Shasta County Department of Resource Management
Planning Division

FOUNTAIN WIND PROJECT
ENVIRONMENTAL IMPACT REPORT

DRAFT ENVIRONMENTAL IMPACT REPORT

July 2020

Use Permit No. UP 16-007
State Clearinghouse No. 2019012029

Prepared for:
Department of Resource Management
Planning Division

Prepared by:
Environmental Science Associates

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ESA

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Draft Environmental Impact Report

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EXECUTIVE SUMMARY

ES.1 Introduction

This Draft Environmental Impact Report (EIR) analyzes the direct, indirect, and cumulative environmental impacts of the proposed Fountain Wind Project (Project) and alternatives to the Project that have been identified by the staff of the Shasta County (County) Department of Resource Management, Planning Division, and recommends mitigation measures to avoid or reduce the environmental effects of the Project that have been identified as "significant" for purposes of the California Environmental Quality Act (CEQA) and its implementing regulations, the CEQA Guidelines. This Draft EIR is an informational document whose purpose is not to recommend either approval or denial of the Project, but rather is to inform agency decision makers and the public of the potential environmental consequences of the Project. Because environmental considerations are but one of multiple factors that may be taken into consideration when an agency is deciding whether to approve a proposal, the County will consider factors outside the scope of CEQA when it decides whether to approve the Project.

ES.2 Project Summary

ES.2.1 Project Overview

The Fountain Wind Project is a renewable wind energy generation development proposed on approximately 4,464 acres in unincorporated Shasta County (Project Site). Access to the Project Site would be provided regionally and locally by Interstate 5 (I-5), approximately 35 miles to the west of the Project Site; State Route (SR) 139, approximately 60 miles to the east of the Project Site; SR 299; Moose Camp Road; and three existing, gated logging roads that would be used to enter the Project Site.

Within the Project Site, the applicant has applied for a Use Permit (UP 16-007) to construct, operate, maintain, and ultimately decommission up to 72 wind turbines and associated transformers together with associated infrastructure and ancillary facilities. Each turbine would be no more than 679 feet tall, as measured from ground level to vertical blade tip (total tip height), and would have a generating capacity of 3 to 5.7 megawatts (MW). The Project would have a maximum total nameplate generating capacity of up to 216 MW.[1] Associated infrastructure and facilities would include: a 34.5-kilovolt (kV) overhead and underground electrical collector system to connect turbines together and to an onsite collector substation; overhead and underground fiber-

[1] "Nameplate capacity" is the amount of power that would be generated under ideal conditions. Actual output can differ from nameplate capacity for a number of reasons, including wind speeds and other weather conditions, and equipment maintenance.

optic communication lines; an onsite switching station to connect the Project to the regional grid operated by Pacific Gas and Electric Company (PG&E); a temporary construction and equipment laydown area; 14 temporary laydown areas distributed throughout the Project Site to store and stage building materials and equipment, an operation and maintenance (O&M) facility; up to four permanent meteorological (MET) towers; temporary, episodic deployment of mobile Sonic Detection and Ranging (SoDAR) or Light Detection and Ranging (LiDAR) systems within identified disturbance areas (e.g., at MET tower locations); two storage sheds; and three temporary batch plants. New access roads would be constructed within the Project Site, and existing roads would be improved. The Project would operate year-round.

ES.2.2 Project Location

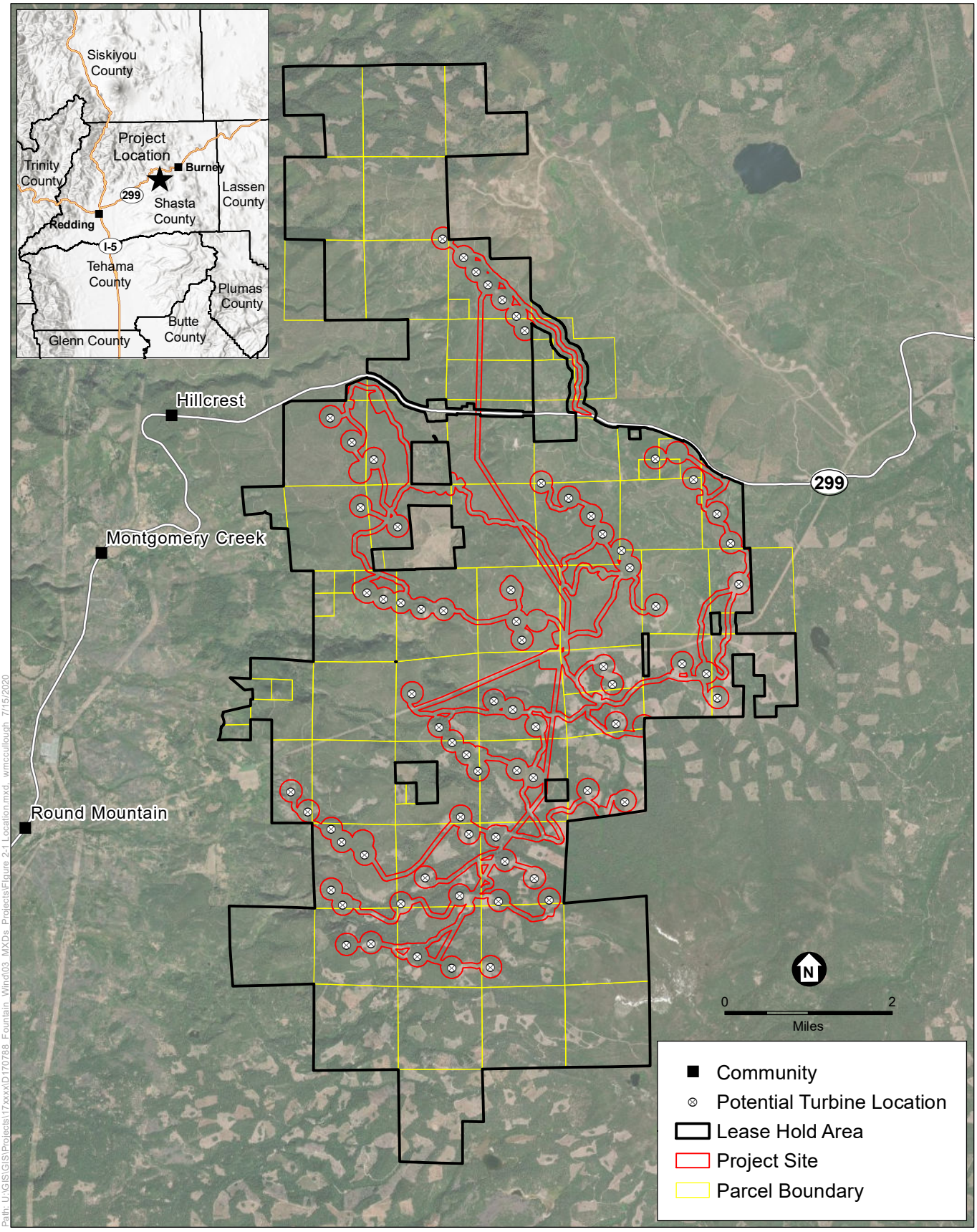
The approximately 4,464-acre Project Site is located within an approximately 29,500-acre area that comprises 76 Shasta County Assessor's parcels (APNs). The 76 APNs consist exclusively of private property operated as managed forest timberlands. The property is located approximately 1 mile west of the existing Hatchet Ridge Wind Project, 6 miles west of Burney, 35 miles northeast of Redding, immediately north and south of California State Route 299 (SR 299), and near the private recreational facility of Moose Camp[2] and other private inholdings. See **Figure ES-1**, *Project Location*. Other nearby communities include Montgomery Creek, Round Mountain, Wengler, and Big Bend. The Project Site is also within in a geographic area that is traditionally and culturally affiliated with the Pit River Tribe. Lassen National Forest lies to the southeast and Shasta-Trinity National Forest is to the north. Other surrounding lands are privately owned; many are used for timber harvesting purposes. Elevations in the area range from 3,000 to 6,000 feet.

Little Cow Creek and the south fork of Montgomery Creek cross the Project Site from east to west. Other small tributaries run through the valleys. Northern portions of the leasehold were affected by the 1992 Fountain Fire, as evidenced by burn scars. The Shasta County General Plan designates the Project Site as Timber (T); the zoning designations are Timber Production (TP) (approximately 4,457 acres) and Unclassified (U) (approximately 6 acres). Existing land uses within the Project Site consist exclusively of managed forest lands. Unpaved logging roads and transmission lines cross the Project Site.

ES.3 Purpose and Use of the Draft EIR

This Draft EIR is an informational document intended to disclose to the public and decision-makers the potential environmental impacts of the Project. This document assesses the direct, indirect and cumulative environmental impacts that could occur as a result of the Project and alternatives to the Project. All of the resource areas in the CEQA Guidelines Appendix G Checklist were studied: Aesthetics, Agriculture and Forestry Resources, Air Quality, Biological

[2] Moose Camp is an approximately 146-acre private recreational facility owned and operated by Moose Recreational Camp, Ltd., a California Non-Profit Mutual Benefit Corporation, for the benefit of its approximately 75 members and their families (Moose Recreational Camp, Ltd., 2012a, 2012b; Environmental Science Associates, 2019 [Letters P17, P23, P37, P43, P55]). In Moose Camp, 50 cabin residences are used year-round (Environmental Science Associates, 2019 [Letters P17, P23, P37, P43, P55]).



Fountain Wind Project

Figure ES-1
Project Location

Resources, Cultural Resources, Energy, Geology and Soils, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Mineral Resources, Noise, Population and Housing, Public Services, Recreation, Transportation, Tribal Cultural Resources, Utilities and Service Systems, and Wildfire. The potential for the Project to result in communications interference is also examined.

The County will rely on this Draft EIR as it may be amended in response to agency and public input received following their review of this Draft EIR, along with other information in the formal record, in deciding whether to approve, approve with modifications, or disapprove the requested application. Other agencies with trustee responsibilities or permitting authority over the Project, including but not limited to the California Department of Forestry and Fire Protection (CAL FIRE), California Department of Fish and Wildlife (CDFW), California Public Utilities Commission (CPUC), and the Regional Water Resources Control Board (RWQCB), also may rely on this document in deciding whether to approve or issue other authorizations for the Project. See Table ES-1, *Summary of Permits and Approvals*, for additional details.

ES.4 Project Objectives

The Applicant seeks to build the Fountain Wind Project to meet the following objectives:

1. Develop, construct, and operate a commercial wind energy generation facility capable of generating up to 216 MW of wind energy.
2. Interconnect to the Northern California electrical grid (NP15).[3]
3. Locate the Project in close proximity to an existing transmission line with sufficient capacity to reduce impacts and costs associated with building new transmission infrastructure.
4. Assist California in meeting the renewable energy generation targets set in Senate Bill (SB) 100.[4]
5. Create temporary and permanent jobs in Shasta County and contribute to the County's tax base.
6. Obtain entitlements to construct and operate a commercially financeable wind energy project.
7. Support landowners through diversification of revenue streams.
8. Offset approximately 128,000 metric tons of carbon dioxide emissions generated by fossil fuels.
9. Provide emissions-free energy for approximately 100,000 households.[5]

[3] The California Independent System Operator (CAISO) manages the operation of California's power grid, including the generation and transmission of electricity by PG&E and the CAISO's other member utilities. The CAISO divides the state into three regions: NP15, SP15, and ZP26. NP15 corresponds to PG&E's electric service territory (CAISO, 2008; PG&E, 2014). An existing 230 kV line crosses the Project Site south of SR 299 (CEC, 2014). The Project would interconnect to the grid along this line.

[4] SB 100 was signed into law on September 10, 2018. This bill accelerates the state's renewable energy goals, requiring 60 percent of California's electricity portfolio to come from eligible renewable sources by 2030 and that all retail electricity be carbon-free by 2045.

[5] The California Public Utilities Commission (CPUC) reported in 2018 that "California households consume electric service at an average rate of 534 kWh per month in the summer months, and 459 kWh per month in the winter months" (CPUC, 2018). If California households consume an average of 496.5 kWh per month (or 5.958 MWh per year), then the Project's generation of 605,491 MWh of electricity per year could serve an estimated 101,627 households per year.

ES.5 Proposed Discretionary Approvals

A "discretionary" approval requires an exercise of judgment or deliberation by a public agency or body in deciding whether to approve, approve with modifications, or disapprove a particular activity. **Table ES-1** summarizes the discretionary approvals and, for informational purposes, some of the key ministerial approvals that may be required for site preparation, construction, operation, maintenance, and decommissioning of the Project.

TABLE ES-1
SUMMARY OF PERMITS AND APPROVALS

Agency	Permit/Approval
Federal	
Federal Aviation Administration (FAA)	Notice of Proposed Construction or Alteration; Determination of No Hazard.*
U.S. Army Corps of Engineers (USACE)	Clean Water Act Section 404 Nationwide Permit if jurisdictional waters of the U.S. could be affected by construction or operation of the Project.
U.S. Fish and Wildlife Service (USFWS)	Section 7 or Section 10 permits may be required if the Project results in take of a species listed under the federal Endangered Species Act (FESA).
State	
California Department of Forestry and Fire Protection (CAL FIRE)	Application for timberland conversion (Pub. Res. Code §4621 et seq.); approval of a timber harvesting plan (Pub. Res. Code §4582).
State and/or Regional Water Resources Control Board (SWRCB and/or RWQCB)	Construction Stormwater General Permit; Notice of Intent to Comply with Section 402 of the Clean Water Act, SWPPP and SPCC Plan; Industrial Stormwater General Permit; Approval of O&M SWPPP and SPCC Plan. Section 401 Certification if USACE determines jurisdictional waters of the U.S. would require a Clean Water Act Section 404 permit.
California Department of Fish and Wildlife (CDFW)	Streambed Alteration Agreement (Fish & Game Code §1600 et seq.); permit authorization if "take" of endangered, threatened, or candidate species could result incidental to an otherwise lawful activity (Fish & Game Code §2081).
California Department of Transportation	Oversize load permit(s) and variances for loads with a width over 15 feet and/or length over 135 feet. Encroachment Permit for utility line crossing state right-of-way.*
California Highway Patrol	Notification of Transportation of Oversize/Overweight Loads.*
California Public Utilities Commission	Approval of construction of switching station for transfer to PG&E (i.e., General Order 131-D).
Local	
Shasta County Air Quality Management District	Authority to Construct and/or Permit to Operate as needed.
Shasta County	Use Permit.
Shasta County Department of Resource Management, Environmental Health Division	Hazardous Materials Business Plan, septic system permit, well permit.*
Shasta County Building Division	Building and grading permits.*
Shasta County Hazardous Materials Program, Certified Unified Program Agency	Hazardous Materials Business Plan and Permit for handling hazardous materials above threshold quantities (includes hazardous waste management).*
Shasta County, Public Works Department	Encroachment Permit.*

NOTE: * Typically processed as ministerial permits

ES.6 Overview of Project Impacts and Mitigation

Section 3.1 in Chapter 3, *Environmental Analysis,* includes a summary of the environmental topics that were removed from consideration and the rationale for doing so. Briefly, resources or resource considerations were not carried forward for more detailed consideration because the resource is not present in the Project Area or because the Project would not result in an impact on the resource. Sections 3.2 through 3.18 provide an overview of the setting; analyze the potential direct, indirect and cumulative impacts of the Project and alternatives; and identify mitigation measures designed to reduce potential significant impacts below established thresholds. The Project would cause no impact, a less-than-significant impact (with or without mitigation), or a significant and unavoidable impact as noted below. See Section ES.7 for a comparison of the environmental impacts of the Project with those of the alternatives.

ES.6.1 Less-than-Significant Impacts / Less-Than-Significant Impacts with Implementation of Mitigation Measures

The Project would have a less-than-significant impact, or a less-than-significant impact with the implementation of recommended mitigation measures, for specific considerations within the following resource categories:

1. Aesthetics
2. Air Quality
3. Biological Resources
4. Communications Interference
5. Cultural and Tribal Cultural Resources
6. Energy
7. Forest Resources
8. Geology and Soils
9. Greenhouse Gas Emissions
10. Hazards and Hazardous Materials
11. Hydrology and Water Quality
12. Land Use and Planning
13. Noise and Vibration
14. Public Services
15. Transportation
16. Utilities and Service Systems
17. Wildfire

ES.6.2 Significant and Unavoidable Impacts

Section 15126.2(b) of the CEQA Guidelines requires that the EIR describe any significant impacts, including those that can be mitigated but not reduced to less-than-significant levels. The Project would have a significant and unavoidable impact regarding the following resource considerations:

1. **Aesthetics**: The Project would have a significant and unavoidable impact, both at the Project-specific level and cumulatively, with regard to its effect on a scenic vista and the existing visual character or quality of public views of the site and its surroundings from publicly accessible vantage points.
2. **Air Quality**: The Project would have a significant and unavoidable impact with regard to a cumulatively considerable net increase in emissions of particulate matter less than or equal to

10 microns in diameter (PM_{10}) in a region of non-attainment for PM_{10} state ambient air quality standards. Mitigation Measure 3.3-2c (Fugitive Dust Controls) is proposed, but would not reduce the potential impact below the established threshold.

3. **Biological Resources**: The Project would have a significant and unavoidable impact with regard to potential mortality and injury to raptors as a result of collisions with wind turbines and electrical transmission lines and mortality and injury to bats, including special-status species. These significant unavoidable impacts also would be cumulatively significant and unavoidable.

4. **Cultural and Tribal Cultural Resources**: The Project would have a significant and unavoidable impact with regard to changes in the significance of a tribal cultural resource. Mitigation Measure 3.6-1 (Archaeological Research Design) and Treatment Plan and Mitigation Measure 3.6-3 (Tribal Cultural Resources Interpretive and Use Program) are proposed, but would not reduce the potential impact below the established threshold.

ES.6.3 Irreversible Impacts

Section 15126.2(c) of the CEQA Guidelines defines an irreversible impact as an impact that uses nonrenewable resources during the initial and continuing phases of the project. Irreversible impacts also can result from damage caused by environmental accidents associated with a project. Irretrievable commitments of resources are evaluated to ensure that such consumption is justified.

Buildout of the Project would commit nonrenewable resources during Project construction and ongoing utility services during Project operations. During operations, some oil, gas, and other fossil fuels and nonrenewable resources would be consumed and irreversible commitments of small quantities of nonrenewable resources would occur as a result of long-term Project operations. However, once operational, the Project would result in a substantial net benefit with respect to nonrenewable resources as a result of the amount of renewable energy that would be generated. See Section 3.10, *Greenhouse Gas Emissions*, for details.

ES.6.4 Summary of Project Impacts and Mitigation Measures

Table ES-2 summarizes the environmental impacts of the Project and recommended mitigation measures that, if adopted, would avoid or substantially reduce potential significant impacts of the Project. The analysis of each impact is provided on a resource-by-resource basis in Chapter 3.

TABLE ES-2
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Aesthetics			
Impact 3.2-1: The Project would, unless mitigated, have a substantial adverse effect on a scenic vista or substantially degrade the character or visual quality of views from publicly accessible vantage points.	Potentially significant	**Mitigation Measure 3.2-1: Project Design to Reduce Aesthetic Impacts at KOP 1** When finalizing the design for the Project, the Applicant shall site turbines to avoid placing turbines within the viewshed of KOP 1, or to reduce the visibility of turbines from KOP 1. For example, if the turbines were to be moved further downslope they would be less visible, from KOP 1. When submitting site plans to the County of Shasta to be approved, the Applicant shall demonstrate to the County that the impacts from KOP 1 have been avoided or reduced. The turbines shall be painted in accordance with manufacturer's and Federal Aviation Administration marking requirements. Commercial messages and symbols shall not be used on turbine structures. When the site plans are presented to the County for approval, the Applicant also shall present the type of turbine selected to the County so that the County may ensure that no commercial messages are used on the turbines.	Significant and unavoidable
Impact 3.2-2: The Project could damage scenic resources within a state scenic highway.	Less than significant impact	No mitigation measures are required	
Impact 3.2-3: The Project could create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area.	Less than significant impact	No mitigation measures are required	
Air Quality			
Impact 3.3-1: Construction, decommissioning, and site reclamation activities would generate pollutant emissions that could conflict or obstruct implementation of the applicable air quality plan.	Potentially significant	**Mitigation Measure 3.3-1a: Tier 4 Final Emission Standards for Off-road Construction Equipment.** The Applicant (and/or its construction contractor[s]) shall require that all diesel-fueled off-road construction equipment of more than 50 horsepower used at the Project Site during construction, decommissioning, and/or reclamation activities meet USEPA Tier 4 Final emission standards. A compliance log shall be maintained by the Applicant and made available to the Shasta County Department of Resource Management upon request. **Mitigation Measure 3.3-1b: Idling Restrictions and Fuel Use.** To ensure that idling time for on road vehicles with a gross vehicular weight rating of 10,000 pounds or greater does not exceed the five-minute limit established in Section 2485 of Title 13 California Code of Regulations, and that idling time for off-road engines does not exceed the five-minute limit established in Title 13 California Code of Regulations Section 2449(d)(3), the Applicant and/or its construction contractor(s) shall prepare and implement a written idling policy and distribute it to all equipment operators. Clear signage of these requirements shall be provided for construction workers at all access points to construction areas. The Applicant shall use CARB-certified alternative fueled (compressed natural gas [CNG], liquid propane gas [LPG], electric motors, or other CARB certified off-road technologies) engines in construction equipment where feasible.	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Air Quality (cont.)			
Impact 3.3-2a: Construction, decommissioning, and site activities would generate ROG emissions that could result in a cumulatively considerable net increase of ozone, for which the Project region is non-attainment of State ambient air quality standards.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.3-2b: Construction, decommissioning, and site reclamation activities would generate NO_x emissions that could result in a cumulatively considerable net increase of ozone, for which the Project region is non-attainment of State ambient air quality standards.	Potentially significant	**Mitigation Measure 3.3-2b:** Implement Mitigation Measures 3.3-1a (Tier 4 Final Emission Standards for Off-road Construction Equipment) and 3.3-1b (Idling Restrictions and Fuel Use).	Less than significant
Impact 3.3-2c: Construction, decommissioning, and site reclamation activities would generate PM_{10} emissions that would result in a cumulatively considerable net increase of PM_{10}, which the Project region is non-attainment of State ambient air quality standards.	Potentially significant	**Mitigation Measure 3.3-2c: Fugitive Dust Controls.** The following AQMD Standard Mitigation Measures for fugitive dust shall be implemented during the construction, decommissioning, and reclamation phases by the Applicant and/or its contractor(s): • Options to open burning of vegetative material on the Project Site shall be used by the Applicant unless otherwise deemed infeasible by the AQMD. Examples of suitable options are chipping, mulching, and conversion to biomass fuel. • The Applicant shall be responsible for ensuring that all adequate dust control measures are implemented in a timely and effective manner during all phases of Project development and construction. • All material excavated, stockpiled, or graded should be sufficiently watered to prevent fugitive dust from leaving property boundaries and causing a public nuisance or a violation of an ambient air standard. Watering should occur at least twice daily with complete site coverage, preferably in the mid-morning and after work is completed each day. • All areas (including unpaved roads) with vehicle traffic should be watered periodically or have dust palliatives applied for stabilization of dust emissions. • All onsite vehicles should be limited to a speed of 15 miles per hour on unpaved roads. • All land clearing, grading, earth moving, and excavation activities on the Project Site shall be suspended when winds are expected to exceed 20 miles per hour. • All inactive portions of the development site should be seeded and watered until suitable grass cover is established.	Significant and unavoidable

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Air Quality (cont.)			
Impact 3.3-2c (cont.)		• The Applicant shall be responsible for applying (according to manufacturer 's specifications) nontoxic soil stabilizers to all inactive construction areas (previously graded areas that remain inactive for 96 hours) in accordance with the Shasta County Grading Ordinance. • All trucks hauling dirt, sand, soil, or other loose material should be covered or should maintain at least 2 feet of freeboard (i.e., minimum vertical distance between top of the load and top of the trailer) in accordance with the requirements of California Vehicle Code Section 23114. This provision shall be enforced by local law enforcement agencies. • All material transported off site shall be either sufficiently watered or securely covered to prevent a public nuisance. • During initial grading, earth moving, or site preparation, the Applicant shall be required to construct a paved (or dust palliative-treated) apron, at least 100 feet in length, onto the Project Site from the adjacent paved Highway 299. • Paved streets adjacent to the development site should be swept or washed at the end of each day to remove excessive accumulations of silt and/or mud that may have accumulated as a result of activities on the development site. • Adjacent paved streets shall be swept at the end of each day if substantial volumes of soil materials have been carried onto adjacent public paved roads from the Project Site. • Wheel washers shall be installed where project vehicles and/or equipment enter and/or exit onto paved streets from unpaved roads. Vehicles and/or equipment shall be washed prior to each trip. • Prior to final occupancy, the applicant shall reestablish ground cover on the construction site through seeding and watering in accordance with the Shasta County Grading Ordinance.	
Impact 3.3-2d: Construction, decommissioning, and site reclamation activities would not result in cumulatively considerable net increases of criteria pollutants in other air district jurisdictions.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.3-3: Operation of the Project would generate pollutant emissions that would not result in a cumulatively considerable net increase of criteria pollutants, which the Project region is non-attainment of State ambient air quality standards.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.3-4: Project activities would generate emissions of toxic air contaminants, potentially exposing sensitive receptors to harmful pollutant concentrations.	Less than significant	No mitigation measures are required	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Air Quality (cont.)			
Impact 3.3-5: Project construction, decommissioning, site reclamation, and operation would not create objectionable odors adversely affecting a substantial number of people.	Less than significant	No mitigation measures are required	Less than significant
Biological Resources			
Impact 3.4-1: Construction of the Project could, unless mitigated, cause a significant impact to special- status plant species.	Potentially Significant	**Mitigation Measure 3.4-1: Avoid and Minimize Construction Impacts on Special-Status Plants** To prevent adverse impacts to special- status plants, the Project Applicant shall implement the following measures if construction activities are to occur in the area not yet surveyed, or if vegetation removal and ground disturbing construction activities have not been completed within 5 years of the completion of rare plant surveys: a) A qualified biologist shall conduct a pre-construction survey for special-status plant species with the potential to occur within the unsurveyed area, or other areas if 5 years have passed since completion of rare plant surveys; or as otherwise approved by CDFW. The survey shall follow the procedures outlined in the CDFW (2018) rare plant survey protocol. b) If special-status plants are found to be present, plant populations shall be avoided using an appropriate (e.g., 20-foot or greater) buffer for the subject population during construction. The buffer shall be staked, roped, and/or fenced off so as to be readily identifiable by construction workers as a buffer area to be avoided. c) Where special-status plant avoidance is not feasible, the applicant shall mitigate for the loss of plants through the implementation of the following: A qualified ecologist shall develop and implement a restoration and mitigation plan according to CDFW guidelines and in coordination with CDFW. At a minimum, the plan shall include collection of reproductive structures or plant salvage from affected plants, a full description of microhabitat conditions necessary for each affected species, seed germination requirements, restoration techniques for temporarily disturbed occurrences, assessments of potential transplant and enhancement sites, success and performance criteria (e.g., greater than 1:1 replacement of individual plants or the population area), include a minimum 3-year monitoring program, as well as measures to ensure long-term sustainability such as weeding or supplemental water. d) Survey results shall be provided to the Shasta County Department of Resource Management, Planning Division and CDFW at least 14 days in advance of the initiation of construction activities within the area(s) surveyed. The Shasta County Department of Resource Management, Planning Division shall, in coordination with CDFW, determine whether or not the survey(s) were conducted in accordance with CDFW plant survey protocol and measures b) and/or c) are to be implemented. Construction shall not begin in the surveyed area until the Shasta County Department of Resource Management, Planning Division has confirmed that the survey(s) were conducted in accordance with the protocol and, if necessary, that measures 3.4-1b and/or 3.4-1c have been implemented.	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Biological Resources (cont.)			
Impact 3.4-2: Construction of the Project could, unless mitigated, cause a significant impact on nesting bald and golden eagles.	Potentially significant	**Mitigation Measure 3.4-2: Avoid and minimize construction-related impacts to nesting eagles (January 1 to August 31).** To prevent adverse impacts to nesting eagles, the Project Applicant shall implement the following measures if construction activities are to occur during the nesting season: a) Conduct terrestrial preconstruction eagle nesting surveys of known previously active nest sites to determine whether eagles are actively nesting or maintaining territories within 2 miles of the Project construction boundary. Surveys will be designed and carried out by a qualified biologist with experience in the natural history and nesting behavior of eagles, following USFWS guidelines. Terrestrial surveys will include all suitable eagle nesting habitat within a 2-mile buffer surrounding the Project construction boundary, as accessible, and subsequent observations at known nests to assess territory occupancy and nesting activity by adult eagles. b) Results of preconstruction eagle nesting surveys will be reported to the Shasta County Department of Resource Management, Planning Division, USFWS, and CDFW by August 31 of the year in which the survey was conducted. The Shasta County Department of Resource Management, Planning Division shall, in coordination with resource agencies, determine whether or not the survey(s) were conducted in accordance with appropriate protocols and measures c) is to be implemented. Construction shall not begin in the surveyed area until the Shasta County Department of Resource Management, Planning Division has confirmed that the survey(s) were conducted in accordance with appropriate protocols and, if necessary, that measure 3.4-2c has been implemented. c) If surveys document active eagle nests within the 2-mile survey buffer, the Project Applicant will coordinate with the County, USFWS and CDFW to define and implement recommended protective measures. Typical measures for working within 2 miles of eagle nests are to establish construction buffers (e.g., with flagging, rope, signage, or other similar barriers) in accordance with USFWS recommendations (National Bald Eagle Management Guidelines, 2007; Golden Eagle, 2013) for specific activities (e.g., vehicular traffic, construction work, etc.); and may be adjusted downward based on site-specific conditions following coordination with the USFWS Migratory Bird Program and CDFW.	Less than significant
Impact 3.4-3: Operation of the Project could, unless mitigated, result in significant adverse impacts to or direct mortality of bald and golden eagles.	Potentially significant.	**Mitigation Measure 3.4-3a: Avoid and minimize operational impacts on avian and bat species.** The Project Applicant will avoid and minimize operational impacts on eagles, other raptors, other birds and bats by enacting the following mitigation measures: a) Discourage raptor use of immediate vicinity of wind turbine generators by taking steps to reduce prey species' numbers, such as minimizing creation of prey habitat such as rock piles. b) Follow APLIC (2006, 2012) guidance for all energized Project components to minimize electrocution or collision with transmission lines.	Significant and Unavoidable.

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Biological Resources (cont.)			
Impact 3.4-3 (cont.)		c) Follow Land-Based Wind Energy Guidelines (USFWS, 2012) for turbine design and best management practices that help to minimize eagle mortality and eliminate potential raptor perches; avoid guy wires on meteorological towers where possible. d) Prior to Project construction, the Applicant will coordinate with USFWS regarding potential impacts to eagles and demonstrate the Projects' compliance with the Bald and Golden Eagle Protection Act and the USFWS Eagle Conservation Plan Guidance (2013). e) All Project staff responsible for operations will be trained in reporting avian and bat wildlife fatalities, including those of bald and golden eagles, other raptors, and bats encountered during turbine maintenance and other regular activities on site. A protocol for project staff will be developed in coordination with CDFW and the County for appropriate handling and reporting fatalities. **Mitigation Measure 3.4-3b: Monitor avian and bat mortality rates during project operations.**[6] To accurately assess operational Project impacts on avian species, including bald eagle, golden eagle, other raptors, and bats, and ensure the effectiveness of avian protection measures, the applicant will design and implement a post-construction mortality monitoring (PCMM) study. The PCMM will include the following elements: a) The duration of PCMM monitoring to assess ongoing impacts of operation will include post-construction monitoring for eagles, other raptors, and bats. The PCMM monitoring will commence immediately following the beginning of commercial operation and continue for three years following the incorporation of all planned turbines and power generation. b) PCMM studies will be designed to meet a minimum overall detection probability for bald and golden eagles of 30 percent during the first three years of full operation. Additionally, the PCMM will include a mandatory incidental monitoring and reporting program for other raptors and bats for the life of the Project. c) Searcher efficiency trials and carcass persistence trials using large raptor carcasses or an appropriate, commercially available proxy will be implemented and used to calculate overall detection probabilities of eagle carcasses. Carcasses of other birds and bats will also be collected and reported. d) Monitoring will occur over all seasons of occupancy for the species being monitored.	

[6] Mitigation measure 3.4-3b encompasses more species than just eagles. This is to avoid redundancy within the document, and the measure is referred to as a means of reducing other impacts throughout the document.

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Biological Resources (cont.)			
Impact 3.4-3 (cont.)		e) Applicant will provide an annual report of PCMM findings to the Shasta County Department of Resource Management, Planning Division, CDFW, and the USFWS. If a bald or golden eagle, other raptors or bats are detected during PCMM, and detections indicate exceedance of the following thresholds, the Applicant and relevant agencies will develop a plan to mitigate the impacts per the *Land-Based Wind Energy Guidelines* (USFWS, 2012).[7] • Bald eagle – injury or mortality to one or more bald eagles in any given year. • Golden eagle – injury or mortality to one or more golden eagles in any given year. • Other raptors – injury or mortality to six or more individuals of any sensitive raptor species in any given year, except northern goshawk. For northern goshawk, injury or mortality to two or more individuals in any given year. • Bats – injury or mortality to three or more bats of a single species identified as Western Bat Working Group (WBWG) high priority (red) species (i.e., pallid bat, Townsend's bat, spotted bat, western red, or western mastiff) in any given year; or injury or mortality to six or more bats of a single species identified as WBWG medium priority (yellow) species (i.e., hoary bat or spotted bat), in any given year. The Applicant will implement minimization measures recommended by these agencies to limit mortality. Which may include operational modifications such as curtailment of turbine speed. The possible use of low-intensity ultraviolet light and ultrasonic deterrence systems to deter birds and bats from approaching rotating wind turbine blades may also be considered as warranted (AWWI, 2018). **Mitigation Measure 3.4-3c: Offset operational impacts on eagles through compensatory mitigation, if necessary.** a) If bald or golden eagle mortality occurs as a result of the Project, the Project Applicant will fund the retrofitting of electrical utility poles that pose a high risk of electrocution to eagles. Applicant will coordinate with the USFWS and follow the most current USFWS Eagle Conservation Plan Guidance (USFWS, 2013). If in coordination with USFWS an alternative compensatory mitigation measure is preferred to pole retrofitting, such alternative compensation measure (e.g., pole reframing or funding carcass removal from roadways) may be implemented.	

[7] Injury and mortality thresholds for bald eagle, golden eagle, and California spotted owl stated above were developed based on the low expectation for species mortality during project operations. For northern goshawk, this species is not listed and no California wind farm mortality has been identified in California. Because this species is unlikely to be encountered, a threshold of two individuals was adopted. For other raptors, the adopted threshold was based on the regional populations of Coopers hawk, sharp-shinned hawk, and northern harrier, which are fairly healthy. For most raptor species, mortality to migrating individuals is not anticipated. This assessment was based on focused baseline surveys of the Project area, monitoring findings from the Hatchet Ridge Wind Project, and coordination with raptor experts. For uncommon bat species with low population numbers, four WBWG high priority species are considered to have a low to moderate potential to occur and a threshold of three individuals per species was adopted based their rarity and low encounter numbers at the Hatchet Ridge Wind Project. For two WBWG medium species, a threshold of six bats was adopted based on the absence of habitat in the Project area (western mastiff bat) or the greater abundance of the species (hoary bat).

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Biological Resources (cont.)			
Impact 3.4-3 (cont.)		b) Any compensatory mitigation must occur within the same Eagle Management Unit as the Project, and must be completed within one year of any instance of documented take. c) Applicant will provide a report to the Shasta County Planning Department and USFWS documenting implementation of measures taken within one year of detection of the eagle take. d) Annually and after collection of 3 years of post-construction monitoring data, the Shasta County Department of Resource Management's will review the data and, in coordination with the Project Applicant, USFWS and CDFW, will determine which, if any, specific wind turbines generate disproportionately high levels of avian (including eagle) mortalities (based on evidence of statistically significant higher levels of mortality relative to other Project wind turbines). If specific wind turbines are found to result in disproportionately high avian mortalities based on collected data, the Project Applicant shall coordinate with the County to evaluate any feasible measures that can be implemented to reduce or avoid mortalities at those specific wind turbines. Furthermore, if mortalities involve eagles, the County will consider additional measures, including but not limited to carcass removal from roadways or funding for the acquisition of conservation easements on habitat that would provide nesting, foraging, or roosting bald and/or golden eagle habitat. e) If unauthorized take of a federal or state listed raptor occurs during project operation, the Project Applicant shall immediately notify the appropriate agency (CDFW and/or USFWS) by phone. The Applicant shall submit a written finding to the appropriate agency and the County within two calendar days that describes the date, time, location, species and, if possible, cause of unauthorized take. The Applicant shall notify the County within three calendar days of the receipt of any USFWS and/or CDFW required or recommended actions resulting from the unauthorized take, including whether an incidental take permit and/or additional requirements is deemed necessary by either agency.	
Impact 3.4-4: Decommissioning of the Project could result in adverse impacts to nesting bald and golden eagles.	Potentially significant	**Mitigation Measure 3.4-4:** Implement Mitigation Measure 3.4-2 (Avoid and minimize construction-related impacts to nesting eagles).	Less than significant
Impact 3.4-5: Construction, operation and decommissioning of the Project could result in adverse impacts to California spotted owls.	Less than significant	No mitigation measures are required.	Less than significant
Impact 3.4-6: Construction and decommissioning of the Project could result in adverse impacts on nesting raptors (other than goshawks).	Potentially significant	**Mitigation Measure 3.4-6: Avoid and minimize construction-related impacts on nesting raptors (March 1 to August 15)** a) Where feasible, tree and vegetation removal activities shall be avoided in potential raptor nesting habitat during the avian nesting season (March 1–August 15) during each year of construction.	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Biological Resources (cont.)			
Impact 3.4-6 (cont.)		b) If construction is planned to occur during the avian nesting season from March 1–August 15, pre-construction raptor nesting surveys shall be conducted by a qualified biologist to identify raptor nests within 500 feet of proposed work areas. A qualified biologist is defined as a person who is knowledgeable in the distribution, habitat, life history, and identification of Northern California birds, is familiar with the survey methods to locate and survey for active nests within the Project Site and can acquire any permits needed to survey for federally listed or state-listed birds, if such permits become necessary. c) Results of preconstruction raptor surveys will be reported to the Shasta County Department of Resource Management, Planning Division, USFWS, and CDFW by August 31 of the year in which the survey was conducted. The Shasta County Department of Resource Management, Planning Division shall, in coordination with resource agencies, determine whether or not the survey(s) were conducted in accordance with appropriate protocols and measure 3.4-6d is to be implemented. Construction shall not begin in the surveyed area until the Shasta County Department of Resource Management, Planning Division has confirmed that the survey(s) were conducted in accordance with appropriate protocols and, if necessary, that measure 3.4-6d has been implemented. d) If active raptor nests are found during pre-construction surveys, a 500-foot exclusion zone shall be established around the nest in which no work would be allowed until the young have successfully fledged or nesting activity has ceased. The determination of fledging or cessation of nesting shall be made by a qualified biologist with experience in monitoring raptor nests. Any sign of nest disturbances shall be reported to the Shasta County Department of Resource Management, CDFW and USFWS. In coordination with CDFW and/or USFWS, the County may modify the size of the exclusion zone depending on the raptor species and type of construction activity occurring near the nest.	
Impact 3.4-7: Construction and decommissioning of the Project could result in adverse impacts to nesting goshawks.	Potentially significant	**Mitigation Measure 3.4-7a:** Implement Mitigation Measure 3.4-6: Avoid and minimize construction-related impacts on nesting raptors (March 1 to August 15) **Mitigation Measure 3.4-7b: Avoid and minimize construction-related impacts to nesting goshawks (March 1 to August 15)** a) Prior to any disturbance of forest habitats that fit the nesting criteria of northern goshawks, the Applicant will conduct acoustic surveys for northern goshawk during their nesting season (March 1–August 31) following methods outlined by Woodbridge and Hargis (2006) to assure species is not nesting or using the territory for nesting. If nesting goshawks are found, the nests would be avoided with a suitable buffer distance (minimum 500 feet) in coordination with CDFW. b) Results of preconstruction goshawk surveys will be reported to the Shasta County Department of Resource Management, Planning Division and CDFW. The Shasta County Department of Resource Management, Planning Division shall, in coordination with resource agencies, determine whether or not the survey(s) were conducted in accordance with appropriate protocols. Construction shall not begin in the surveyed area until the Shasta County Department of Resource Management, Planning Division has confirmed that the survey(s) were conducted in accordance with appropriate protocols.	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Biological Resources (cont.)			
Impact 3.4-8: Operation of the Project could result in mortality and injury to raptors (including goshawk), as a result of collisions with wind turbines and electrical transmission lines.	Potentially significant	**Mitigation Measure 3.4-8:** Implement Mitigation Measure 3.4-3b (Monitor avian and bat mortality rates during project operations).	Significant and unavoidable
Impact 3.4-9: Operation of the proposed project could result in mortality and injury to waterfowl as a result of collisions with wind turbines and electrical transmission lines.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.4-10: Construction, operation, and decommissioning of the Project could have potential significant impacts on sandhill cranes during migratory movements in fall and spring, and could result in mortality of and injury to sandhill cranes.	Less than significant	No mitigation measures are required.	Less than significant
Impact 3.4-11: Construction and decommissioning of the Project could result in adverse impacts to nesting songbirds, potentially including special-status species.	Less than significant	No mitigation measures are required.	Less than significant
Impact 3.4-12: Site preparation and construction, operations and maintenance, and decommissioning and site restoration of the Project could result in habitat loss and water quality impacts on Pit roach, special-status amphibians and western pond turtle.	Potentially significant	**Mitigation Measure 3.4-12:** Implement Mitigation Measure 3.12-1 (Water Quality Best Management Practices during Activities in and near Water) and Mitigation Measure 3.4 16b (Avoid or Minimize Impacts to Wetlands and Other Waters)	Less than significant
Impact 3.4-13: Operation and maintenance of the Project could result in direct mortality and injury to bats, including special-status species.	Potentially significant	**Mitigation Measure 3.4-13:** Implement Mitigation Measure 3.4-3b (Monitor Avian and Bat Mortality Rates During Project Operations).	Significant and unavoidable
Impact 3.4-14: Site Preparation and Construction and Decommissioning and Site Restoration of the Project could result in temporary adverse impacts to special-status mammals.	Less than significant	No mitigation measures are required.	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Biological Resources (cont.)			
Impact 3.4-15: Site preparation and construction, operations and maintenance, and decommissioning and site restoration of the Project would result in adverse impacts to riparian habitat or other sensitive vegetation communities.	Potentially significant	**Mitigation Measure 3.4-15a:** To minimize the amount of riparian vegetation removed during construction. Implement Mitigation Measure 3.4-16b for wetlands (Avoid and minimize impacts to wetland and other waters). **Mitigation Measure 3.4-15b: Compensate for Impacts to Rocky Mountain Maple Riparian Scrub Habitat.** The Applicant shall implement a Reclamation and Revegetation Plan that includes detailed measures for the compensation, restoration, and/or enhancement of Rocky Mountain Maple Riparian Scrub Habitat on a per-acre basis. The standard for mitigation shall be no net loss. If restoration is selected as a method of compensatory mitigation, the Applicant shall prepare a riparian mitigation and monitoring plan as part of the Project's reclamation and revegetation plan and shall submit it to the County for review, determination of adequacy, and approval. Mitigation ratios shall be at a1:1 level. The Rocky Mountain Maple Riparian Scrub Habitat mitigation and monitoring plan shall be written by a qualified biologist and shall include the following elements, at minimum: a) goals of the plan and permitting requirements satisfied; b) Riparian habitat restoration activities and locations, including the restoration of temporarily affected riparian habitat to preconstruction conditions; c) monitoring and reporting requirements (including monitoring period), and criteria to measure mitigation success; and d) remedial measures, should mitigation efforts fall short of established targets. The County may consult with CDFW about the adequacy of the plan and may consult with other agencies, if the plan aims to fulfill multiple permitting and mitigation requirements.	Less than significant
Impact 3.4-16: Site preparation and construction, operations and maintenance, and decommissioning and site restoration of the Project could result in adverse impacts to wetlands and other waters.	Potentially significant	**Mitigation Measure 3.4-16a:** Implement Mitigation Measure 3.12-1 (Water Quality Best Management Practices during Activities in and near Water) **Mitigation Measure 3.4-16b: Avoid and Minimize Impacts to Wetlands and Other Waters.** The Applicant will avoid and minimize impacts on wetlands and other waters by implementing the following mitigation measures: a) Avoid direct and indirect impacts to wetlands and streams in final siting and design to the maximum extent feasible. b) Design stream crossings, including culverts, to pass a 100-year event without increasing average flow velocity or bed/bank scour potential. c) Monitor stream crossings in burn areas seasonally and maintain culverts and drains, since burned areas may experience sediment and debris loads that could result in clogged or blocked culverts.	Less than significant.

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Biological Resources (cont.)			
Impact 3.4-16 (cont.)		d) The Applicant shall also submit a site plan showing all aquatic resources and appropriate regulatory buffers or setbacks to Shasta County. e) The Applicant shall assign a qualified wetland scientist to mark all aquatic resources associated with the final project site plan. Temporary high visibility fencing, and signage may be used to help protect these areas. The qualified wetland scientist would also identify corresponding setbacks to aquatic resources, as required by Project permits. f) On a continuous basis, a qualified wetland scientist or biological monitor shall be assigned to visually inspect aquatic resources, and surrounding areas, for evidence of hydrologic loss in aquatic areas. g) Develop a Spill Prevention, Control, and Countermeasures (SPCC) Plan to minimize adverse impacts to wetlands. **Mitigation Measure 3.4-16c: Compensate for Impacts to Wetlands and other Waters.** The Applicant shall implement a Reclamation and Revegetation Plan that includes detailed measures for the compensation, restoration, and/or enhancement of wetlands and other waters on a wetland type per-acre basis. The standard for mitigation shall be no net loss. If restoration is selected as a method of compensatory mitigation, the Applicant shall prepare a wetland mitigation and monitoring plan as part of the Project's reclamation and revegetation plan and shall submit it to the County for review, determination of adequacy, and approval. Mitigation ratios shall be calculated following USACE wetland mitigation procedures and shall be based on the actual impact acreage of final design per as-built construction drawings and the results of the preconstruction surveys. After review and approval by the County and pertinent regulatory agencies, mitigation shall be carried out at a ratio no less than 1:1, or another ratio approved by the appropriate jurisdictional agency, whichever is higher. The wetland mitigation and monitoring plan shall be written by a qualified biologist and shall include the following elements, at minimum: a) goals of the plan and permitting requirements satisfied; b) wetland restoration activities and locations, including the restoration of temporarily affected wetlands and other waters to preconstruction conditions; c) monitoring and reporting requirements (including monitoring period), and criteria to measure mitigation success; and d) remedial measures, should mitigation efforts fall short of established targets. The County may consult with USACE about the adequacy of the plan and may consult with other agencies, if the plan aims to fulfill multiple permitting and mitigation requirements.	

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Biological Resources (cont.)			
Impact 3.4-17: Site preparation and construction, operations and maintenance, and decommissioning and site restoration of the Project would not result in adverse impacts to movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	Less than Significant	No mitigation measures are required.	Less than significant
Impact 3.4-18: The Project could cause a cumulatively considerable contribution to a significant cumulative impact to avian and bat species from collisions with Project infrastructure.	Potential significant	No additional reasonable, feasible mitigation measures are available that, if implemented, would reduce the Project's contribution below the established level of significance.	Significant and Unavoidable
Communications Interference			
Impact 3.5-1: The Project could cause intermittent interference to or freezing of television reception at some residences in the service area of the stations that broadcast over the Project Site.	Potentially significant	**Mitigation Measure 3.5-1: Correct or mitigate conflicts with television signals.** Prior to issuance of a construction permit from the County, the Applicant shall send notifications, via certified mail or other means that documents receipt, to all property owners of residences within the service area of the stations that broadcast over the Project site notifying them of the potential for interference with "over-the-air" television signals received by antenna. The notification shall provide contact information and instructions so that recipients may file a complaint with the Shasta County Department of Resource Management, Planning Division if interference occurs. In the event that the County receives a verified complaint regarding television broadcast interference that is attributable to this Project, the Applicant will resolve receiver interference through coordination with property owners. Verification shall include a letter or report from a qualified third party supporting the conclusion that interference is attributable to the Project. The Applicant shall not be required to provide qualifying residents with better reception than they had before the construction and operation of the Project.	Less than significant
Impact 3.5-2: The Project would not interfere with existing navigational systems operated by the FAA or the U.S. military.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.5-3: None of the Project turbines would obstruct or prevent known point-to-point microwave relay station transmissions; however, interference could occur due to turbine location adjustments or currently unknown transmissions.	Potentially Significant	**Mitigation Measure 3.5-3: Correct or mitigate conflicts with microwave signals.** Prior to issuance of a construction permit from the County, the Applicant shall notify, via certified mail or other means that documents receipt, all owners of frequency-based communication stations and towers within 2 miles of the Project Site. The notification shall provide the locations of all turbines and shall provide contact information and instructions so that recipients may file a complaint with the Shasta County Department of Resource Management, Planning Division if interference occurs.	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Communications Interference (cont.)			
Impact 3.5-3 (cont.)		In the event that the County receives a verified complaint regarding microwave transmission interference that is attributable to this Project, the Applicant will resolve receiver interference through coordination with owners of frequency-based communication stations and towers. Verification shall include a letter or report from a qualified third party supporting the conclusion that interference is attributable to the Project. Possible actions include the Applicant being responsible for installation of high-performance antennas at nearby microwave sites, if required. The Applicant shall not be required to provide qualifying owners with better signals than they had before the construction and operation of the Project.	
Cultural and Tribal Cultural Resources			
Impact 3.6-1: The Project could cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5.	Potentially Significant	**Mitigation Measure 3.6-1: Archaeological Research Design and Treatment Plan.** Prior to receiving a County grading permit for the Project, the applicant shall: 1. Relocate Project components to a location that would not potentially impact the known historical resource. 2. If relocation is documented to the satisfaction of the County as infeasible (where "feasible" means "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors" as defined in CEQA Guidelines Section 15364) and the historical resource would potentially be impacted by the Project, design and implement an Archaeological Research Design and Treatment Plan (ARDTP). The investigation would be completed under the methods and research design outlined in an ARDTP to be prepared in accordance with the California Resources Agency's Guidelines for Archeological Research Designs (California Resources Agency, 1991). A qualified archaeologist (defined as one meeting the Secretary of the Interior's Professional Qualification Standards for archaeology) shall prepare the ARDTP in consultation with the culturally affiliated Native American tribe(s). The ARDTP shall address, at a minimum, the following: the establishment of Environmentally Sensitive Areas; treatment and recovery of important data contained within the portions of the historical resource located within and adjacent to the Project Site; construction worker cultural resources sensitivity training; compensated archaeological and Native American monitoring; inadvertent discovery protocols; and provisions for curation or reburial of recovered materials. The ARDTP shall include the specific methods that will be employed (e.g., the length and depth of excavation, the type of equipment utilized, the percent of area investigated). The ARDTP shall identify how the proposed investigation would preserve any significant historical information obtained and identify the scientific/historic research questions applicable to the resource, the data classes the resource is expected to possess, and how the expected data classes would address the applicable research questions. The results of the investigation shall be documented in a technical report that provides a full artifact catalog, analysis of items collected, results of any special studies conducted, and interpretations of the resource within a	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Cultural and Tribal Cultural Resources (cont.)			
Impact 3.6-1 (cont.)		regional and local context. All technical documents shall be placed on file at the North Central Information Center of the California Historical Resources Information System. The results report shall include recommendations for archaeological and Native American monitoring in Environmentally Sensitive Areas and the protocol to follow should additional cultural materials be identified during construction activities.	
Impact 3.6-2: The Project could disturb human remains, including those interred outside of formal cemeteries.	Potentially significant	**Mitigation Measure 3.6-2: Inadvertent Discovery of Human Remains.** In the event human remains are uncovered during ground-disturbing activities (including construction, operations and maintenance, and decommissioning), the Project proponent or its contractor shall immediately halt work within a 100-foot radius, contact the Shasta County Coroner to evaluate the remains within 48 hours, and follow the procedures and protocols pursuant to Section 15064.5(e)(1) of the CEQA Guidelines. Health and Safety Code Section 7050.5 requires that no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to Public Resources Code Section 5097.98. If the remains are determined to be of Native American descent, the coroner has 24 hours to notify the Native American Heritage Commission (NAHC). The NAHC will then identify the person thought to be the most likely descendent of the deceased Native American. The most likely descendent will make recommendations for means of treating, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98.	Less than significant
Impact 3.6-3: The Project would cause a substantial adverse change in the significance of a tribal cultural resource.	Potentially Significant	**Mitigation Measure 3.6-3a:** Implement Mitigation Measure 3.6-1: Archeological Research Design and Treatment Plan **Mitigation Measure 3.6-3b: Coordination with the Pit River Tribe during Project Development.** Shasta County and the Applicant will facilitate a preconstruction meeting and field visit with the Pit River Tribe through the Tribe's chairperson and the Pit River Environmental Office to discuss "tribal cultural resources" as defined in Public Resources Code Section 21074 in the Project Site and identify ways to minimize impacts on these locations during construction. The site visit will focus on viewing the location of the Project facilities, describing Project construction and operation activities, and identifying potential cultural significant features. **Mitigation Measure 3.6-3c: Detailed Recordation of Features Considered Culturally Significant to the Pit River Tribe.** The Applicant shall retain a professional ethnographic consultant to undertake a detailed recordation of any locations considered important to the Pit River Tribe. The recordation will commence prior to construction and will include photographic documentation of pre- and post-construction conditions of any identified culturally sensitive location. The information gathered as a result of field, interview, and research tasks will be compiled into a report that will be transmitted to the Pit River Tribe. Detailed recordation of any ethnographic location in this manner will create a photographic and written record of the cultural resource prior to construction of the Project, resulting in partial compensation for Project impacts.	Significant and unavoidable

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Cultural and Tribal Cultural Resources (cont.)			
Impact 3.6-3 (cont.)		**Mitigation Measure 3.6-3d: Cultural Resources Monitoring Program with the Pit River Tribe during Construction.** The Applicant shall offer and provide the opportunity for cultural resource monitors from the Pit River Tribe to monitor initial ground disturbing construction activities in areas identified by the Tribe as culturally sensitive. Monitors will have the authority to ensure that cultural site(s) discovered during the archeological survey and/or inadvertent discoveries in the Project Site are avoided or that impacts on such localities are mitigated to the extent feasible, including but not limited to, avoidance or data recovery (as outlined in Mitigation Measure 3.6-1. Archaeological Research Design and Treatment Plan). The Pit River Environmental Office should coordinate with the appropriate Achumawi bands (Itsatawi and Madesi) to assign monitors. If the offer is accepted, the Applicant shall provide compensation commensurate with market rates based on the qualifications and experience of the cultural monitor(s). Prior to tendering an offer to the Tribe the Applicant shall provide a copy of the offer to the County for review, including but not limited to the proposed number of monitors to be employed, proposed construction schedule/hours during which monitors would be present on site, proposed level(s) of compensation, and other relevant details of the proposed cultural monitoring program.	
Energy			
Impact 3.7-1: Project construction, operation and maintenance, and decommissioning and site reclamation could result in the wasteful, inefficient, or unnecessary consumption or use of energy.	Less than significant	No mitigation measures are required	Less than significant
Forestry Resources			
Impact 3.8-1: The Project could result in the loss of forest land or conversion of forest land to non-forest use	Less than significant	No mitigation measures are required	Less than significant
Geology and Soils			
Impact 3.9-1: The Project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.9-2: The Project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.	Less than significant	No mitigation measures are required	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Geology and Soils (cont.)			
Impact 3.9-3: The Project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.9-4: The Project could result in substantial soil erosion or the loss of topsoil.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.9-5: The Project could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.9-6: The Project could be located on expansive or corrosive soil, as defined in California Building Code Section 1803.5.3, creating substantial direct or indirect risks to life or property.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.9-7: The Project could have soils incapable of adequately supporting the use of a septic tank.	Less than significant	No mitigation measures are required	Less than significant
Greenhouse Gas Emissions			
Impact 3.10-1: The Project would generate GHG emissions, directly and indirectly.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.10-2: The Project could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.	Less than significant	No mitigation measures are required	Less than significant
Hazards and Hazardous Materials			
Impact 3.11-1: The Project could create a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials or wastes.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.11-2: The Project could create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.	Less than significant	No mitigation measures are required	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Hazards and Hazardous Materials (cont.)			
Impact 3.11-3: During normal operation, equipment failure or an extreme event could lead to turbine failure, resulting in a potential hazard.	Potentially significant	**Mitigation Measure 3.11-3: Mandatory Setbacks.** A minimum wind turbine setback of two times the total tip height shall be maintained from the exterior Project boundaries where the Project Site is adjacent to existing parcels of record that contain an off-site residence.	Less than significant
Impact 3.11-4: During normal operation, weather conditions could lead to ice shed from turbine blades, resulting in a potential hazard.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.11-5: During normal operations, applications of certain pesticides could result in a potential hazard.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.11-6: During normal operations, alternating changes in light intensity could occur when turbine blades are rotating and result in an adverse health effect.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.11-7: The Project could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	Potentially significant	**Mitigation Measure 3.11-7:** Implement the Traffic Management Plan that would be required by Mitigation Measure 3.14-3.	Less than significant
Hydrology and Water Quality			
Impact 3.12-1: The Project would, unless mitigated, violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality during construction and decommissioning.	Potentially significant	**Mitigation Measure 3.12-1: Water Quality Best Management Practices during Activities in and near Water.** To avoid and/or minimize potential impacts on water quality (and jurisdictional waters) during construction- and decommissioning-related project activities that would be conducted near (i.e., within 50 feet), in, or over waterways, the project contractor shall implement the following standard construction BMPs to prevent releases of hazardous materials and to avoid other potential environmental impacts: 1. In-stream construction shall be scheduled during the summer low-flow season to minimize impacts on aquatic resources. If instream construction takes place during higher flow seasons, the following measures shall be implemented: a. Minimize mechanized equipment use below top of bank of streams; b. Perform activities in accordance with all permit conditions and best practices; and c. Have environmental monitors on-site to monitor instream construction to ensure compliance with permit conditions and best practices.	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Hydrology and Water Quality (cont.)			
Impact 3.12-1 (cont.)		2. All construction material, wastes, debris, sediment, rubbish, trash, etc., shall be removed from the Project Site daily during construction and decommissioning, and thoroughly at the completion of each of these phases. Debris shall be transported to an authorized upland disposal area. 3. Consistent with the Project's Hazardous Materials Business Plan (HMBP) and Spill Prevention Control and Countermeasures Plan (SPCC), construction workers shall receive training prior to construction/decommissioning and protective measures shall be implemented to prevent accidental discharges of oils, gasoline, or other hazardous materials to jurisdictional waters during fueling, cleaning, and maintenance of equipment, as outlined in the Project's HMBP. Equipment used to perform construction work on the Project Site shall be maintained in accordance with manufacturers' protocols, and, except in the case of failure or breakdown, equipment maintenance shall be performed off-site. Crews shall check heavy equipment daily for leaks; if a leak is discovered, it shall be immediately contained and use of the equipment shall be suspended until repaired. The source of the leak shall be identified, material shall be cleaned up, and the cleaning materials shall be collected and properly disposed. 4. Vehicles and equipment shall be serviced off-site, or, if on-site service is necessary, in a designated location a minimum distance of 100 feet from drainage channels and other waterways. Fueling locations shall be inspected after fueling to document that no spills have occurred. Any spills shall be cleaned up immediately.	
Impact 3.12-2: Blasting, if it occurs, could substantially degrade groundwater quality.	Potentially significant	**Mitigation Measure 3.12-2: Best Management Practices for Blasting.** All activities related to blasting shall follow Best Management Practices (BMPs) to prevent contamination of groundwater including preparing, reviewing and following an approved blasting plan; proper drilling, explosive handing and loading procedures; observing the entire blasting procedures; evaluating blasting performance; and handling and storage of blasted rock. 1) ***Blasting Plan.*** Prior to conducting the first blast on the Project Site, the Applicant shall prepare and submit a detailed blasting plan to the Shasta County Department of Resource Management and the Shasta County Sheriff's Department. The blasting plan shall contain a complete description of how explosives will be safely transported and used at the site; evacuation, security and fire prevention procedures; blasting equipment list; and procedures for notification of nearby receptors. The blasting plan shall explain how the Applicant will comply with the requirements of 30 C.F.R. §§816.61 through 816.68 regarding the use of explosives to be consistent with the technical requirements of the statute. Procedures for notification shall include, but not be limited to, the following: a. At least 30 days before initiation of blasting, the operator shall notify, in writing, all residents or owners of dwellings or other structures located within 0.5-mile of the permit area describing how to request and submit a pre-blasting survey. Notification shall include posting a written notice within the Project Site, and on the County's public website describing how to obtain and submit a pre-blasting survey.	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Hydrology and Water Quality (cont.)			
Impact 3.12-2 (cont.)		b. A resident or owner of a dwelling or structure within 0.5-mile of any part of the permit area may request a pre-blasting survey. This request shall be made, in writing, directly to the operator or to the regulatory authority, who shall promptly notify the operator. The operator shall promptly conduct a pre-blasting survey of the dwelling or structure and promptly prepare a written report of the survey detailing the results. c. The operator shall determine the condition of the dwelling or structure and shall document any pre-blasting damage and other physical factors that could reasonably be affected by the blasting. Structures such as pipelines, cables, transmission lines, and cisterns, wells, and other water systems warrant special attention; however, the assessment of these structures may be limited to surface conditions and other readily available data. d. Prior to finalizing the blasting plan, the County or designated operator shall consult with jurisdictional authorities tasked with protecting waters of the state and implement avoidance and minimization measures, as required by CDFW, USACE, and regional water quality (Section 401) regulatory permits prepared for the Project. Such protective measures shall be included in the blasting plan and/or incorporated by reference. 2) ***Loading practices.*** The following blast hole loading practices to minimize environmental effects shall be followed: a) Drilling logs shall be maintained by the driller and communicated directly to the blaster. The logs shall indicate depths and lengths of voids, cavities, and fault zones or other weak zones encountered as well as groundwater conditions. b) Explosive products shall be managed on-site so that they are either used in the borehole, returned to the delivery vehicle, or placed in secure containers for off-site disposal. c) Spillage around the borehole shall either be placed in the borehole or cleaned up and returned to an appropriate vehicle for handling or placement in secured containers for off-site disposal. d) Loaded explosives shall be detonated as soon as possible and shall not be left in the blast holes overnight, unless weather or other documented safety concerns reasonably dictate that detonation should be postponed. e) Loading equipment shall be cleaned in an area where wastewater can be properly contained and handled in a manner that prevents release of contaminants to the environment. f) Explosives shall be loaded to maintain good continuity in the column load to promote complete detonation. Industry accepted loading practices for priming, stemming, decking and column rise shall be attended to. 3) ***Explosive Selection.*** To reduce the potential for groundwater contamination when explosives are used, explosive products shall be selected that (a) are appropriate for site conditions and safe blast execution, and (b) have the appropriate water resistance for the site conditions present to minimize the potential for hazardous effect of the product upon groundwater.	

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Hydrology and Water Quality (cont.)			
Impact 3.12-2 (cont.)		4) **Prevention of Misfires.** Appropriate practices shall be developed and implemented to prevent misfires. 5) **Blast Rock Pile Management.** To reduce the potential for contamination, the interaction of blasted rock piles and stormwater shall be managed to prevent contamination of water supply wells or surface water.	
Impact 3.12-3: The Project could decrease groundwater supplies or interfere with groundwater recharge such that the project may impede sustainable groundwater management of the basin.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.12-4: The Project would, unless mitigated, substantially increase siltation of waterways or provide substantial additional sources of polluted runoff during construction and decommissioning.	Potentially significant	**Mitigation Measure 3.12-4:** Implement the water quality best management practices during activities in and near water that would be required by Mitigation Measure 3.12-1.	Less than significant impact
Impact 3.12-5: The Project would, unless mitigated, conflict with implementation of the Central Valley Basin Plan.	Potentially significant	**Mitigation Measure 3.12-5a.** Implement the water quality best management practices during activities in and near water that would be required by Mitigation Measure 3.12-1. **Mitigation Measure 3.12-5b:** Implement the best management practices for blasting that would be required by Mitigation Measure 3.12-2.	Less than significant impact
Noise and Vibration			
Impact 3.13-1: Operation of the Project could result in the generation of a substantial permanent increase in ambient noise levels in the vicinity of the Project in excess of standards established in the Shasta County General Plan or the applicable standards of other agencies.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.13-2: Construction, decommissioning, and site reclamation of the Project could result in the generation of a substantial temporary increase in ambient noise levels on and near the Project Site in excess of standards established in the Shasta County General Plan or the applicable standards of other agencies.	Potentially Significant	**Mitigation Measure 3.13-2: Noise-Reducing Construction Practices.** The Project Applicant shall ensure that the following measures are implemented during construction, decommissioning, and site reclamation activities to avoid and minimize construction noise effects on sensitive receptors: a) Construction vehicle routes shall be located at the most distant point feasible from noise-sensitive receptors. b) All heavy trucks shall be properly maintained and equipped with noise-control (e.g., muffler) devices, in accordance with manufacturers' specifications, at each work site during Project construction, decommissioning, and site reclamation to minimize heavy truck traffic noise effects on sensitive receptors.	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Noise and Vibration (cont.)			
Impact 3.13-2 (cont.)		c) Haul trucks and delivery trucks shall prioritize use of the east access road, if available, over the west access road, and shall avoid use of the west access road during nighttime hours. d) Helicopter use shall be limited to a period of 2 weeks or less such that receptors are not impacted for a substantial period of time. e) Limit construction operations located within 2,500 feet of residences to daytime hours only. f) Residences within 2,000 feet of helicopter activity shall be notified of the timeline of proposed operations at least 2 weeks` prior to line stringing operations. g) Nighttime (10 p.m. to 7 a.m.) helicopter use and blasting shall be prohibited.	
Impact 3.13-3: Construction, decommissioning, and site reclamation of the Project could generate groundborne vibration.	Potentially significant	**Mitigation Measure 3.13-3: Charge Weight Limits on Blasting Activities.** The Project Applicant shall ensure that blasting contractors restrict charge weight per delay such that a performance standard of less than 0.3 in/sec PPV would result at any structures in the vicinity of the blasting area. This performance standard shall be established as a condition of contract and implemented by a licensed blasting contractor in possession of a Federal Explosives License/Permit, issued by the Bureau of Alcohol, Tobacco, and Firearm.	Less than significant
Transportation			
Impact 3.14-1: The Project could conflict with a program plan, ordinance or policy addressing the circulation system.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.14-2: The Project could conflict or be inconsistent with CEQA Guidelines Section 15064.3(b).	Less than significant	No mitigation measures are required	Less than significant
Impact 3.14-3: The Project would, unless mitigated, substantially increase safety hazards.	Potentially significant	**Mitigation Measure 3.14-3: Traffic Management Plan.** Prior to the issuance of construction or building permits and prior to the removal of materials from the Project Site during decommissioning, the Applicant shall: 1. Prepare and submit a Traffic Control Plan to Shasta County Public Works Department and the Caltrans offices for District 2, as appropriate, for approval. The Traffic Control Plan must be prepared in accordance with both the Caltrans Manual on Uniform Traffic Control Devices and Work Area Traffic Control Handbook and must include, but not be limited to, the following: a. A plan for communicating construction/decommissioning plans with Caltrans, emergency service providers, and residents located in the vicinity of the Project Site. b. An access and circulation plan for use by emergency vehicles when lane closures and/or detours are in effect. If lane closures occur, provide advance notice to local fire departments and sheriff's department to ensure that alternative evacuation and emergency routes are designed to maintain response times.	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Transportation (cont.)			
Impact 3.14-3 (cont.)		c. Timing of deliveries to/removals from the Project Site of heavy equipment and building materials; d. Directing vehicles, pedestrians, and bicyclists on SR 299 through the construction zone with a flag person; e. Providing detours to route vehicular traffic, bicyclists, and pedestrians around lane or shoulder closures, if they occur; f. Providing adequate parking for construction trucks, equipment, and workers in the designated staging areas within the Project Site; g. Placing temporary signage, lighting, and traffic control devices if required, including, but not limited to, appropriate signage along access routes to indicate the presence of heavy vehicles and construction/decommissioning traffic, and the placement of traffic cones to provide temporary left-turn lanes into Project driveways as needed;[8] h. Preserving access to existing ingress/egress points for all adjacent property at all times; and, i. Specifying both construction/decommissioning-related vehicle travel and oversize/overweight vehicle haul routes. 2. Obtain all necessary encroachment permits for the work within the road right-of-way or use of oversized/overweight vehicles that will utilize county maintained roads, which may require California Highway Patrol or a pilot car escort. Copies of the approved traffic plan and issued permits shall be submitted to the Shasta County Public Works Department and Caltrans. 3. Consult with the Shasta County Public Works Department and Caltrans to identify any substantial construction activities on SR 299 that may overlap with construction of the Project (e.g., Caltrans SR 299 resurfacing project from Milepost 60.0 to 67.8). Coordinate with the contractor(s) of any identified project(s) to ensure that overlapping construction activities do not cause unnecessary delays on SR 299 or preclude the ability of large vehicles to access the Project Site.	
Impact 3.14-4: The Project would, unless mitigated, result in inadequate emergency access.	Potentially Significant	**Mitigation Measure 3.14-4:** Implement the Traffic Management Plan that would be required by Mitigation Measure 3.14-3 (Traffic Management Plan).	Less than significant

[8] A left-turn lane warrant analysis was conducted for the three Project driveways, which is provided in Appendix H. The analysis found that left-turn lanes would be warranted during Project construction at all three Project driveways during the a.m. peak hour.

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Utilities and Service Systems			
Impact 3.15-1: The Project would have sufficient water supplies available to serve the Project for the reasonable and foreseeable future development during normal, dry, and multiple dry years.	Less than significant	No mitigation measures are required	Less than significant
Impact 3.15-2: The Project could result in a determination by a wastewater treatment provider that it has inadequate capacity to serve the Project's projected demand in addition to the provider's existing commitments	Less than significant	No mitigation measures are required	Less than significant
Impact 3.15-3: The Project could generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals.	Less than significant	No mitigation measures are required	Less than significant
Wildfire			
Impact 3.16-1: The Project would, unless mitigated, substantially impair an adopted emergency response plan or emergency evacuation plan.	Potentially significant	**Mitigation Measure 3.16-1a:** Implement Mitigation Measure 3.14-3 (Traffic Management Plan) **Mitigation Measure 3.16-1b: Pre-Construction Coordination with CAL FIRE** Prior to construction, the Applicant shall provide GIS files or other maps of the Project layout to CAL FIRE to facilitate aerial fire-fighting planning. The Applicant shall notify CAL FIRE of any changes to the Project layout or any maintenance that would require the use of helicopters or the use of equipment not previously identified on maps provided to CAL FIRE that could present a new, previously unidentified vertical obstacle to aerial firefighting.	Less than significant
Impact 3.16-2: The Project would, unless mitigated, exacerbate wildfire risks and expose people to pollutant concentrations or a significant risk of loss, injury or death from a wildfire or the uncontrolled spread of a wildfire.	Potentially significant	**Mitigation Measure 3.16-2a: Fire Safety.** The Applicant and/or its contractors shall prepare and implement a Project-specific Fire Prevention Plan (FPP) to prevent an exacerbation of wildfire risk during both the Project construction and operation and maintenance phases. Prior to construction, the Applicant shall contact and consult with the Shasta Trinity Unit of CAL FIRE and the Shasta County Fire Department to determine the appropriate amounts of fire equipment to be carried on the vehicles and appropriate prevention measures to be taken. The Applicant shall submit verification of its consultation with the appropriate fire departments to Shasta County. The Applicant shall submit a draft FPP to the Shasta County Project Manager for approval when the building permit application is submitted. The County shall have an opportunity to make comments on and revisions to the FPP, which the Applicant shall incorporate into a revised FPP for approval. The Applicant shall make the approved FPP available to all construction crew members prior to construction of the Project. The FPP shall list fire safety measures including fire prevention and extinguishment procedures, as well as specific emergency response and evacuation measures that would be followed during emergency situations; examples are listed	Less than significant

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Wildfire (cont.)			
Impact 3.16-2 (cont.)		below. The FPP also shall provide fire-related rules for smoking, storage and parking areas, usage of spark arrestors on construction equipment, and fire-suppression tools and equipment. The FPP shall include or require, but not be limited to, the following: • Prior to construction, the Project applicant shall designate primary and alternate Fire Coordinators such that a Fire Coordinator is present at all times during Project construction. The Fire Coordinator shall be responsible for ensuring that crews have sufficient fire suppression equipment, communication equipment, shall lead and coordinate fire patrols, ensure that the required clearances are followed onsite, and ensure that all crew members receive training on the FPP and its components. • For vehicles within control of the contractor, the contractor shall require vehicle drivers to conduct a visual inspection of the vehicle for potential sparking risks prior to operation of the vehicle. This inspection should include, but not be limited to a check of tire pressure and an inspection for chains or other vehicle components that could drag while driving. For subcontractors or vendors where vehicles are not within the control of the contractor, the contractor or Applicant shall develop a standard brochure to send to vendors that shall provide educational materials about fire risks associated with vehicles and shall provide an inspection checklist. • The Applicant and/or its contractors shall have water tanks, water trucks, or portable water backpacks (where space or access for a water truck or water tank is limited) sited/available in the study area for fire protection. • During construction of the Project the Applicant and/or its contractors shall implement ongoing fire patrols during construction hours and for 1 hour after the end of daily construction and hotwork. • All construction crews and inspectors shall be provided with radio and/or cellular telephone access that is operational within the Project Site to allow communications with other vehicles and construction crews. All fires shall be reported immediately upon detection. • Require that all internal combustion engines, stationary and mobile, be equipped with spark arresters in good working order. • Require that light trucks and cars with factory-installed mufflers be used only on roads where the roadway is cleared of vegetation. • Require that equipment parking areas and small stationary engine sites are cleared of all extraneous flammable material. • Include a fire conditions monitoring program to monitor meteorological data during construction and operation. • Include a monitoring and inspection protocol for turbines and electrical infrastructure. • Include protocol for disabling re-closers and de-energizing portions of the electrical collection and transmission systems	

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Wildfire (cont.)			
Impact 3.16-2 (cont.)		• Prohibit smoking in wildland areas, with smoking limited to paved areas or areas cleared of all vegetation. • All construction vehicles shall have fire suppression equipment. • The Applicant shall ensure that all construction workers receive training on the implementation of the FPP including how to conduct a fire patrol, proper use of fire-fighting equipment and procedures to be followed in the event of a fire, vegetation clearance and equipment usage requirements, turbine, and electrical equipment inspections. • As construction may occur simultaneously at several locations, each construction site shall be equipped with fire extinguishers and fire-fighting equipment sufficient to extinguish small fires. • The Applicant shall enforce a requirement that construction personnel park any vehicles within roads, road shoulders, graveled areas, and/or cleared areas (i.e., away from dry vegetation) wherever such surfaces are present at the construction site. • The Applicant and its contractor shall cease all non-emergency work during Red Flag Warning events. • The Applicant shall coordinate the finalization of road improvements (i.e. frequency of grading and vegetation clearance) with CAL FIRE and other emergency responders to ensure that sufficient ingress and egress exists onsite. • Prior to the initiation of construction, a designated inspector from the County shall inspect the Project Site to ensure that sufficient fire suppression equipment is present onsite, that the required vegetation clearances have been cleared, that a crew member training program has been created, that construction vehicles are equipped with fire suppression equipment, that spark arrestors are installed on construction equipment, that a fire conditions monitoring program has been developed, that a monitoring and inspection protocol has been developed, that a disabling and re-closing protocol has been developed, and that CAL FIRE was appropriately consulted regarding road improvements and ingress and egress. • During construction, the Applicant shall submit a weekly FPP compliance report that demonstrates the following: fire patrols have been conducted following construction, any new construction workers have received training on the implementation of the FPP, that non-emergency work is being halted appropriately during Red Flag Warnings, and that sufficient fire suppression equipment is present onsite. Successful implementation of Mitigation Measure 3.16-2a (Fire Safety) would be demonstrated by the development of an FPP in consultation with local fire authorities which is documented and submitted to Shasta County for review, any revisions, and final approval. Additionally, successful implementation of Mitigation Measure 3.16-2a would require that the Applicant and its contractor comply with all components of the FPP, that ignition from Project construction activities is promptly reported to the fire department(s) with jurisdiction, and that when it is safe to do so, any Project-caused ignition is suppressed immediately.	

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Wildfire (cont.)			
Impact 3.16-2 (cont.)		**Mitigation Measure 3.16-2b: Nacelle Fire Risk Reduction.** Turbines shall be equipped with fire detection and prevention technology compatible with the manufacturer's operating requirements and will be maintained in good working order throughout the life of the Project. Turbines with electrical equipment in the nacelle shall have safety devices to detect electrical arc and smoke that use the best available technology for fire detection and suppression within turbines. The turbine design shall include the following components: 1. Early fire detection and warning systems; 2. Automatic switch-off and complete disconnection from the power supply system; and 3. Automatic fire extinguishing systems in the nacelle of each wind turbine. 4. Additionally, turbines shall include lightning protection equipment such as grounding equipment, and a lightning measurement system. Should any of these devices report an out-of-range condition, the device shall command a shutdown of the turbine and disengage it from the electrical collection system, and send a notice through the SCADA. The entire turbine shall be protected by current-limiting switchgear installed at the base of the tower. In the event of a lightning strike, an electrical inspection shall be conducted on the affected turbine to identify and address any damage to the turbine or electrical system that could result in subsequent fire risk. **Mitigation Measure 3.16-2c: Emergency Response Plan.** Prior to the submission of the building permit application, the Applicant shall prepare an emergency response plan to be reviewed and approved by Shasta County Planning, CAL FIRE, and the Shasta County Fire Department. Following approval of the plan, the Applicant and/or its contractors shall implement the requirements in the plan during all phases of construction and operation, as applicable. The emergency response plan shall describe the likely types of potential accidents or emergencies involving fire that could occur during both construction and operation, and shall include response protocols for each scenario. The plan shall include key contact information and a description of key processes, in the event of an emergency in order to alert relevant responders of the emergency, and how to control the emergency. The plan shall include crew member training in response, suppression, and evacuation. The training shall be coordinated by the designated Fire Coordinators. Prior to construction, the Applicant shall submit to the County a compliance report demonstrating that all crew members have been trained. As new construction crews or operation workers are brought onsite, the Applicant shall submit additional compliance reports demonstrating that they have been received training on the emergency response plan.	

TABLE ES-2 (CONTINUED)
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Environmental Impact	Levels of Significance Before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Wildfire (cont.)			
Impact 3.16-3: The Project would require the installation and maintenance of Project-related infrastructure (such as roads and power lines) that may exacerbate fire risk, and the installation and maintenance of fire suppression infrastructure (such as vegetation clearances and emergency water sources) that may result in temporary or ongoing impacts to the environment.	Less than significant	No mitigation measures are required	
Impact 3.16-4: The Project would, unless mitigated, expose people or structures to significant risks, including adverse water quality effects or downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	Potentially Significant	**Mitigation Measure 3.16-4:** Implement the Fire Safety measures that would be required by Mitigation Measure 3.16-2a (Fire Safety); implement the Nacelle Fire Risk Reduction measures that would be required by Mitigation Measure 3.16-2b; and implement the Emergency Response Plan that would be required by Mitigation Measure 3.16-2c.	Less than significant

ES.7 Overview of Alternatives to the Project

CEQA requires a lead agency to analyze a reasonable range of alternatives to the project that could feasibly attain the basic objectives of the project while substantially reducing or eliminating significant environmental effects. CEQA also requires an EIR to evaluate a "no project" alternative to allow decision-makers to compare impacts of approving a project with the impacts of not approving it. The alternatives development process, alternatives eliminated from further consideration, and alternatives considered in the EIR are described in greater detail in Chapter 2, *Description of Project and Alternatives*.

ES.7.1 Alternatives Eliminated from Further Consideration

Alternatives may be eliminated from detailed consideration in an EIR if they fail to meet most of the project objectives, are infeasible, or do not avoid or substantially reduce any significant environmental effects (CEQA Guidelines §15126.6[c]). Alternatives that are remote or speculative, or the effects of which cannot be reasonably predicted, also do not need to be considered (CEQA Guidelines §15126[f][2]). The following potential alternatives were eliminated from further consideration in the EIR because they failed to meet most of the Project objectives, were infeasible, or did not avoid or substantially reduce any significant environmental effects:

1. **Off-site Alternatives:** The County initially considered a variety of potential off-site alternatives, including replacing the current proposal with an off-shore wind facility or with an on-shore facility far from the proposed site. See Section 2.5.2.1, *Off-site Alternatives*.
2. **Repowering Alternative:** The County initially considered a repowering alternative focused on one or more existing wind facilities, potentially including the Dillon, Tule Wind, Phoenix Wind, Manzana Wind, Mountain View III, and/or Shiloh projects. See Section 2.5.2.2, *Repowering Alternative*.
3. **Alternative Technologies:** The County initially considered alternative technologies, including hydroelectric power, cogeneration, and solar. See Section 2.5.2.3, *Alternative Technologies*.
4. **Alternative Approaches:** The County initially considered alternative approaches, including conservation and demand side management, other distributed energy resources, and improving the efficiency of existing energy infrastructure. See Section 2.5.2.4, *Alternative Approaches.*

ES.7.2 Alternatives Considered in the EIR

The reasonable range of alternatives analyzed in this Draft EIR is summarized below. Three alternatives to the Project are considered in detail. These alternatives were selected for more detailed consideration through the screening process described in greater detail in Section 2.5.1, *Alternatives Development and Screening.*

E.7.2.1 No Project Alternative

Under the No Project Alternative, Use Permit No. UP 16-007 would not be issued and the proposed Project would not be developed. None of the proposed wind turbines or associated transformers, associated infrastructure, or ancillary facilities would be constructed, operated and

maintained, or decommissioned on the Project Site. FAA-required safety lighting would not be installed. The proposed overhead and underground electrical collector system and communications lines would not be developed; and the onsite collector substation, switching station, and operation and maintenance (O&M) facility would not be constructed. Foundations would not be excavated, laydown areas would not be cleared, no new access roads would be constructed, and no existing roads would be improved. No groundwater well, water storage tank, or septic system would be installed onsite, and no construction-related or other refuse would be removed from the site. No electric power would be needed at the Project site, or delivered to the regional grid from the Project site. Existing stormwater drainage patterns on the site would not be affected. No materials delivery-related or other construction trucks, equipment, or additional vehicle trips would be made to, from, or within the site relative to baseline conditions. None of the proposed up to 400 construction workers and none of the up to 12 full-time employees would travel to or be employed on the Project Site; decommissioning and site restoration phase workers similarly would not be present. Instead, it is assumed that the land within the Project boundary would continue to be managed for timber production. See Section 2.5.3.1, *No Project Alternative*.

E.7.2.2 Alternative 1: South of SR 299

Under Alternative 1, the Project would be constructed, operated and maintained, and ultimately decommissioned as proposed south of SR 299, and none of the up to seven turbines proposed to the north of SR 299 (turbine numbers A01 through A07) or related infrastructure would be developed. The Alternative 1 Site would consist of the approximately 4,086 acres located south of SR 299, while the approximately 378 acres of the Project Site located north of SR 299 would continue to be managed for timber production. Each of Alternative 1's up to 65 turbines could be up to 679 feet above ground level at the top of the blade (the same as the Project) and would have a generating capacity of 3 to 5.7 MW (also the same as the Project). Overall, Alternative 1 would have a total nameplate generating capacity of up to 195 MW.

Scoping comments suggested that the County consider a reduced-Project alternative (i.e., one with fewer turbines and/or a more concentrated placement of turbines) and a modified Project alternative that would relocate the proposed turbines to the south relative to the existing proposal. Alternative 1 responds to these suggestions. Relative to the screening criteria outlined in Section 2.5.1, *Alternatives Development and Screening*, the County preliminarily has determined that Alternative 1 would be reasonable and feasible even if it would impede to some degree the attainment of the Project objectives relating to generating capacity, carbon dioxide emissions offset, and the number of households that could be served with clean energy if the Project were approved. Alternative 1 has been designed to avoid all Project impacts north of SR 299 and to lessen any significant effects of the Project to aesthetics, avian and other wildlife species and to Tribal Cultural Resources, including to birds traditionally important to the Pit River culture (e.g., eagles, eagle nests, and osprey) and audible and physical disruption of an area identified by Native Americans as culturally significant. See Section 2.5.3.2, *Alternative 1, South of SR 299*.

E.7.2.3 Alternative 2: Increased Setbacks

Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within three times the height of the turbine (i.e., within 2,037 feet) of a residential property line and within 1.5 times the height of the turbine (i.e., within 1,018.5 feet) of State Route 299, any other publicly-maintained public highway or street, and of Supan Road or Terry Mill Road. These setback distances would be among the most protective of public health and safety in the State based on a comparison of setback requirements included in county ordinances in California for large wind projects as compiled by WINDExchange, a resource of the Wind Energy Technologies Office of the U.S. Department of Energy (DOE, 2020). Implementation of these setbacks would preclude construction of proposed turbines M03, D05, and B01 based on the residential property line setback, and would preclude turbine KO2 based on the roadway setback. Related infrastructure and work areas for these turbines (including temporary turbine construction areas, access roads and crane roads) would not be needed. The remaining turbines, infrastructure and other improvements would be the same as proposed for the Project. Each of Alternative 2's up to 68 turbines could be up to 679 feet above ground level at the top of the blade (the same as the Project) and would have a generating capacity of 3 to 5.7 MW (also the same as the Project). Overall, Alternative 2 would have a total nameplate generating capacity of up to 204 MW.

Scoping comments suggested that the County consider a Project alternative that would remove turbines farther from Moose Camp, and expressed concerns about noise, vibration, and safety. Alternative 2 has been designed to respond to these suggestions. Relative to the screening criteria outlined in Section 2.5.1, *Alternatives Development and Screening*, the County preliminarily has determined that Alternative 2 would be reasonable and feasible even if it would impede to some degree the attainment of the Project objectives relating to generating capacity, carbon dioxide emissions offset, and the number of households that could be served with clean energy if the Project were approved.

E.7.2.4 Comparison of Alternatives

Draft EIR Chapter 4, *Comparison of Alternatives*, compares the potential environmental impacts of the Project to those of the No Project Alternative, Alternative 1, and Alternative 2. **Table ES-3** summarizes impacts of the Project, Alternative 1, *South of SR 299*, and Alternative 2, *Increased Setbacks*. The No Project Alternative would avoid all impacts of the Project and instead would result in the environmental benefits and consequences that reasonably would be expected to occur based on the site's current timber production-related General Plan and zoning. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effects. CAL FIRE would review any future timber harvesting proposal to evaluate any potential Project-specific, site-specific environmental impacts. Table ES-3 summarizes impacts of Alternative 1, *South of SR 299*, and Alternative 2, *Increased Setbacks*, as they compare to those of the Project.

TABLE ES-3
SUMMARY OF IMPACTS OF THE PROJECT AND ALTERNATIVES

EIR Section	Resource Area	Project	Alternative 1, South of SR 299	Alternative 2, Increased Setbacks
3.2	Aesthetics	Impact 3.2-1: The Project, in particular the form, color, movement, and nighttime lighting of the proposed turbines, would have a substantial adverse effect by substantially reducing visual character, visual quality, and the quality of scenic vistas for tourists, recreationists, or residents. While the implementation of recommended Mitigation Measure 3.2-1 would reduce the potential significance of impacts, impacts would not be reduced below established thresholds of significance (Significant and Unavoidable). The Project would result in a less than significant impact relating not only to the potential to damage to scenic resources within a state scenic highway (Impact 3.2-2), but also to the potential to create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area (Impact 3.2-3). (Less than Significant Impact)	Under Alternative 1, the up-to-seven turbines north of SR 99 (turbine numbers A01 through A07) would not be constructed, resulting in incrementally fewer obstructions in the visual landscape and incrementally fewer safety lights. Depending on the specific viewing location, this alternative could reduce aesthetic impacts; however, from certain locations, clustering of turbines south of SR 299 could reduce the coherence between the Hatchet Ridge project and the proposed Project, creating an appearance of multiple separate wind energy generation projects encroaching in the foothills. Any increase or decrease in the aesthetic impacts created by Alternative 1 would not be significant. Therefore, depending on the viewing location, Alternative 1 could either slightly increase or reduce aesthetic impacts. Impacts would be substantially similar to the Project impact conclusions and mitigation requirements would remain the same. **Equal to the Project**	Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within three times the height of the turbine (i.e., within 2,037 feet) of a residential property line and within 1.5 times the height of the turbine (i.e., within 1,018.5 feet) of State Route 299, any other publicly-maintained public highway or street, and of two private roads (Supan Road and Terry Mill Road). This would result in four of the Project turbines (M03, D05, B01 and K02) not being constructed. The resulting spacing of the turbine strings could reduce from key observation points 1, 2, and 3 the visibility and visual impact of turbines from SR 299 and regarding views from KOPs near SR 299. Although this alternative would reduce the overall visual impact of the wind energy development compared to the Project, impact conclusions and mitigation requirements would remain the same. **Less than the Project**
3.3	Air Quality	Impact 3.3-2c: Construction, decommissioning, and site reclamation activities would generate PM_{10} emissions that would result in a cumulatively considerable net increase of PM_{10}, for which the Project region is non-attainment of California Ambient Air Quality Standards (CAAQS). The implementation of recommended Mitigation Measure 3.3-2c would reduce the severity of the impact, but not below established threshold of significance. (Significant and Unavoidable) Impact 3.3-1, Impact 3.3-2b: Construction, decommissioning, and site reclamation activities would generate NO_x and other emissions that could obstruct implementation of the Northern Sacramento Valley Planning Area 2018 Plan to attain the ozone CAAQS by resulting in a violation of an ozone air quality standard, and thereby would be inconsistent with the intent of the 2018 Plan and result in a cumulatively considerable net increase in regional ozone emissions. The implementation of recommended Mitigation Measures 3.3-1a and 3.3-1b would reduce the potential significance of these impacts below established thresholds. (Less than Significant with Mitigation Incorporated) The Project would result in various less than significant impacts, including with respect to its construction, decommissioning, and site reclamation activities and the generation of ROG emissions that could result in a cumulatively considerable net increase of ozone (Impact 3.3-2a); its operation, which would generate pollutant emissions that would not result in a cumulatively considerable net increase of criteria pollutants (Impact 3.3-2d and 3.3-3); its emission of Toxic Air Contaminants (Impact 3.3-4); and its potential to create objectionable odors (Impact 3.3-5). (Less than Significant Impact)	Under Alternative 1, construction activities, including timber harvesting, would generate fewer vehicle trip and equipment emissions than the number estimated for the Project because up-to-seven fewer turbines and related infrastructure would be constructed. Similarly, the decommissioning and site reclamation phase also would generate fewer vehicle trip and equipment emissions than the amounts estimated for the Project because fewer turbines and related infrastructure would be developed and the size of the area to be reclaimed would be smaller than what was identified for the Project. Although the impacts would be reduced relative to the Project, the impact conclusions and mitigation requirements would remain the same. **Less than the Project**	Under Alternative 2, construction activities, including timber harvesting, would generate fewer vehicle trip and equipment emissions than the number estimated for the Project because up-to-four fewer turbines and related infrastructure would be constructed. Similarly, the decommissioning and site reclamation phase would generate fewer vehicle trip and equipment emissions than the amounts estimated for the Project because fewer turbines and related infrastructure would be developed and the size of the area to be reclaimed would be smaller than for the Project. Although the impacts would be reduced relative to the Project, the impact conclusions and mitigation requirements would remain the same. **Less than the Project**
3.4	Biological Resources	Operation of the Project would result in significant unavoidable Project-specific and cumulative impacts -potentially including mortality and injury- to eagles and other raptors (including goshawk) as well as to bats, including special-status bat species, via collision with power lines or operating wind turbine generators, or electrocution from energized components. See Impact 3.4-3, Impact 3.4-8, Impact 3.4-13, and Impact 3.4-18. Mitigation measures including monitoring and potential adaptive operational techniques are identified at the Project-specific level; however, even with mitigation incorporated, remaining impacts would be Significant and Unavoidable. Because no additional reasonable, feasible mitigation measures are available to address cumulative impacts that, if implemented, would reduce the Project's contribution below the established level of significance. Therefore, cumulative impacts would remain Significant and Unavoidable. Mitigation measures have been identified, the implementation of which would reduce other Project impacts below established thresholds. This is true with respect to: Impact 3.4-1 (potential construction impacts to special- status plant species within an unsurveyed 800-acre area of the Project Site), Impact 3.4-2 (construction impacts on nesting bald and golden eagles –although the likelihood of eagles nesting within the Project Site is low, construction noise and activity could result in nesting disruption or abandonment if activities occur during the nesting season and active nests are located in the vicinity), Impact 3.4-4 (decommissioning impacts to nesting bald and golden eagles similar to those described for the construction in Impact 3.4-3), Impact 3.4-6 (construction and decommissioning impacts to nesting raptors other than goshawks due to noise, vegetation removal, and increased activities during the construction and decommissioning), Impact 3.4-7 (construction and decommissioning impacts to nesting goshawks due to noise, vegetation removal, and increased activities	Under Alternative 1, the Project Site would be 4,086 acres resulting in 378 acres of less Project-related disturbance and seven (9.7 percent) fewer turbines than the Project. This would result in a similar percentage reduction in bird and bat collision-related impacts. Collisions resulting in eagle, other sensitive raptors, and bats would continue to be significant and unavoidable, but likely reduced by approximately 10 percent compared to the Project. Alternative 1 would require less Rocky Mountain Maple Riparian Scrub (a sensitive vegetation community) habitat removal. An estimated 31.3 fewer acres of this habitat would be removed, resulting in a 27 percent reduction in the impact area. As for the Project, the impacts related to removal of this habitat would be less than significant with mitigation incorporated. In other respects, Alternative 1 would reduce impacts relative to the Project generally commensurate with the reduction in disturbance and number of turbines. Although the impacts would be reduced relative to the Project, the impact conclusions and mitigation requirements would remain the same. **Less than the Project**	Alternative 2 is anticipated to result in 102 fewer acres of temporary disturbance and 49 fewer acres of permanent disturbance than the Project. Alternative 2 also would result in the construction and operation of four (5.5 percent) fewer turbines than the Project. This would result in a similar percentage reduction in bird and bat collision related impacts. Collisions resulting in eagle, other sensitive raptors, and bats would continue to be significant and unavoidable, but likely reduced by approximately 5.5 percent compared to the Project. Alternative 2 would require approximately 1.7 acres less removal of Rocky Mountain Maple Riparian Scrub habitat. As for the Project, the impacts related to removal of this habitat would be less than significant with mitigation incorporated. In other respects, Alternative 2 reduce impacts relative to the Project generally commensurate with the reduction in disturbance. Although the impacts would be reduced relative to the Project, the impact conclusions and mitigation requirements would remain the same. **Less than the Project**

TABLE ES-3 (CONTINUED)
SUMMARY OF IMPACTS OF THE PROJECT AND ALTERNATIVES

EIR Section	Resource Area	Project	Alternative 1, South of SR 299	Alternative 2, Increased Setbacks
3.4 (cont.)	Biological Resources	during the construction and decommissioning), Impact 3.4-12 (habitat loss and water quality impacts on Pit roach, special-status amphibians and western pond turtle), Impact 3.4-15 (Project impacts to riparian habitat or other sensitive vegetation communities, including removal of up to 107.2 acres of sensitive Rocky Mountain Maple Riparian Scrub habitat), and Impact 3.4-16 (Project impacts to wetlands and other waters, including permanent impacts on 2.22 acres of wetlands and 1.2 acres of other waters; temporary impacts on 1.48 acres of wetlands and 0.6 acres of other waters; and impacts resulting from the construction of or improvement to 32 stream crossings, including crossings of perennial, ephemeral, intermittent and unvegetated ditch type streams. In other respects, Project impacts would be less than significant, and no mitigation measures would be required. This is true with respect to Impact 3.4-5 (Project impacts to California spotted owls – although California spotted owl use of the area is expected to be low based on Project Site surveys and the results of Hatchet Ridge Wind post construction monitoring efforts, 995 acres of the Project Site was identified as being suitable [moderate or high quality] habitat for California spotted owls and potential nesting disruption could result from project noise, vegetation clearing, and increased activities during the construction and decommissioning phases), Impact 3.4-9 (collision-related impacts to waterfowl during operation), Impact 3.4-10 (Project impacts on sandhill cranes during migratory movements in fall and spring), Impact 3.4-11 (construction and decommissioning impacts to nesting songbirds, potentially including special-status species). Impact 3.4-14 (temporary adverse impacts to special-status mammals during site preparation and construction, and during decommissioning and site restoration activities), and Impact 3.4-17 (impacts to movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites).		
3.5	Communications Interference	The Project could cause intermittent interference to or freezing of television reception at some residences in the service area of the stations that broadcast over the Project Site (Impact 3.5-1) and or interference with point-to-point microwave relay station transmissions due to turbine location adjustments or currently unknown transmissions. The implementation of recommended Mitigation Measures 3.5-1 and 3.5-3 would reduce the potential significance of these impacts below established thresholds. (Less than Significant with Mitigation Incorporated) The Project also would result in a less-than-significant impact related to potential interfere with existing navigational systems operated by the FAA or the U.S. military (Impact 3.5-2). (Less than Significant Impact)	All of the turbine locations under Alternative 1 would be at least as far away from land mobile/public safety radio transmitter stations, earth satellite stations, AM broadcast facilities, television broadcast facilities, aircraft navigation beacons, and microwave and cellular communication facilities as for the Project. Therefore, the potential impacts on television reception (Impact 3.5-1), aircraft navigation (Impact 3.5-2), and microwave and cellular communication (Impact 3.5-3) would be the same as described for the Project. It is possible that Alternative 1 could slightly reduce the potential for unforeseen microwave communication interference because the turbines north of SR 299 would not be constructed (turbines A01, A02, and A03 are some of the closest to known microwave paths, as identified in Appendix D; however, evaluation of these turbines did not indicate interfere with the Fresnel zones of these paths, and so these turbines are not expected to cause interference. Therefore, the impact conclusions and mitigation requirements would be the same as for the Project. **Equal to the Project**	All of the turbine locations Under Alternative 2 would be at least as far away from land mobile/public safety radio transmitter stations, earth satellite stations, AM broadcast facilities, television broadcast facilities, aircraft navigation beacons, and microwave and cellular communication facilities as described for the Project. Therefore, the potential impacts on television reception (Impact 3.5-1), aircraft navigation (Impact 3.5-2), and microwave and cellular communication (Impact 3.5-3) would be the same as described for the Project, although there may be a small reduction in the potential for unforeseen microwave communication interference because several turbines would not be constructed (turbine D05 is one of the closest to known microwave paths, as identified in Appendix D; however, evaluation of this turbine did not indicate that it would interfere with the Fresnel zones of these paths and so is not expected to cause interference). Therefore, the impact conclusions and mitigation requirements would be the same as for the Project. **Equal to the Project**
3.6	Cultural and Tribal Cultural Resources	Impact 3.6-3: There is a prehistoric archaeological site in the Project Site that, for the purposes of CEQA, is considered a tribal cultural resource. In addition, Native American tribes have identified tribal cultural resources in the Project Site. The Project would cause a substantial adverse change in the significance of a tribal cultural resource if such a resource were disturbed or damaged. The implementation of recommended Mitigation Measures 3.6-1 and 3.6-3 would reduce the severity of the impact, but not below established thresholds (Significant and Unavoidable) Impact 3.6-1: The Project could cause a substantial adverse change pursuant to CEQA Guidelines Section 15064.5 due to disturbance of a historical resource, for example, during grading and excavation associated with construction, trenching, or the soil borings that would be collected to an approximately 50-foot depth to ensure that the proposed turbine foundations would be stable. The implementation of recommended Mitigation Measure 3.6-1 would reduce the potential significance below established thresholds. (Less than Significant with Mitigation Incorporated) Impact 3.6-2: Given the prehistoric archaeological sensitivity of the Project Site, the possibility of encountering human remains cannot be discounted. Project-related disturbance of human remains would be a significant impact and could occur if, for example, grading, excavation, or soil borings associated with construction of facilities and infrastructure. The implementation of recommended Mitigation Measure 3.6-2 would reduce the potential significance below established thresholds. (Less than Significant with Mitigation Incorporated).	Under Alternative 1, no turbines would be erected north of SR 299. Thus, Alternative 1 would avoid all impacts to cultural and tribal cultural resources north of SR 299, if any such resources exist. There would be an overall reduced acreage of temporary and permanent disturbance, limited to a footprint defined in a smaller area with fewer turbines compared to the Project. The prehistoric archaeological site in the Project Site would not be avoided. Although impacts would be reduced relative to the Project, the impact conclusions and mitigation requirements would remain the same. **Less than the Project**	Under Alternative 2, the prehistoric archaeological site identified within the Project Site would not be avoided; however, the overall reduction in the number of turbines would reduce both temporary (construction-related) and permanent disturbance compared to the Project. Alternative 2 would require implementation of the same protective measures and mitigation as the Project. Although impacts would be reduced relative to the Project, impact conclusions and mitigation requirements would remain the same under Alternative 2. **Less than the Project**

TABLE ES-3 (CONTINUED)
SUMMARY OF IMPACTS OF THE PROJECT AND ALTERNATIVES

EIR Section	Resource Area	Project	Alternative 1, South of SR 299	Alternative 2, Increased Setbacks
3.7	Energy	Impact 3.7-1: Project construction, operation and maintenance, decommissioning and site reclamation could result in the wasteful, inefficient, or unnecessary consumption or use of energy associated with equipment and vehicle fuel use, although there are no unusual Project characteristics that would cause the such use to be less energy-efficient compared with other similar projects elsewhere in the state. The Project's use of electricity during operation and maintenance would be greatly offset by the generation of electricity from the Project. Accordingly, the Project's electricity demand also would not constitute a wasteful, inefficient, or unnecessary use of energy. (Less than Significant Impact) The Project would provide a new source of renewable energy supporting SB 100 and the State's energy goals, and would result in a substantial beneficial impact relating to renewable energy generation, the use of which to serve demand would be prioritized over gas-fired plants and non-renewable sources. (Beneficial Effect)	Under Alternative 1, incrementally less fuel would be required to construct, operate, maintain, and decommission a wind energy development on the Project Site because up-to-seven fewer turbines and related infrastructure would be developed. Alternative 1 would have a total nameplate generating capacity of up to 195 MW, which equates to approximately 21 MW less nameplate generating capacity as the Project. This output would more than offset the amount of electricity needed to operate and maintain Alternative 1, but would not result in as substantial a benefit as the Project due to the reduced overall capacity. Although the impacts and overall benefit of Alternative 1 would be reduced relative to the Project, the impact conclusion would remain the same, and no mitigation measures would be required. **Greater than the Project**	Alternative 2 would preclude the construction of four wind turbines, as compared to the Project, resulting in the loss of approximately 12 MW to 22.8 MW of generating capacity based on generation potential per turbine. Under Alternative 2, the number of workers and durations of construction, operation and maintenance, and decommissioning and site restoration would be incrementally less than for the Project, resulting in slightly reduced fuel use. Electricity needed during operation and maintenance would more than offset the amount of electricity needed to operate and maintain Alternative 2, but would not result in as substantial a benefit as the Project due to the reduced overall capacity. Although the impacts and overall benefit of Alternative 2 would be reduced relative to the Project, the impact conclusions would remain the same, and no mitigation measures would be required. **Greater than the Project**
3.8	Forest Resources	Impact 3.3-1: The Project would result in the temporary disturbance of up to 1,384 acres of timberland during construction and the permanent conversion of up to 713 acres of timberland to developed power generation facilities uses (i.e., to the loss of forest land or conversion of forest land to non-forest use). This would result in a reduction of less than 0.05 percent of the commercial forest lands in Shasta County. (Less than Significant Impact)	Alternative 1 would adversely affect incrementally less timberland than the Project because the approximately 378 acres of the Project Site located north of SR 299 would continue to be managed for timber production. This elimination of 378 acres of the Project Site from development would reduce temporary impacts to commercial forest lands from 1,384 acres to 1,259 acres and would reduce permanent impacts from 713 acres to 652.5 acres. Although the impacts of Alternative 1 would be slightly reduced relative to the Project, the impact conclusion would remain the same, and no mitigation measures would be required. **Less than the Project**	Alternative 2 would reduce temporary impacts to commercial forest lands from 1,384 acres to 1,282 acres relative to the Project and would reduce permanent impacts from 713 acres to 664 acres. Although the impacts of Alternative 2 would be slightly reduced relative to the Project, the impact conclusion would remain the same, and no mitigation measures would be required. **Less than the Project**
3.9	Geology and Soils	The Project would cause less-than-significant impacts to geology, soils and paleontological resources, including the risk of loss, injury, or death involving strong seismic ground shaking (Impact 3.9-1), seismic-related ground failure (including liquefaction) (Impact 3.9-2), and landslides (Impact 3.9-3). It also would result in less-than-significant impacts resulting in substantial soil erosion or the loss of topsoil (Impact 3.9-4) or unstable geologic units or soils that potentially could result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse (Impact 3.9-5). Further, the Project would cause less-than-significant impacts relating to the creation of substantial direct or indirect risks to life or property due to its location on expansive or corrosive soil (Impact 3.9-6) and the adequacy of onsite soils to support the proposed septic tank (Impact 3.9-7). (Less than Significant Impact)	Alternative 1 would result in an incremental reduction in soil disturbance (and erosion potential) relative to the Project due to the fact that up-to-seven fewer turbines and related infrastructure would be developed, and fewer onsite road miles would be needed to develop and serve Alternative 1. A septic system would be developed just as for the Project. Although the impacts of Alternative 1 would be slightly reduced relative to the Project, the impact conclusions would remain the same, and no mitigation measures would be required. **Less than the Project**	Alternative 2 would result in an incremental reduction in soil disturbance (and erosion potential) relative to the Project due to the fact that four fewer turbines and related infrastructure would be developed, and fewer onsite road miles would be needed to develop and serve Alternative 2. A septic system would be developed just as for the Project. Although the impacts of Alternative 2 would be slightly reduced relative to the Project, the impact conclusions would remain the same, and no mitigation measures would be required. **Less than the Project**
3.10	Greenhouse Gas Emissions	The Project also would have a less than significant impact relating to its potential to conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. The Project would directly support the 40 percent reduction in GHG emissions by 2030 target under the 2017 Scoping Plan Update and goal of SB 100 for increasing California's procurement of electricity from renewable sources to 100 percent by 2045; Executive Order B-55-18 and the new statewide goal of achieving carbon neutrality (zero-net GHG emissions) by 2045 and maintaining net negative emissions thereafter; the 2018 Regional Transportation Plan & Sustainable Communities Strategy for the Shasta Region; and the Forest Carbon Plan. (Impact 3.10-2). The Project would result in a less-than-significant impact relating to the generation, directly and indirectly, of GHG emissions such as CO_2, methane, nitrous oxide and SF_6. After accounting for the annualized construction and decommissioning, and annual operational emissions of 809 MT CO2e per year, and the loss of carbon sequestration capacity during the Project's operational timeframe, the Project would provide a potential reduction of 225,131 MT CO2e per year. Overall, this would be a beneficial impact. (Impact 3.10-1)	Alternative 1 would generate incrementally fewer GHG emissions than the Project and would offset incrementally fewer MT CO2e per year because it would have a total nameplate generating capacity that would be approximately 21 MW less than the Project due to the reduction in the number of turbines. There would be no change relative to the Project with respect to plan consistency. The impacts of Alternative 1 would be slightly reduced relative to the Project; the beneficial effect of Alternative 1 also would be reduced. Nonetheless, the impact conclusions would remain the same, and no mitigation measures would be required. **Greater than the Project**	Alternative 2 would generate incrementally fewer GHG emissions than the Project and would offset incrementally fewer MT CO2e per year because it would have a total nameplate generating capacity that would be 12 to 22.8 MW less than the Project due to the reduction in the number of turbines. There would be no change relative to the Project with respect to plan consistency. The impacts of Alternative 2 would be slightly reduced relative to the Project; the beneficial effect of Alternative 2 also would be reduced. Nonetheless, the impact conclusions would remain the same, and no mitigation measures would be required. **Greater than the Project**

TABLE ES-3 (CONTINUED)
SUMMARY OF IMPACTS OF THE PROJECT AND ALTERNATIVES

EIR Section	Resource Area	Project	Alternative 1, South of SR 299	Alternative 2, Increased Setbacks
3.11	Hazards and Hazardous Materials	During normal operation, equipment failure or an extreme event could lead to turbine failure, resulting in a potential hazard (Impact 3.11-3). The Project also could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan (Impact 3.11-7). The implementation of recommended Mitigation Measure 3.11-3 and Mitigation Measure 3.11-7, respectively, would reduce the potential significance of each impact below established thresholds. (Less than Significant with Mitigation Incorporated) The Project would have a less-than-significant impact from the potential to create a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials or wastes (Impact 3.11-1), reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment (Impact 3.11-2), potential hazards from ice shed from turbine blades (Impact 3.11-4), applications of certain pesticides (Impact 3.11-5), and from the alternating changes in light intensity that could occur when turbine blades are rotating (Impact 3.11-6).	Alternative 1 would result in substantially the same impact as the Project relating to equipment or turbine failure and to potential impairment of or interference with an evacuation plan. the same mitigation requirements would apply. Alternative 1 would result in incremental reductions in the less-than-significant impacts that would be caused by the Project due to the up-to-seven fewer turbines that would be constructed, operated and ultimately decommissioned. As a result, Alternative 1 would cause an incremental reduction in the amount of hazardous materials or waste, incrementally fewer turbine blades that could shed ice, and incrementally less vegetation that would be subject to pesticide application. The turbines that would be installed under Alternative 1 would cause substantially the same shadow flicker as the Project in light of the locations of potential receptors. Even with these incremental changes in impact levels, the impact conclusions would remain the same. **Less than the Project**	Alternative 2 would differ from the Project by precluding the construction, operation and maintenance of turbines within three times the height of the turbine from a residential property line and would require setbacks of 1.5 times the height of the turbine from public and private roads. Because Project turbines (M03, D05, B01 and K02 not be constructed, Alternative 2 would result in a less than significant impact relative to whether, during normal operation, equipment failure or an extreme event could lead to a turbine failure resulting in a blade throw. Under Alternative 2, Mitigation Measure 3.11-3 (Mandatory Setbacks) would not be required. Given the greater distance between proposed turbines and potential visual receptors, the less than significant impact of the Project relating to shadow flicker would be even more remote under Alternative 2. Remaining impacts would be incrementally reduced, or substantially the same as the Project. **Less than the Project**
3.12	Hydrology and Water Quality	The Project would, unless mitigated, violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality during construction and decommissioning (Impact 3.12-1); substantially degrade groundwater quality from blasting, if it occurs (Impact 3.12-2); substantially increase siltation of waterways or provide substantial additional sources of polluted runoff during construction and decommissioning (Impact 3.12-4); and conflict with implementation of the Central Valley Basin Plan (Impact 3.12-5). The implementation of recommended mitigation measures would reduce the potential significance of each of these potential significant impacts below established thresholds. (Less than Significant with Mitigation Incorporated) The Project would result in a less-than-significant impact relating to the potential to decrease groundwater supplies or interfere with groundwater recharge such that the project may impede sustainable groundwater management of the basin (Impact 3.12-3).	Alternative 1 would avoid all impacts to Little Hatchet Creek and most disturbance-related impacts to the main stem of Hatchet Creek. There would be an overall reduction in temporary and permanent disturbance due to the fewer number of turbines compared to the Project. Although the impacts of Alternative 1 would be reduced relative to the Project, the impact conclusions would remain the same, and the same mitigation measures would be required. **Less than the Project**	Given the location of the Project turbines that would not be constructed under Alternative 2, Alternative 2 would result in substantially similar impacts to hydrology and water quality as the Project. The same impact conclusions would be reached, and the same mitigation measures would be required. **Equal to the Project**
3.13	Noise and Vibration	The Project could result in the generation of a substantial temporary increase in ambient noise levels (Impact 3.13-2) on and near the Project Site in excess of standards if construction activities were required during nighttime hours or during helicopter use. The implementation of recommended Mitigation Measure 3.13-2 would reduce the potential significance of this potential significant impact below established thresholds. The Project also could result in significant impacts due to groundborne vibration from blasting. The implementation of Mitigation Measure 3.13-3 would reduce impacts to below established thresholds. (Less than Significant with Mitigation Incorporated) The Project would have a less-than-significant impact from operational noise due to the generation of a substantial permanent increase in ambient noise levels in the vicinity of the Project (Impact 3.13-1).	Because the Project turbines that would not be constructed under Alternative 1 would be located over 5,000 feet from the nearest receptor (LT-3) and, thus, would contribute substantially less to noise and vibration impacts, the impacts of Alternative 1 would be substantially the same as those of the Project, the impact conclusions would be the same, and the same mitigation requirement would apply. **Equal to the Project**	Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within 2,037 feet of a residential property line and within 1,018.5 feet of SR 299, any other publicly-maintained public highway or street, and of Supan Road or Terry Mill Road. Implementation of these setbacks would remove turbines M03, D05, and B01 based on the residential property line setback, and would remove turbine KO2 based on the roadway setback. The effect of eliminating these turbines, in particular turbine D05, would reduce the operational and construction-related noise levels at receptor location R-4 compared to those identified for the Project. Although this impact would be incrementally reduced relative to the Project, the impact conclusions would be the same and the same mitigation requirements would apply. **Less than the Project**
3.14	Transportation	The Project would, unless mitigated, substantially increase safety hazards to the public and inhibit emergency access due to the proposed use of oversize vehicles, which could limit motorists' views on roadways and obstruct the driving area (Impact 3.14-3, Impact 3.14-4). The implementation of recommended Mitigation Measure 3.14-3 would reduce these potential significant impacts to a less-than-significant level. (Less than Significant with Mitigation Incorporated) The Project would result in less-than-significant impacts relating to its potential to conflict with a program plan, ordinance or policy addressing the circulation system (Impact 3.14-1) and its potential to conflict or be inconsistent with CEQA Guidelines Section 15064.3(b) regarding vehicle miles traveled (VMT) as the appropriate focus of transportation analyses toward reducing related GHG emissions (Impact 3.14-2).	Alternative 1 would require incrementally fewer oversized loads to deliver/remove heavy construction equipment and wind turbine components due to the reduction by up to seven turbines relative to the Project. Further, Alternative 1 would incrementally further reduce the Project's less-than-significant VMT impact because incrementally fewer vehicle trips by pick-up trucks, haul trucks, and worker vehicles due to the possibility of an incremental reduction in construction and decommissioning schedules resulting from a need for less work to occur during those timeframes. Although the impacts of Alternative 1 would be reduced relative to the Project, the impact conclusions would remain the same and the same mitigation measure would be required. **Less than the Project**	Alternative 2 would require incrementally fewer oversized loads to deliver/remove heavy construction equipment and wind turbine components due to the reduction by four turbines relative to the Project. Further, Alternative 2 would incrementally further reduce the Project's less-than-significant VMT impact because it would require fewer vehicle trips due to the possibility of an incremental reduction in construction and decommissioning schedules resulting from a need for less work to occur during those timeframes. Although the impacts of Alternative 2 would be reduced relative to the Project, the impact conclusions would remain the same and the same mitigation measure would be required. **Less than the Project**

TABLE ES-3 (CONTINUED)
SUMMARY OF IMPACTS OF THE PROJECT AND ALTERNATIVES

EIR Section	Resource Area	Project	Alternative 1, South of SR 299	Alternative 2, Increased Setbacks
3.15	Utilities and Service Systems	The Project would have a less-than-significant impact on utilities and service systems relating to the sufficiency of water supplies available to serve the Project (Impact 3.15-1), the adequacy of a wastewater treatment provider's capacity to serve the Project's projected demand (Impact 3.15-2), and the Project's potential to generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals (Impact 3.15-3). (Less than Significant Impact*)*	Alternative 1 would incrementally reduce water, wastewater and solid waste needs commensurate with the reduction in development and ground disturbance associated with up-to-seven fewer turbines and related infrastructure such as would be needed for the collector system, access roads, and lay-down areas relative to the Project. Storm water drainage infrastructure or improvements would not be required north of SR 299. Although the impacts of Alternative 1 would be reduced relative to the Project, the impact conclusions would remain the same. **Less than the Project**	Alternative 2 would incrementally reduce water, wastewater and solid waste needs commensurate with the reduction in development and ground disturbance associated with the development of four fewer turbines and related infrastructure. Although the impacts of Alternative 2 would be reduced relative to the Project, the impact conclusions would remain the same. **Less than the Project**
3.16	Wildfire	The Project would, unless mitigated, substantially impair an adopted emergency response plan or emergency evacuation plan (Impact 3.16-1); exacerbate wildfire risks and expose Project occupants to pollutant concentrations or a significant risk of loss, injury or death from a wildfire or the uncontrolled spread of a wildfire (Impact 3.14-2); and expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes (Impact 3.16-4). The implementation of recommended Mitigation Measure 3.16-1; Mitigation Measures 3.16-2a, 3.16-2b and 3.16-2c; and Mitigation Measure 3.16-4 would reduce these potential significant impacts to a less-than-significant level. (Less than Significant with Mitigation Incorporated) The Project also would have a less-than-significant impact resulting from the proposed installation and maintenance of infrastructure such as roads, fuel breaks, emergency water sources, power lines or other utilities because such infrastructure could exacerbate fire risk (Impact 3.16-3). (Less than Significant Impact*)*	Alternative 1 would incrementally reduce the construction, operations and maintenance, and decommissioning footprint, restricting it to the portion of the Project Site that is located south of SR 299. This would have the effect of incrementally reducing the potential for a wind project-related ignition during all phases of the Project. Further, under Alternative 1, the portion of the Project Site north of SR 299 would remain under timber management and production, which could decrease the risk of wildland fire because that portion of the Project Site would be harvested and thinned, preventing excessive fuel build up in the area of the Project Site north of SR 299. Although the impacts of Alternative 1 would be reduced relative to the Project, the impact conclusions would remain the same and the same mitigation requirements would apply. **Less than the Project**	Alternative 2 would reduce the number of turbines by four relative to the Project, and so would incrementally reduce potential ignition sources from turbines, vehicles and equipment during construction, operation and decommissioning relative to the Project. Additionally, increasing the setbacks of the turbines from residential properties would provide some additional protection to surrounding communities by increasing the area between residences and the turbines in the event that a turbine fire were to occur. Although Alternative 2 would reduce impacts to wildland fire slightly, impact conclusions would be the same and the same mitigation requirements would apply. **Less than the Project**

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ES.8 Environmentally Superior Alternative

The CEQA Guidelines define the environmentally superior alternative as that alternative with the least adverse impacts to the project area and its surrounding environment. The No Project Alternative is considered the environmentally superior alternative for CEQA purposes because it would avoid all impacts of the Project. However, the No Project Alternative would fail to meet the basic objectives of the Project, including, but not limited to: locating a commercially financeable wind energy project with the capacity to provide up to 216 MW to the northern California grid (NP15) in close proximity to an existing PG&E transmission line (see Section 2.3, *Project Objectives*). Since the environmentally superior alternative is the No Project Alternative, the EIR also must identify an environmentally superior alternative from among the other alternatives.

Determining an environmentally superior alternative can be difficult because of the many factors that must be balanced. For example, Alternative 2 could be preferred because, relative to the Project, it would further remove wind project infrastructure from residential property lines and from all roads, not just public ones. Slightly fewer roads and less below-ground and above-ground infrastructure would be constructed, operated and maintained, and decommissioned and removed from the Project Site. Similarly, Project could be preferred because, relative to either Alternative 1 or Alternative 2, it would generate the greatest amount of renewable energy, and so would offset the most metric tons of carbon dioxide emissions generated by fossil fuels and provide greater assistance to the State toward meeting the renewable energy generation targets set in SB 100. Additional information received in or developed during the agency and public review period for the Draft EIR or during the Project approval process that could affect the balancing of the respective benefits and consequences of the alternatives. Accordingly, it would be premature to designate an Environmentally Superior Alternative at this stage. An Environmentally Superior Alternative will be identified in the Final EIR.

ES.9 Areas of Controversy

Any of the environmental issues considered during scoping or in this Draft EIR could become an issue of controversy. Preliminarily, the County has identified areas of controversy as including the issues and questions raised in agency and public comments received during scoping; all comments received during the scoping period are included in the Project Scoping Report, which is included as Appendix J to this Draft EIR. Issues identified as potential areas of controversy relate to: Aesthetics, Forestry Resources, Air Quality, Biological Resources, Communications Interference, Cultural and Tribal Cultural Resources, Economic and Social Impacts, Energy, Geology and Soils, Greenhouse Gas Emissions and Climate Change, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Noise and Vibration, Public Health, Public Services, Recreation, Transportation, Utilities and Service Systems, and Wildfire. More specifically, scoping input expressed potential controversy particularly regarding daytime and nighttime views of the Project, and potential impacts on avian species and all manner of flora and fauna; headwaters, surface waters, and other sources of drinking water in the affected area; public health; and tribal cultural resources. The County also received input during scoping

regarding the identification of alternatives to the Project and considerations to be evaluated as part of the cumulative scenario.

ES.10 Issues to be Resolved

Section 15123(b)(3) of the CEQA Guidelines requires that an EIR contain issues to be resolved, which include the choice among alternatives and whether or how to mitigate significant impacts. The following major issues are to be resolved:

- Determine whether the EIR adequately describes the environmental impacts of the Project;
- Choose among alternatives;
- Determine whether the recommended mitigation measures should be adopted or modified; and
- Determine whether or not additional mitigation measures need to be applied to the Project.

ES.11 References

California Energy Commission (CEC), 2014. Energy Infrastructure Map of Northern California. May 21, 2014.

California Independent System Operator (CAISO), 2008. California (CAISO) Electric Regions. February 2008.

California Public Utilities Commission (CPUC), 2018. Delivery, Consumption & Prices for Utility Service within California. Available online: https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/About_Us/Organization/Divisions/Policy_and_Planning/PPD_Work/PPD_Work_Products_(2014_forward)/California%20Regions%20Final.pdf. January 18, 2018.

Pacific Gas & Electric Company (PG&E), 2014. Service Area Map. Available online: https://www.pge.com/tariffs/tm2/pdf/ELEC_MAPS_Service_Area_Map.pdf. Effective December 17, 2014.

U.S. Department of Energy (DOE), 2020. WINDExchange Ordinances Database. Available online: https://windexchange.energy.gov/policies-incentives?utf8=%E2%9C%93&search=california. Accessed January 17, 2020.

CHAPTER 1
Introduction

1.1 Purpose of This Document

This Draft Environmental Impact Report (EIR) is an informational document intended to disclose to the public and decision-makers the potential environmental impacts of the Fountain Wind Project (Project). The Shasta County (County) Department of Resource Management, Planning Division, as the lead agency under the California Environmental Quality Act (CEQA),[1] has prepared this Draft EIR to document its analysis of the potential direct, indirect, and cumulative impacts of the Project described in Section 2.4, *Description of the Project*, and the alternatives described in Section 2.5, *Description of Alternatives*. All resource areas in the CEQA Guidelines Appendix G Checklist have been studied: Aesthetics, Agriculture and Forestry Resources, Air Quality, Biological Resources, Cultural Resources, Energy, Geology and Soils, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Mineral Resources, Noise, Population and Housing, Public Services, Recreation, Transportation, Tribal Cultural Resources, Utilities and Service Systems, and Wildfire. The potential for the Project to result in communications interference is also examined. See Chapter 3, *Environmental Analysis*.

The County will rely on the analysis in this Draft EIR, as it may be amended in response to agency and public input, along with other information in the record, in deciding whether to approve, approve with modifications, or disapprove the requested Use Permit (UP 16-007) to construct, operate, maintain, and ultimately decommission the Project. Other agencies with trustee responsibilities or permitting authority over the Project, including but not limited to the California Department of Forestry and Fire Protection (CAL FIRE), California Department of Fish and Wildlife (CDFW), California Public Utilities Commission (CPUC), and the Regional Water Resources Control Board (RWQCB), may rely on this document in deciding whether to approve or issue other authorizations for the Project.

1.2 Project Overview

The Project is a renewable wind energy generation development proposed on a 4,464-acre site (Project Site) in unincorporated Shasta County. More specifically, the applicant proposes to construct, operate, maintain, and ultimately decommission up to 72 wind turbines and associated transformers together with associated infrastructure and ancillary facilities. Each turbine would be

[1] This analysis is being prepared CEQA (Pub. Res. Code §21000 et seq.) and its implementing regulations, the CEQA Guidelines (14 Cal. Code Regs. §15000 et seq.).

no more than 679 feet tall, as measured from ground level to vertical blade tip (total tip height), and would have a generating capacity of 3 to 5.7 megawatts (MW). The Project would have a maximum total nameplate generating capacity of up to 216 MW.[2]

Associated infrastructure and facilities would include: a 34.5-kilovolt (kV) overhead and underground electrical collector system to connect the electricity generated by individual turbines together and deliver the electricity to an onsite collector substation; underground or overhead fiber-optic communication lines (or, in the alternative, a relay microwave tower); an onsite switching station to connect the Project to the regional grid operated by Pacific Gas and Electric Company (PG&E); interconnection facilities to allow the interconnection to the grid (to be owned and operated by PG&E); a temporary construction and equipment laydown area; 14 temporary laydown areas distributed throughout the Project Site to store and stage building materials and equipment; an operation and maintenance (O&M) facility; up to four permanent meteorological (MET) towers; temporary, episodic deployment of mobile Sonic Detection and Ranging (SoDAR) or Light Detection and Ranging (LiDAR) systems within identified disturbance areas (e.g., at MET tower locations); two storage sheds; the potential for new groundwater wells; three temporary concrete batch plants; and a septic system. Existing commercial timber within the Project Site would be harvested as needed to construct the proposed infrastructure. New access roads would be constructed within the Project Site, and existing roads would be improved. The Project would operate year-round. Both scheduled and unscheduled maintenance events would occur. Project decommissioning and site restoration activities would result in the removal of Project infrastructure from the Project Site and, in coordination with the landowner, disturbed areas would be replanted with the goal of developing a vegetation cover, composition, and diversity similar to the area's ecological setting and consistent with the landowner's current and future land use practices.

1.3 Use of this Document by Agencies

CEQA Guidelines §15124(d) requires that an EIR contain a statement briefly describing the intended uses of the EIR. The following discussion summarizes the roles of the lead agency and any responsible agencies and the intended uses of the EIR in their approval or permitting processes; see Section 2.6, *Permits and Approvals*, for additional detail.

Shasta County has the primary responsibility for considering whether to approve the requested Use Permit for the Project, is the CEQA "lead agency" for purposes of this Draft EIR, and has directed the preparation of the EIR. This analysis will be used by the County, in conjunction with other information developed in the County's formal record, when considering whether to approve, approve with conditions, or deny the requested Use Permit. Other necessary County approvals may include a Hazardous Materials Business Plan, septic system permit, and well permit from the Shasta County Department of Resource Management, Environmental Health Division; building

[2] "Nameplate capacity" is the amount of power that would be generated under ideal conditions. Actual output can differ from nameplate capacity for a number of reasons, including wind speeds and other weather conditions, and equipment maintenance.

and grading permits from the Shasta County Building Division; and an encroachment permit from the Shasta County Public Works Department.

CAL FIRE has primary jurisdiction over timber conversion and timber harvesting, each of which would require discretionary approval prior to construction of the Project. As a "responsible agency" for purposes of CEQA, CAL FIRE would rely on the EIR, once it is certified, in deciding whether to approve a Timber Conversion Permit and Timber Harvest Plan pursuant to the Z'berg-Nejedly Forest Practice Act and Forest Practice Rules (CAL FIRE, 2019). Other agencies also may rely on information in this EIR to inform their own permitting decisions and approvals for the Project.

1.4 CEQA Process Overview

This EIR has been prepared in accordance with CEQA (Public Resources Code [Pub. Res. Code] §21000 et seq.) and its implementing regulations, the CEQA Guidelines (14 California Code of Regulations [Cal. Code Regs.] §15000 et seq.). CEQA requires state and local government agencies to consider the environmental consequences of projects over which they have discretionary authority before taking action on those projects. Shasta County, as lead agency, considered the potential impacts of the Project in an Initial Study before determining that an EIR would provide the appropriate level of CEQA documentation for the Project. The Initial Study is included in Appendix A of the Scoping Report, which is provided as Appendix J of this Draft EIR.

The overall purposes of the CEQA process are:

1. Disclose to decision-makers and the public the potential significant environmental effects of a proposed discretionary project.

2. Prevent or minimize potential damage to the physical environment through the development of project alternatives, mitigation measures, and mitigation monitoring.

3. Enhance public participation in the environmental review process through scoping meetings, public notice, public review, and hearings.

4. Involve other potentially affected governmental agencies through coordination, early consultations, the scoping process, and State Clearinghouse review.

As defined in CEQA Guidelines §15378, a "project" is any action that "has a potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment." CEQA Guidelines §15093 requires the County, as the lead agency, to balance the benefits of a proposed project against any significant unavoidable environmental effects it may have. If the benefits of the Project outweigh the significant unavoidable adverse impacts, then the County may adopt a statement of overriding considerations that finds the environmental consequences to be acceptable in light of the Project's benefits to the public. The environmental review process as set forth under CEQA is outlined below.

1.4.1 Pre-scoping Activities

The County initiated pre-scoping activities following receipt of the application for Use Permit No. 16-007 in November 2016. Pre-scoping activities included initial agency and community outreach, the results of which efforts were documented in an Initial Study, and consultation with Tribes pursuant to Assembly Bill (AB) 52. The Initial Study, initial outreach efforts, and the AB 52 consultation process are summarized in the Scoping Report (Appendix J).

1.4.1.1 Initial Study

Pre-scoping activities included the preparation of an Initial Study. On the basis of the Initial Study, the County determined that preparation of this EIR would be required.

1.4.1.2 Initial Agency and Community Outreach

As part of its initial outreach efforts, the County sent early consultation referrals for the Project to an expansive and broad range of local, state, and federal agencies, native American tribes, community organizations, media outlets, and others (Shasta County, 2018). Written responses were received from: the Burney Fire Protection District, California Department of Fish and Wildlife, California Department of Transportation, Central Valley Regional Water Quality Control Board, Shasta County Assessor/Recorder, Shasta County Air Quality Management District, Shasta County Fire Department, Shasta County Office of the Sheriff, and the Shasta Mosquito and Vector Control District. Initial community outreach included communications with: the Pit Rive Tribe, Frontier Communications, and the Wintu Audubon Society. Correspondence with these agencies and members of the community is documented in the Initial Study.

1.4.1.3 Tribal Consultation Pursuant to AB 52

Pursuant to the AB 52 Tribal consultation process, CEQA lead agencies consult with tribes that are traditionally and culturally affiliated with the project area and that have requested consultation pursuant to Pub. Res. Code §21080.3.1. The purpose of the consultation is to determine whether a proposed project may result in a significant impact to tribal cultural resources. As set forth in Pub. Res. Code §21080.3.1(b), the law requires:

> *Prior to the release of a negative declaration, mitigated negative declaration, or environmental impact report for a project, the lead agency shall begin consultation with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project if: (1) the California Native American tribe requested to the lead agency, in writing, to be informed by the lead agency through formal notification of proposed projects in the geographic area that is traditionally and culturally affiliated with the tribe, and (2) the California Native American tribe responds, in writing, within 30 days of receipt of the formal notification, and requests the consultation.*

The County's AB 52 contact list consists of Native American tribes that had submitted written requests for notification of CEQA projects within their geographic area of traditional and cultural affiliation as of December 8, 2017, when the County initiated consultation. The County sent letters by certified mail on December 8, 2017, to two representatives of the Pit River Tribe:

Mickey Gemmill (Shasta County, 2017a) and Morning Star Gali (Shasta County, 2017b). Each letter identified the area within which the Project is proposed as within the Tribe's geographic area of traditional and cultural affiliation. Return receipts for the certified letters indicate the letters were delivered on December 8, 2017. The County received no response to either letter. Although the AB 52 process formally closed when no response was received to the December 8, 2017 letters, the County has continued efforts to connect directly with representatives of the Pit River Tribe and has used this information in the analysis of potential impacts on resources of importance to the Tribe and its members.

1.4.2 Scoping Activities

CEQA Guidelines §15083 provides that a "Lead Agency may…consult directly with any person…it believes will be concerned with the environmental effects of the project." Scoping is the process of early consultation with affected agencies and the public prior to completion of a Draft EIR. Section 15083(a) states that scoping can be "helpful to agencies in identifying the range of actions, alternatives, mitigation measures, and significant effects to be analyzed in depth in an EIR and in eliminating from detailed study issues found not to be important." Scoping is an effective way to bring together and consider the concerns of affected State, regional, and local agencies, the project proponent, and other interested persons (CEQA Guidelines §15083[b]). The purpose of scoping is to determine the scope of information and analysis to be included in an EIR and, thereby, to ensure that an appropriately comprehensive and focused EIR will be prepared that provides a firm basis for informed decision-making.

The scoping process for this EIR included the following:

1. **Notice of Preparation (NOP):** On January 15, 2019, the County published and distributed an NOP accompanied by the Initial Study described above, to advise interested local, regional, state, and federal agencies, as well as the public, that an EIR would be prepared for the Project. The County sent the NOP package to trustee, responsible, and potentially affected federal agencies; to the Governor's Office of Planning and Research/State Clearinghouse; and to the Shasta County library in Redding, Anderson and Burney.

2. **Additional public notifications:** The County sent separate notice to a mailing list of 603 recipients that included Tribes, property owners within 2 miles of the Project Site, and other interested parties. The County also posted an electronic copy of the NOP and the direct-mail notice on its website: https://www.co.shasta.ca.us/index/drm_index/planning_index/eirs/fountain-wind-project. In addition to the NOP, direct mail notifications, and web posting, the County notified the public about the public scoping meeting through newspaper advertisements published in the *Record Searchlight* on January 15, 2019, in the *Mountain Echo* on January 15, 2019, and in the Intermountain News on January 16, 2019.

3. Agency-**specific scoping meeting:** The County held an agency-specific scoping meeting for responsible and trustee agencies on Thursday, January 24, 2019, at 2 p.m. at the Shasta County Administration Building. A follow-up site visit was held on January 25 to further inform County and other agency representatives about the specifics of the proposed site.

4. **Public meeting:** A meeting was held on Thursday, January 24, 2019, at Montgomery Creek Elementary School to provide information to the public about the Project and the CEQA

process, and to solicit scoping input from attendees. Doors opened to view Project information at 6:30 p.m.; the public scoping meeting began at 7 p.m. Presentation slides, the "storyboards" displayed at the meeting, and a transcript of comments made by speakers at the meeting are provided in the Scoping Report (Appendix J).

5. **Scoping period:** The EIR scoping period lasted from January 15 to February 22, 2019. In addition to oral comments made at the public scoping meeting, written input was received from approximately 150 entities. All input received on or before end of the scoping period is documented in the Scoping Report provided as Appendix J to this Draft EIR.

1.4.3 Draft EIR

Preparation of the Draft EIR follows and is informed by the scoping process. Article 9 of the CEQA Guidelines (§§15120–15132) establishes the required contents of an EIR. These are summarized below.

1. **Table of contents or an index:** A table of contents is provided.

2. **Summary:** An executive summary is provided (see p. ES-1 et seq.).

3. **Project description:** A description of the Project is provided (see p. 2-1 et seq.).

4. **Environmental Setting:** The environmental setting is described on a resource-by-resource basis throughout Chapter 3.

5. **Analysis of direct, indirect, and cumulative impacts of the proposed project:** Potential impacts of the Project are described on a resource-by-resource basis throughout Chapter 3.

6. **Consideration and discussion of mitigation measures proposed to minimize potential significant impacts:** Mitigation measures are proposed to minimize potential significant impacts (see, e.g., Table ES-2, *Summary of Project Impacts and Mitigation Measures*).

7. **Consideration and discussion of alternatives to the proposed project, including a No Project Alternative:** The alternatives development screening process, alternatives rejected from detailed consideration, and the alternatives evaluated in detail on a resource-by-resource basis throughout Chapter 3 are described in Chapter 2 (see p. 2-27 et seq.).

8. **Organizations and persons consulted:** Federal, state, and local agencies; Tribal entities and members; and organizations and individuals consulted pursuant to the preparation of this Draft EIR are identified in Section 5.4, *Entities Consulted and Recipients of the Draft EIR* (p. 5-2 et seq.).

1.4.4 Agency and Public Review

As required by CEQA, this Draft EIR is being made available for agency and public review and comment for a period of at least 45 days. Copies were provided to the State Clearinghouse for circulation to interested state agencies. Printed copies of the Draft EIR and electronic copies of all appendices and all documents referenced in the Draft EIR are available for public review during normal hours at the Shasta County library in Redding, Anderson, and Burney and also are available for review by members of the public at the Shasta County Department of Resource Management

office by appointment. An electronic copy of the Draft EIR is available for all-hours access on the County's website: https://www.co.shasta.ca.us/index/drm_index/planning_index/eirs/fountain-wind-project.

Notifications of the availability of the Draft EIR and information about how to access it were sent directly to responsible, trustee, and local agencies; the Shasta County Clerk's office; and to the Tribal entities and members, organizations, individuals identified in Section 5.4, *Entities Consulted and Recipients of the Draft EIR* (p. 5-2 et seq.). Notice of the availability of the Draft EIR also was published in the *Record Searchlight*, in the *Mountain Echo*, and in the *Intermountain News*.

Please submit any written comments on the Draft EIR to the address shown below:

> Shasta County Dept. of Resource Management, Planning Division
> Attention: Lio Salazar, AICP, Senior Planner
> 1855 Placer Street, Suite 103
> Redding, CA 96001
> E-mail: fw.comments@co.shasta.ca.us

The County will review all substantive comments received during the review period and provide written responses in a Final EIR. The Final EIR will be made available to agencies and the public, and will provide a basis for agency decision-making.

1.4.5 Final EIR

After the end of the Draft EIR's public review period, the Shasta County Department of Resource Management will prepare a Final EIR for consideration by the public and the Shasta County Planning Commission. The Final EIR will include comments received on the Draft EIR, written responses to substantive comments received, a list of commenters, and identification of revisions to the EIR made in response to the comments received. The Planning Commission will review and consider the Final EIR before taking action on the Project.

1.4.6 Findings of Fact

After publication of the Final EIR and before deciding whether to certify the EIR or approve, modify, or deny the Project, the County will make the following findings regarding each significant impact consistent with Pub. Res. Code §21081:

1. Changes or alterations have been required in, or incorporated into, the Project which mitigate or avoid the significant effects on the environment;

2. Those changes or alterations are within the responsibility and jurisdiction of another public agency and have been, or can and should be, adopted by that other agency; or

3. Specific economic, legal, social, technological, or other considerations, including considerations for the provision of employment opportunities for highly trained workers, make infeasible the mitigation measures or alternatives identified in the EIR.

With respect to any significant effects that are subject to the third finding, the County must find that specific overriding economic, legal, social, technological, or other benefits of the Project outweigh its potential to result in significant unavoidable adverse effects on the environment before it could approve the Project. A statement of overriding considerations would not otherwise be required.

1.5 References

California Department of Forestry and Fire Protection (CAL FIRE), 2019. California Forest Practice Rules 2019. Available online: http://calfire.ca.gov/resource_mgt/downloads/2019%20Forest%20Practice%20Rules%20and%20Act_FINAL.pdf. February 2019.

Shasta County, 2017a. Letter from Bill Walker, AICP, Senior Planner, Shasta County Department of Resource Management, to Mickey Gemmill, Chairman, Pit River Tribe, regarding Tribal Cultural Resources under the California Environmental Quality Act, AB 52 (Gatto, 2014). Formal Notification of Determination that a Project Application is Complete, pursuant to Public Resources Code §21080.3.1. Available online: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/projects/fountain-wind-project/ab52/ltrpitrivertribemorningmickeygemmillchairman120717.pdf. December 8, 2017.

Shasta County, 2017b. Letter from Bill Walker, AICP, Senior Planner, Shasta County Department of Resource Management, to Morning Star Gali, Tribal Historic Officer, Pit River Tribe, regarding Tribal Cultural Resources under the California Environmental Quality Act, AB 52 (Gatto, 2014). Formal Notification of Determination that a Project Application is Complete, pursuant to Public Resources Code §21080.3.1. Available online: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/projects/fountain-wind-project/ab52/LtrPitRiverTribeMorningStarGaliTribalHistoricOfficer120717.pdf. December 8, 2017.

Shasta County, 2018. Use Permit 16-007. Fountain Wind Project Referral Distribution List. January 4, 2018.

CHAPTER 2
Description of Project and Alternatives

2.1 Project Overview

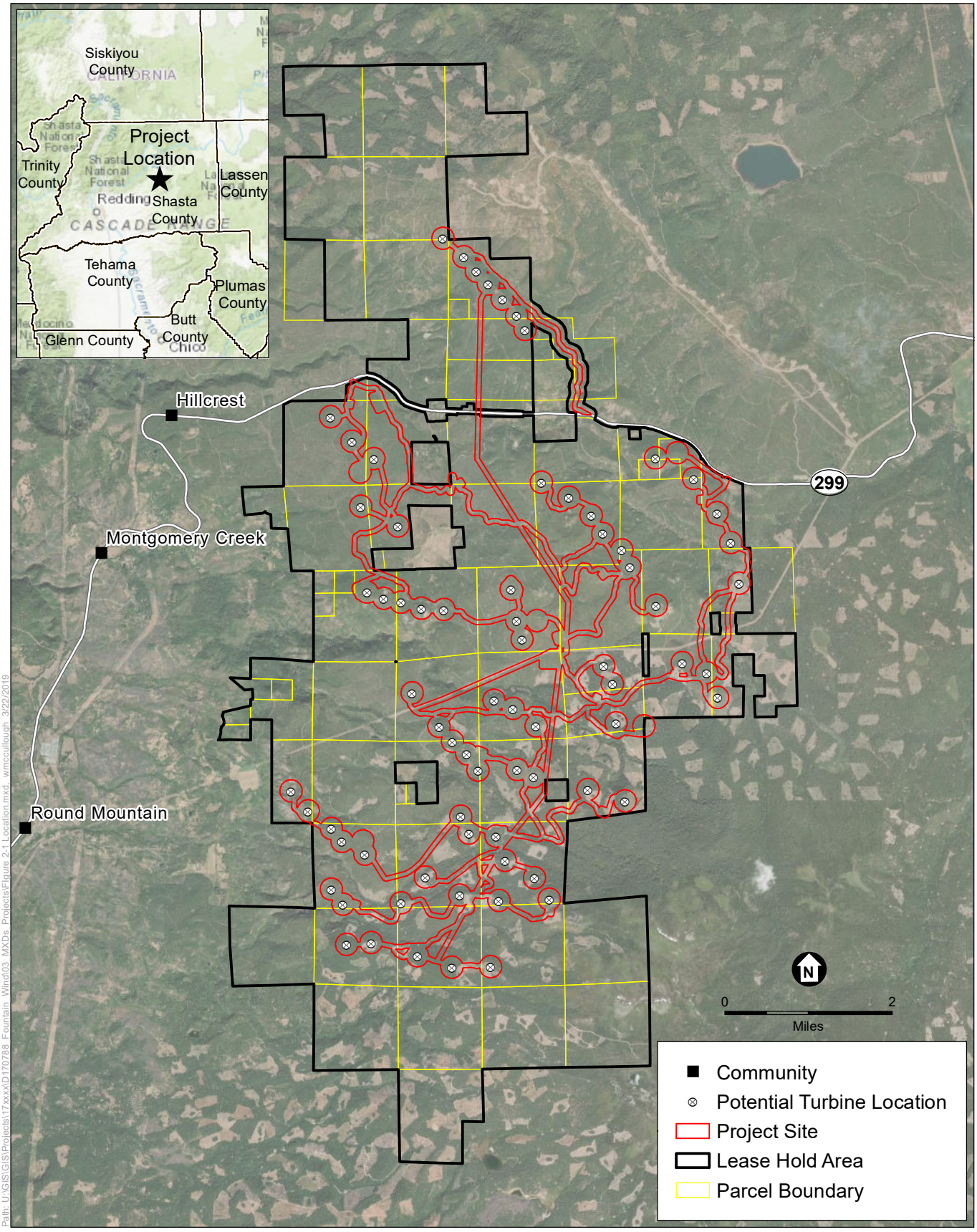
The Fountain Wind Project (Project) is a wind energy generation development proposed by Fountain Wind LLC (Applicant), in an unincorporated area of Shasta County. The Applicant has applied for a Use Permit (UP 16-007) to construct, operate, maintain, and decommission wind turbines and related infrastructure within an approximately 29,500-acre leased area encompassing 74 Shasta County (County) Assessor's Parcels. Within the leasehold area, the Project would be developed within an 4,464-acre area (Project Site) where the permanent project facilities would be sited. The Project Site includes all area where either temporary or permanent disturbance may occur. See **Figure 2-1**, *Project Location*.

The County, as the Lead Agency under the California Environmental Quality Act (CEQA),[1] is preparing this Environmental Impact Report (EIR) to document its analysis of the potential impacts of the Project described in Section 2.4, *Description of the Project*, and the alternatives described in Section 2.5, *Description of Alternatives*.

The Project described in Section 2.4 reflects refinements made since the July 2017 Use Permit application filing date based on the Applicant's further environmental and engineering review. Briefly, the Applicant proposes fewer, taller wind turbines than initially proposed: a decrease from 100 to up to 72 turbines and an increase in maximum height from 591 feet to 679 feet tall, as measured from ground level to vertical blade tip (total tip height), with hub heights of up to approximately 410 feet (125 meters) and rotor diameters of up to approximately 531.5 feet (162 meters). With fewer turbines, the Project analyzed in this EIR also includes reduced access roads, collection systems, and related infrastructure relative to the initial proposal. Each turbine would have a generating capacity of 3 to 5.7 megawatts (MW). Overall, the Project would have a total nameplate generating capacity of up to 216 MW.[2] Associated infrastructure and facilities would include: a 34.5-kilovolt (kV) overhead and underground electrical collector system to connect turbines together and to an onsite collector substation; overhead and underground fiber-optic communication lines; an onsite switching station to connect the Project to the regional grid operated by the Pacific Gas and Electric Company (PG&E); a temporary construction and

[1] This analysis is being prepared pursuant to CEQA (Pub. Res. Code §21000 et seq.) and its implementing regulations, the CEQA Guidelines (14 Cal. Code Regs. §15000 et seq.).

[2] "Nameplate capacity" is the amount of power that would be generated under ideal conditions. Actual output can differ from nameplate capacity for a number of reasons, including wind speeds and other weather conditions, and equipment maintenance.



Fountain Wind Project

Figure 2-1
Project Location

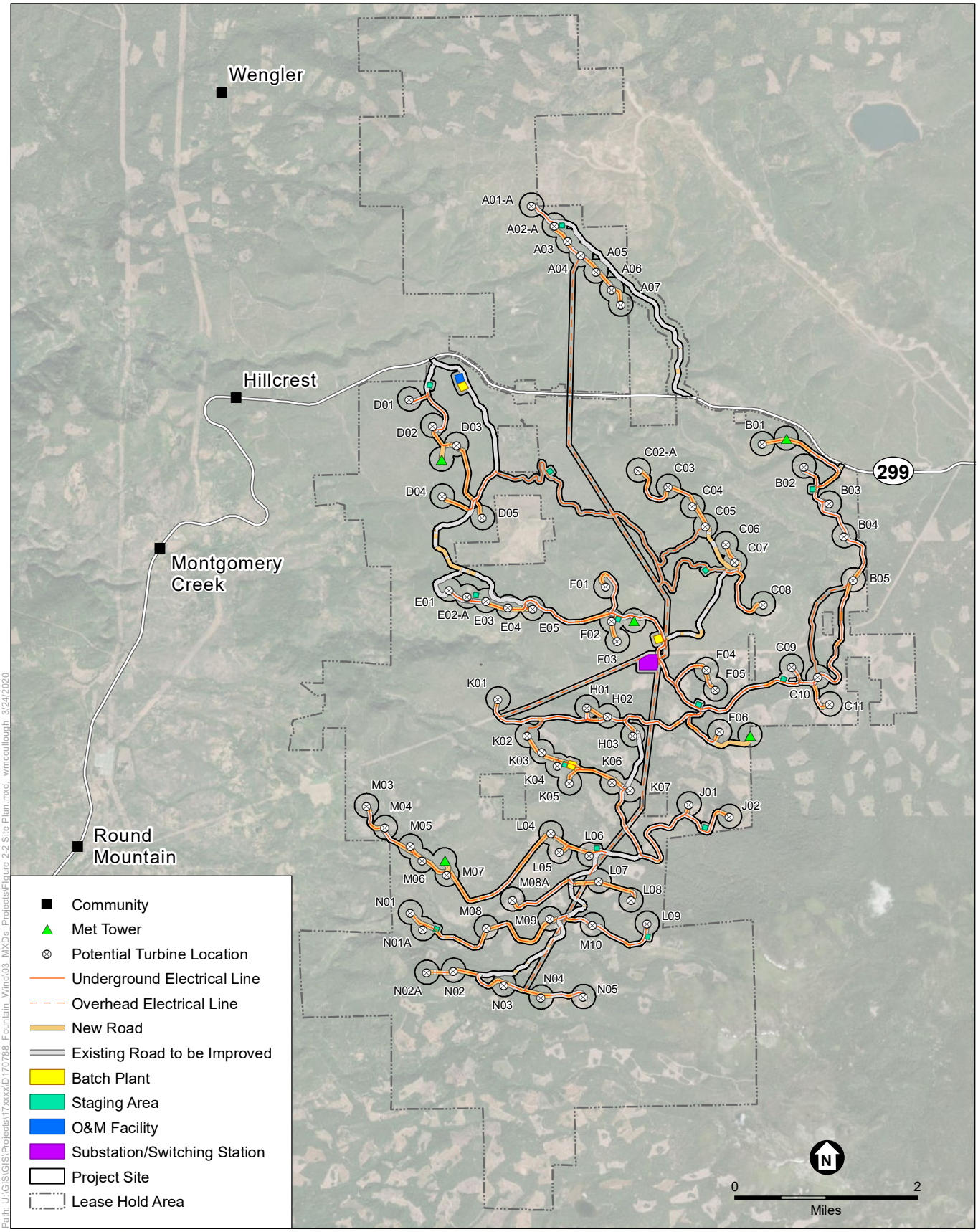
equipment laydown area; 14 temporary laydown areas distributed throughout the Project Site to store and stage building materials and equipment, an operation and maintenance (O&M) facility with employee parking; up to four permanent meteorological evaluation towers (METs); temporary, episodic deployment of mobile Sonic Detection and Ranging (SoDAR) or Light Detection and Ranging (LiDAR) systems within identified disturbance areas (e.g., at MET locations); two storage sheds; and three temporary batch plants. New access roads would be constructed within the Project Site, and existing roads would be improved. See **Figure 2-2**, *Project Site Plan*, which shows the proposed layout of Project components. The Project would operate year-round.

2.2 Project Location

The Project Site is located approximately 1 mile west of the existing Hatchet Ridge Wind Project, 6 miles west of Burney, 35 miles northeast of Redding, immediately north and south of State Route (SR) 299, and near the private recreational facility of Moose Camp.[3] Other communities near the Project Site include Montgomery Creek, Round Mountain, Wengler and Big Bend. The project site is also within in a geographic area that is traditionally and culturally affiliated with the Pit River Tribe. Access to the Project Site is provided locally by SR 299, Moose Camp Road, and three existing, gated logging roads, and would be provided regionally by highways that provide access to SR 299, including Interstate 5 (I-5), which is approximately 35 miles to the west of the Project Site, and SR 139, which is approximately 60 miles to the east of the Project Site.

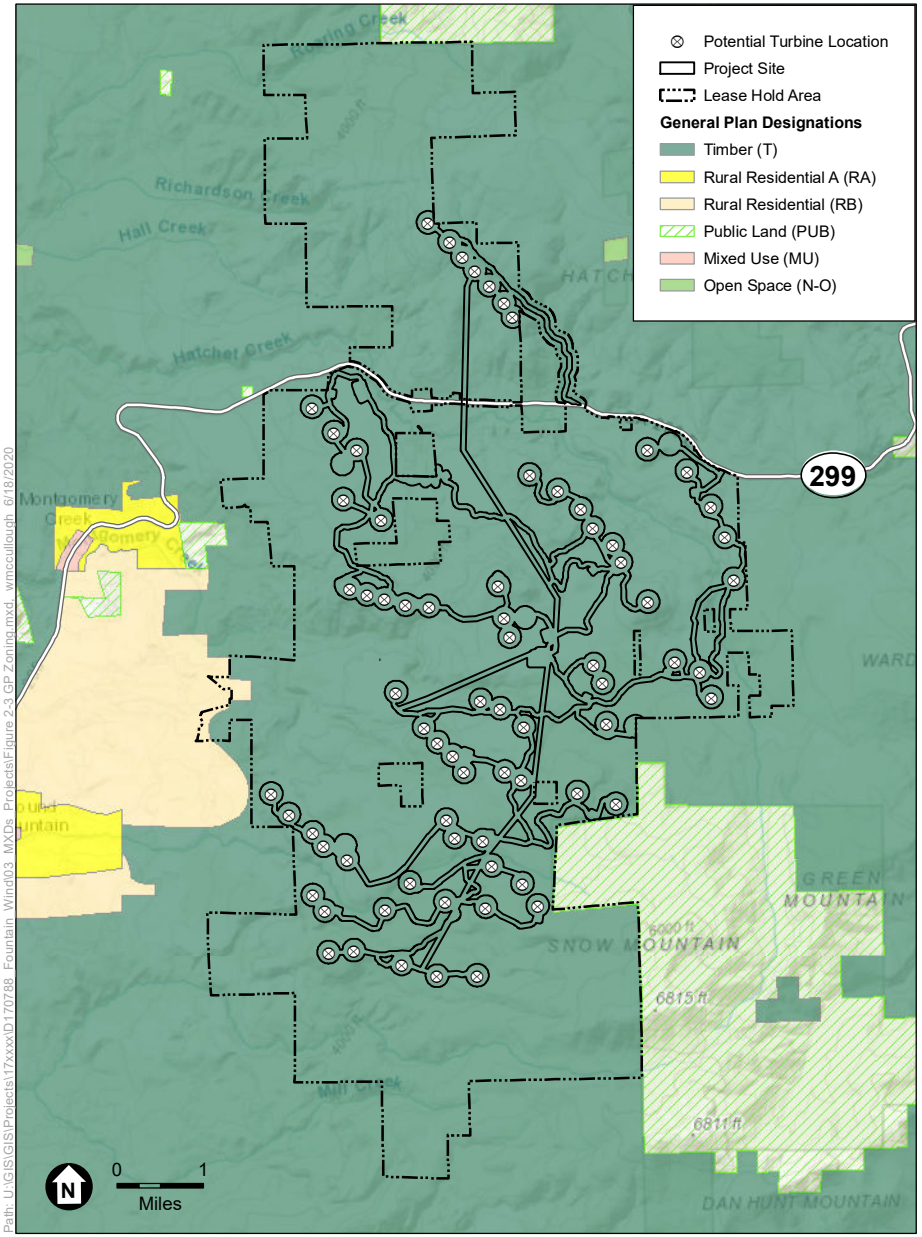
The Project Site is located within the southern end of the Cascade Range with topography characterized by buttes and peaks separated by small valleys. The Lassen National Forest lies to the southeast, and the Shasta-Trinity National Forest is to the north. Other surrounding lands are privately owned; many are used for timber harvesting purposes. Elevations within the Project Site range from 3,000 to 6,000 feet above sea level. Little Cow Creek and the south fork of Montgomery Creek cross the Project Site from east to west. Other small tributaries run through the valleys. Northern portions of the leasehold were affected by the 1992 Fountain Fire, as evidenced by burn scars. The Shasta County General Plan designates the Project Site as Timber (T); the zoning designations are Timber Production (TP) (approximately 4,457 acres) and Unclassified (U) (approximately 6 acres). See **Figure 2-3**, *General Plan Land Use and Zoning Designations*. The existing land use within the Project Site consists exclusively of managed forest lands. Logging roads (some of which are unpaved) and transmission lines cross the Project Site.

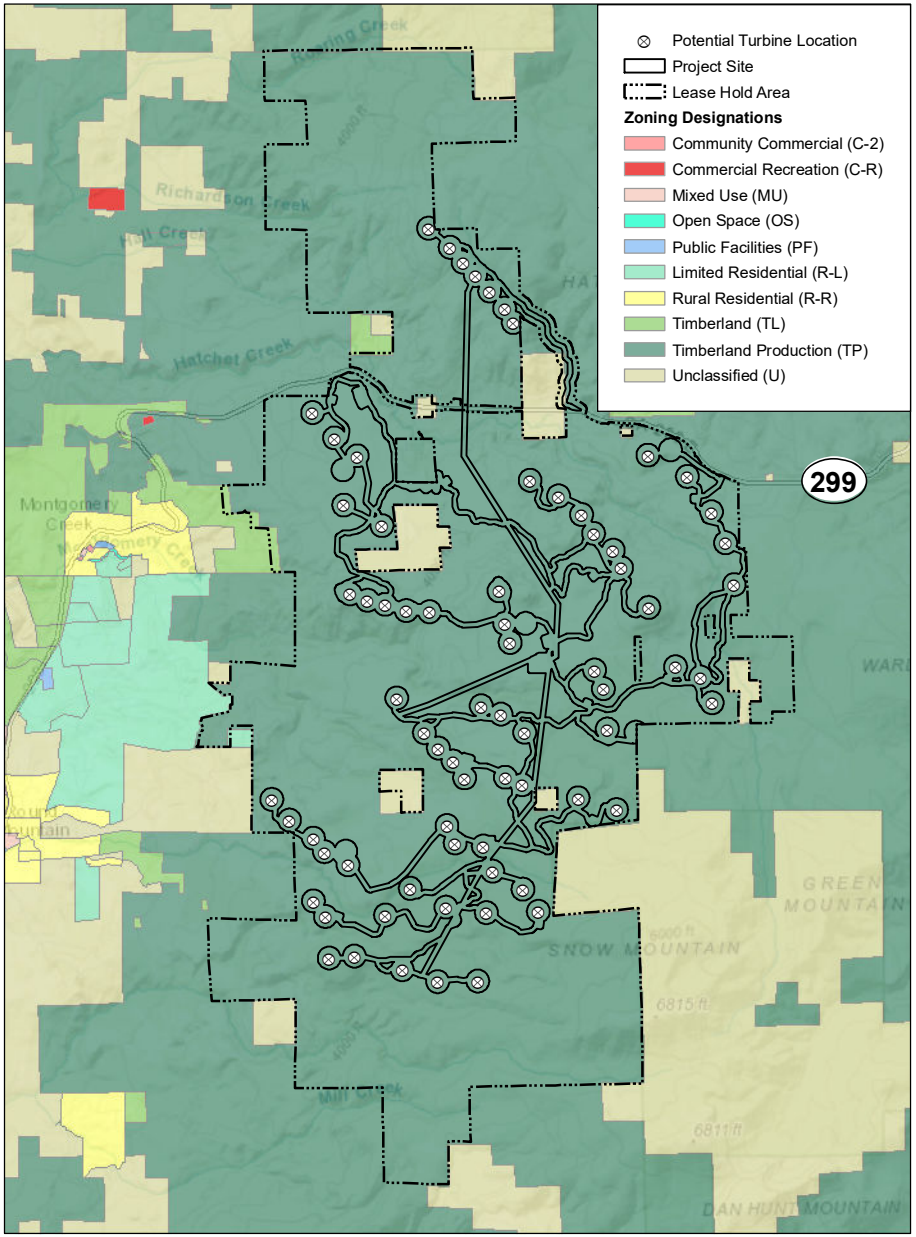
[3] Moose Camp is an approximately 146-acre private recreational facility owned and operated by Moose Recreational Camp, Ltd., a California Non-Profit Mutual Benefit Corporation, for the benefit of its approximately 75 members and their families (Moose Recreational Camp, Ltd., 2012a, 2012b; Appendix J, *Scoping Report* [Letters P17, P23, P37, P43, P55]). In Moose Camp, 50 cabin residences are used year-round (Appendix J, *Scoping Report* [Letters P17, P23, P37, P43, P55]).



Fountain Wind Project

Figure 2-2
Site Plan





General Plan Land Use Designations

Zoning Designations

Fountain Wind Project

Figure 2-3

General Plan Land Use and Zoning Designations

ESA

SOURCE: Shasta County, 2019

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2.3 Project Objectives

The Applicant seeks to build the Fountain Wind Project to meet the following objectives:

1. Develop, construct, and operate a commercial wind energy generation facility capable of generating up to 216 MW of wind energy.
2. Interconnect to the Northern California electrical grid (NP15).[4]
3. Locate the Project in close proximity to an existing transmission line with sufficient capacity to reduce impacts and costs associated with building new transmission infrastructure.
4. Assist California in meeting the renewable energy generation targets set in Senate Bill (SB) 100.[5]
5. Create temporary and permanent jobs in Shasta County and contribute to the County's tax base.
6. Obtain entitlements to construct and operate a commercially financeable wind energy project.
7. Support landowners through diversification of revenue streams.
8. Offset approximately 128,000 metric tons of carbon dioxide emissions generated by fossil fuels.
9. Provide emissions-free energy for approximately 100,000 households.[6]

2.4 Description of the Project

The Project consists of three major components: (1) Up to 72 turbines, including associated concrete foundations, pads, and temporary construction areas; (2) 34.5 kV overhead and underground collector lines and fiber optic communication cabling; and (3) an onsite substation and switching station for connecting the Project into the existing PG&E transmission line (Figure 2-2). All of these improvements would be entirely within the Project Site. The elements of each of these major components are described in more detail below. Ancillary facilities and infrastructure also would be required, including access roads, temporary construction laydown areas, an O&M facility, up to four permanent METs (five potential locations are being analyzed), storage sheds, and up to three temporary concrete batch plants. Project components and disturbance areas, including for the removal of vegetation/timber and timber conversion, are summarized in **Table 2-1**, *Project Components and Disturbance Areas*.

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4 The California Independent System Operator (CAISO) manages the operation of California's power grid, including the generation and transmission of electricity by PG&E and the CAISO's other member utilities. The CAISO divides the state into three regions: NP15, SP15, and ZP26. NP15 corresponds to PG&E's electric service territory (CAISO, 2008; PG&E, 2014). An existing 230 kV line crosses the Project Site south of SR 299 (CEC, 2014). The Project would interconnect to the grid along this line.

5 SB 100 was signed into law on September 10, 2018. This bill accelerates the state's renewable energy goals, requiring 60 percent of California's electricity portfolio to come from eligible renewable sources by 2030 and that all retail electricity be carbon-free by 2045.

6 The California Public Utilities Commission (CPUC) reported in 2018 that "California households consume electric service at an average rate of 534 kWh per month in the summer months, and 459 kWh per month in the winter months" (CPUC, 2018a). If California households consume an average of 496.5 kWh per month (or 5.958 MWh per year), then the Project's generation of 605,491 MWh of electricity per year could serve an estimated 101,627 households per year.

TABLE 2-1
PROJECT COMPONENTS AND DISTURBANCE AREAS

Project Component	Quantity	Total Temporary Construction Disturbance Area	Permanent Disturbance Area
Turbines and pads (including temporary turbine construction areas)	Up to 72	5 acres per turbine (up to 360 total acres)	2.5 acres per turbine (up to 180 total acres)[a]
Underground electrical collector system[b]	Up to 51 miles	50-foot-wide corridor, up to a total of 309 acres	30-foot-wide corridor cleared of large vegetation, up to a total of 185 acres
Overhead electrical collector line and associated roads, work footprint, and permanent 2-track access road[c]	Up to 12 miles	100-foot-wide corridor, up to a total of 145 acres	80-foot-wide right of way cleared of large vegetation, up to a total of 116 acres
Onsite collector substation	1	8 acres	5 acres
Onsite switching station (including interconnection equipment)	1	11 acres	8 acres
Access roads (including crane roads)	Up to 24 miles of new roads	80-foot-wide disturbance area, up to a total of 233 acres. Nominally up to 200-foot-wide construction clear area in some locations to accommodate grading, slope stabilization, and blade delivery.	20-foot-wide drivable surface with a 1-foot shoulder on both sides and up to an additional 10 feet on either side where required for storm water drainage design, up to a total of 122 acres. Permanent disturbance width nominally up to 200 feet in some locations.
Widen existing 16-foot-wide access roads	Up to 33 miles of existing roads may be widened	80-foot-wide disturbance area (16 feet of which are already disturbed), up to 256 acres of new disturbance. Nominally up to 200-foot-wide construction clear area in some locations to accommodate grading, slope stabilization, and blade delivery.	Permanently widen to 20 feet with a 1-foot shoulder on both sides and up to 10 feet on either side where required for storm water drainage design, up to 96 acres. Permanent disturbance width nominally up to 200 feet in some locations.
O&M facility	1	5 acres	5 acres (including a 5,460-square foot O&M building and two 0.5-acre Operations storage sheds)
Temporary construction and equipment area, construction trailer area, and associated parking area	1	10 acres	0 acres
Temporary laydown areas	14	2 acres per laydown area (28 acres total)	0 acres
Temporary concrete batch plant, if necessary	3	3 to 5 acres per batch plant (up to 15 acres total)	0 acres
MET Towers	4	1 acre per structure (4 acres total)	0.5 acre per structure (2 acres total)
Anticipated Total Temporary Construction Disturbance[d]: 1,384 acres			
Anticipated Total Permanent Disturbance: 713 acres			

NOTES:

[a] The area of permanent disturbance for each turbine includes an approximately 0.5-acre area to accommodate the footprint of the turbine, related components, and gravel access pad. An additional area, up to approximately 2.0 acres, would be maintained clear of taller vertical vegetation during operations and maintenance and would serve as defensible fire space around each turbine.

[b] Portions of the underground collector system would be located within the access road construction buffer to minimize impacts. No additional permanent impacts would occur in these areas. This acreage includes the co-located underground communications system.

[c] Acreage includes co-located overhead communications system. An 80-foot-wide corridor centered on the overhead electrical collector line is assumed for disturbance calculations.

[d] Timber harvested and timberland to be coverted is included within the anticipated disturbance areas.

SOURCE: Stantec, 2018 (in Draft EIR Appendix J)

2.4.1 Wind Turbine Generators

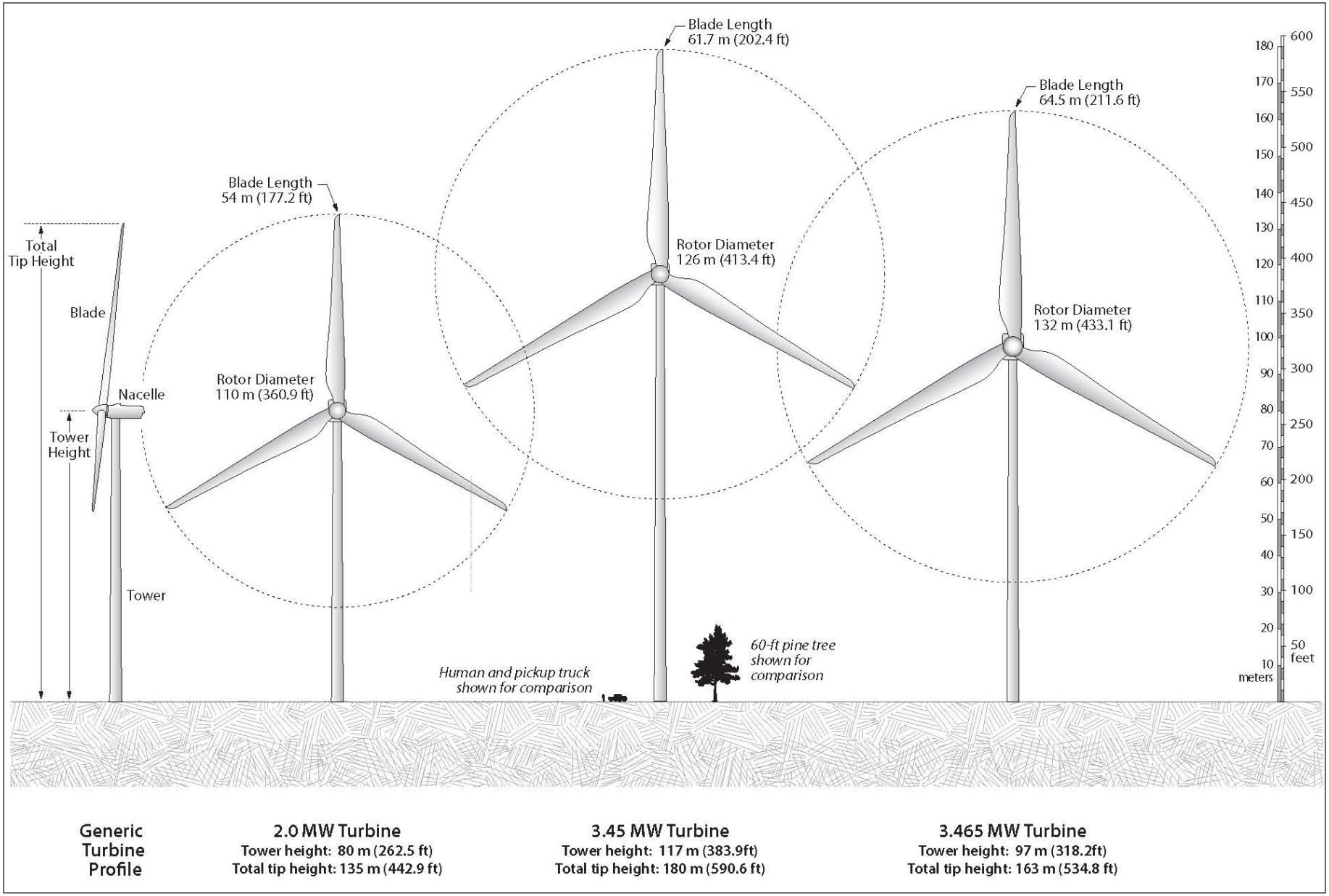
The site plan shown in Figure 2-2 depicts 72 turbine sites that are being considered as part of the Project. Final design may include fewer than 72 turbine sites. The 72 turbine sites represent feasible locations for a range of turbine models, each with different dimensions, generating capacity, and layout requirements. Prior to construction, the Applicant would determine which model would be installed based on component availability from the manufacturer, data on onsite wind resources, and other Project-specific factors. Regardless of the model ultimately selected, the Project would not exceed the proposed maximum 216 MW nameplate generating capacity.

The Project would construct, operate, maintain, and decommission up to 72 wind turbines, each with a nameplate generating capacity of 3.0 to 5.7 MW, to convert wind energy directly to electrical power to supply the existing electrical grid. The Project would use three-bladed, horizontal-axis turbines, meaning the rotor shaft and nacelle, which contains the electrical generator, would be mounted at the top of a cylindrical tower. A range of turbine heights are being considered; however, the maximum possible height would be 679 feet from ground level to the vertical turbine blade tip. Each turbine tower would be mounted on a concrete pedestal supported by a permanent foundation. Generic (non-Project-specific) turbine profiles are shown in **Figure 2.4a**, *Typical Wind Turbine*.

Designated turbines and METs would have flashing red lights installed to improve nighttime visibility for aviation and comply with Federal Aviation Administration (FAA) standards and Advisory Circular 70/7460-1L (FAA, 2016). In accordance with these standards, the Applicant would prepare a lighting plan for the Project and obtain FAA approval that would specify the installation of flashing red lights on designated turbines and METs to improve nighttime visibility for aviation. Because the height of the proposed turbines would be greater than 500 feet, it is expected that each would need to be lit with two lights. The Applicant would submit the FAA-approved plan to the County before turbine installation begins.

A commercial-scale wind turbine is made up of three main parts, including a tower, nacelle, and three blades that make up the rotor. The rotor is attached to the nacelle, which houses the generating components within a wind turbine, including the drive shaft, gearbox, generator, and controls. The tower provides the vertical support for the nacelle and rotor. Each turbine tower would be mounted on a concrete pedestal supported by a foundation. Spread footing foundations, which have a wide base that spreads the weight of the structure over a larger subsurface area for greater stability, are likely to be used for the foundation design. This type of foundation is buried underground to a depth of approximately 10 to 15 feet with a pedestal that extends approximately 1 foot above ground.

Turbine foundations would be designed based on the findings of a Project-specific, site-specific geotechnical investigation that would be prepared once final turbine locations have been verified. Section 1803 of the California Building Code specifies the required content of geotechnical reports. Existing law requires that the geotechnical investigation be conducted by a registered design professional and in accordance with the provisions of California Building Code



SOURCE: Pacific Wind Development, LLC.

NOTE: Generic turbine profiles are shown, not the specific turbines proposed for this Project. Dimensions of the proposed turbines are as described in Section 2.4, Description of the Project.

Fountain Wind

Figure 2-4a
Typical Wind Turbine

ESA

Section 1803, as may be amended from time to time and as in effect at the time the investigation is conducted. Prior to finalizing the location of each turbine, soil borings would be collected to an approximately 50-foot depth, or as appropriate, to verify soil and rock characteristics and ensure sufficient soil strength and bearing capacity to provide a stable foundation for the turbine. Depending on the final turbine model selected, the widest underground portion of the turbine spread footing foundation would be between 50 to 80 feet in diameter. The aboveground, visible portion of the foundation is anticipated to be similar in diameter to the turbine tower, up to approximately 16 feet in diameter. A step-up transformer would be located either within the turbine nacelle or within a 9-foot by 9-foot reinforced concrete box pad located approximately 5 feet from the tower foundation. A typical turbine site is shown in Figure 4 of the Initial Study provided as part of the Notice of Preparation package in Draft EIR Appendix J, *Scoping Report*.

During construction, a temporary work area would be cleared and graded around each turbine, including the area to be occupied by the turbine foundation. The size and configuration of each work area would depend on the turbine site's terrain. Each work area would require an up to 250-foot by 300-foot area for foundation excavation and construction and turbine assembly. A typical work area is 200 feet by 250 feet depending on site conditions. The work area would be used to stage the construction crane, which would be used to hoist turbine sections into place. Depending on site conditions, additional temporary work space may be used for rotor assembly. Temporary work areas would be cleared and leveled to approximately a 2 percent slope or less. Within each work area, a crane pad would be constructed of compacted soil to provide a stable area for crane operation during turbine component installation. The size and location of each crane pad would be determined by the contractor. A portion of the crane pad would be left in place after construction and used for turbine repair or during decommissioning of the Project. Post-construction, a permanent, 15-foot gravel ring would be placed around the base of the foundation to provide a stable surface for maintenance vehicles and to minimize surface erosion and runoff. These permanent turbine pads would be between 65 and 95 feet in diameter, depending on the site conditions and final turbine model constructed. An area up to an additional 2 acres around the permanent turbine pad would be removed from timber production and maintained as low-growing vegetation.

2.4.2 Electrical Collector System and Communication System

A combination of overhead and underground 34.5 kV electrical collector lines would collect energy generated by the turbines and deliver it to an onsite collector substation, described in more detail in Section 2.4.3, *Project Substation, Switching Station and Interconnection Facilities*. A communication system also would be installed within the same footprint. The communication system consists of fiber optic communication cabling for the Supervisory Control and Data Acquisition (SCADA) system, which provides communication capabilities between turbine locations, substation, and operations and maintenance facilities. Most of the collector system would be located underground and adjacent to onsite access roads. However, portions of the collector system may be constructed overhead in response to environmental and engineering constraints such as:

- a large distance from generators to the substation;

- meeting the transmission limits of underground cable (20 to 25 MW);
- steep terrain where the use of a backhoe or trenching machine is infeasible or unsafe;
- stream and wetland crossings and cultural resource sites, where an overhead line would avoid or minimize an impact to the resource; or
- the presence of soils with low thermal conductivity or rocky conditions which could significantly increase trenching costs.

See also Figure 5 and Figure 6 of the Initial Study provided as part of the Notice of Preparation package in Draft EIR Appendix J, *Scoping Report*, which show conceptual design details of the proposed underground and overhead collector system.

2.4.2.1 Underground Collector System

The underground collector system would consist of insulated cables buried in trenches that are 46 inches deep and at least 12 inches wide. Each trench would contain power cables, a ground wire, a fiber optic communication cable, and a marker tape above the cables. Cables generally would be co-located with turbine access roads to minimize ground disturbance. In areas where the underground collector system would be co-located with both new and existing access roads, no additional ground disturbance would be required to install the underground electrical collection system beyond that which is disclosed in the impacts for the widening of the road. Where cable trenches cannot be co-located with access roads, a temporary, 50-foot-wide disturbance area would be required to install the cable. During operations, a permanent, 30-foot-wide corridor centered on the buried cable would be maintained clear of woody vegetation. The cables would terminate at individual turbines; the cables would connect from there to junction boxes, overhead power lines, or at the onsite substation. Junction boxes also would be installed on long collector runs between turbine strings. Blasting may be required prior to trenching in rocky areas.

2.4.2.2 Overhead Collector System

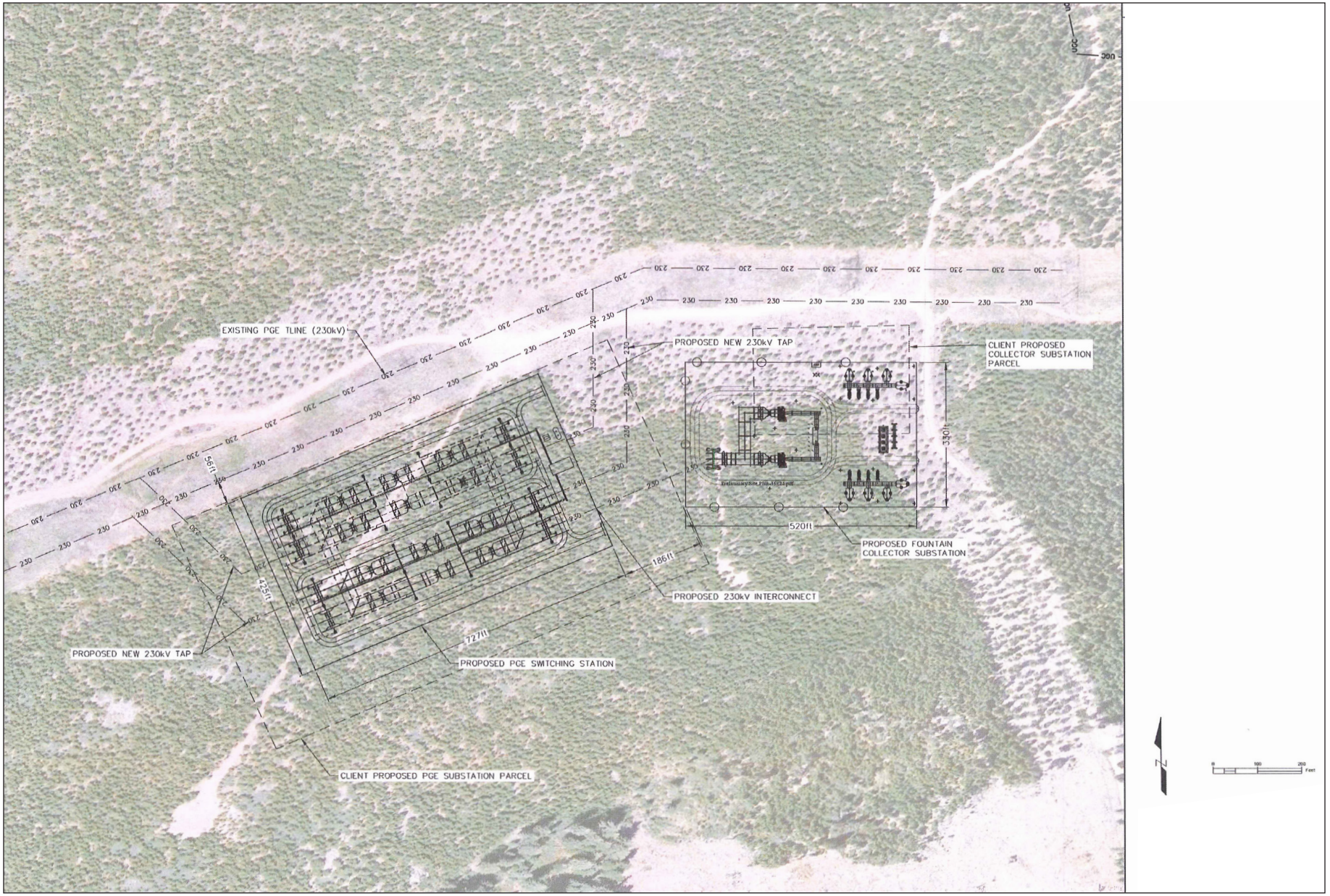
The 34.5 kV overhead electrical collector system would be installed on wood poles with a maximum height of 90 feet and wire heights between approximately 20 to 30 feet above the ground depending on the span; however, special circumstances could require greater wire clearances. Installation of the overhead collector line could require a temporary workspace consisting of an approximately 100-foot-wide corridor centered on the center line of the overhead line. An approximately 80-foot-wide corridor would be maintained during the operations phase. This area would be kept clear of taller woody vegetation to provide for safe operations and allow access for equipment inspections, vegetation control, and maintenance. Permanent disturbance impacts associated with the overhead collector system would be limited to the individual pole locations. All overhead collector lines would be designed in accordance with the Avian Protection Plan Guidelines prepared by the U.S. Fish and Wildlife Service (USFWS, 2005), and the Edison Electric Institute's Avian Power Line Interaction Committee (APLIC) guidance for reducing avian electrocution risk (APLIC, 2006) and risk of collisions with power lines (APLIC, 2012). Riser poles used to transition underground lines to overhead collectors would be constructed consistent with APLIC guidance for power pole configurations at wind energy projects (APLIC, 2019).

2.4.3 Project Substation, Switching Station and Interconnection Facilities

As described above, an onsite collector substation and switching station would increase the voltage of the electricity from the collection system's 34.5 kV to 230 kV to match the voltage of the existing PG&E 230 kV line. The preliminary substation and switching station designs are depicted in **Figure 2-4b**, *Preliminary Switching Station and Substation Site Plan*. The basic elements of the substation facilities include a control house, a bank of one or two main transformers, outdoor breakers, capacitor banks, relaying equipment, high-voltage bus work, steel support structures, an underground grounding grid, and overhead lightning-suppression conductors. The main outdoor electrical equipment and control enclosure would be installed on a concrete foundation.

The switching station would be located next to the Project substation and would facilitate the interconnection between the Project's electricity and the PG&E transmission lines. The Project would tap into the existing PG&E 230 kV line via an aboveground line tap located directly adjacent to the switching station. Minor modifications or upgrades to the existing 230 kV line may be required within the Project Site to facilitate the Project's interconnection. Upgrades to PG&E facilities are anticipated to include construction or reconfiguration of utility line structures and transmission line circuits involving four to six new transmission poles. If required, the new poles would be located adjacent to the proposed substation and switching station. Additionally, a relay microwave tower or overhead fiber optic communication circuits could be required. If required, the microwave relay tower would be up to 150 feet tall and would be located within the switching station permanent footprint. The tower would be a self-supporting lattice or lattice mast design and would require either a reinforced concrete slab foundation or a drilled pier foundation. A reinforced concrete slab foundation can be up to approximately 42 inches thick, covering a 25-by-25-foot area. A drilled pier foundation can be approximately 40 feet deep. An antenna system would be mounted on the tower and oriented for optimal communication with PG&E's control and communication system. The Applicant would construct the switching station; PG&E would construct the electrical connections to its facility. PG&E ultimately would own and operate the switching station and interconnection components.

Together, construction of the substation, switching station, and interconnection facilities would temporarily disturb up to approximately 19 acres; the permanent area of disturbance would be approximately 5 acres for the collector substation and 8 acres for the switching station. The permanent footprint of the substation and switching station would include a graveled parking area for maintenance vehicles. The substation and switching station would be enclosed with a chain-link fence. Appropriate safety signs would be posted along roads and around towers, transformers, and other high-voltage facilities in conformance with applicable regulations.



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SOURCE: Avangrid Renewables

Fountain Wind

Figure 2-4b
Preliminary Switching Station and Substation Site Plan

ESA

2.4.4 Other Infrastructure

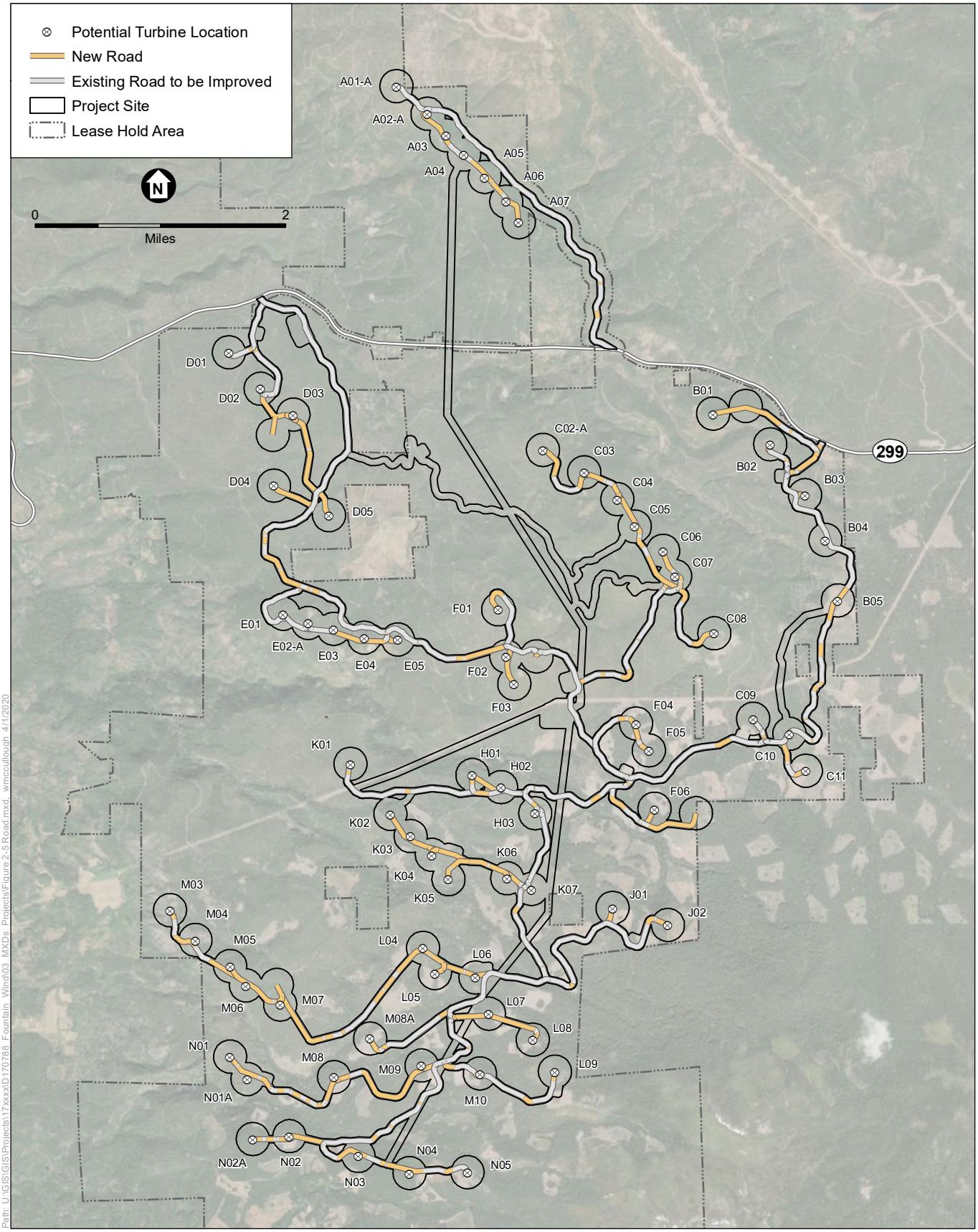
2.4.4.1 Access Roads

The Project Site would be accessed from three existing, gated logging roads located off SR 299 that would remain gated throughout Project construction, operation, and decommissioning. Existing gates may be replaced or reinforced during Project construction. During construction, workers would access the Project Site using the three access points and would park at the O&M facility or at a laydown area. The proposed road system is shown in **Figure 2-5**, *Road Network*. The road layout may be modified as final Project designs are developed to maximize the use of existing roads. Access road cross section details are shown in Figure 7a and Figure 7b of the Initial Study provided as part of the Notice of Preparation package in Draft EIR Appendix J, *Scoping Report*. As new roads are built and existing roads are modified, existing culverts would be replaced as needed with wider, stronger culverts to maintain a functional stormwater drainage system. Drainage improvements would be made in accordance with the Project's erosion control plan pursuant to the National Pollution Discharge Elimination System (NPDES) permit, described in more detail in Section 2.4.5.6, *Stormwater Control*. During operation and maintenance activities, the access roads would continue to be used by service vehicles and equipment.

2.4.4.2 Temporary Construction and Equipment Areas

Construction would require an approximately 10-acre cleared, graded, compacted gravel pad for use as a main construction staging area, to store equipment and materials, host construction trailers, refuel equipment, and store construction waste temporarily (i.e., for up to 14 days). Construction waste would be removed weekly or biweekly by a local waste management entity. This area also would provide temporary parking, construction office space (mobile trailers), and temporary sanitary facilities. A vendor-supplied fuel truck would make daily or weekly deliveries to approved storage tanks, which then would be used to refuel construction vehicles. Fuel tank storage capacity would be determined by the construction contractor. Fuel tanks would be maintained and operated according to all local, state, and federal regulations during construction and operation, and hazardous material storage would be detailed in the Spill Prevention, Countermeasure, and Control (SPCC) Plan described in Section 2.4.8.3, *Hazardous Materials*.

Refueling and general maintenance for construction equipment, such as changing fluids and lubricating parts, would occur within this temporary construction and equipment area or other outdoor locations with sufficient containment capabilities and according to measures outlined in the SPCC Plan. Post-construction, the portions of the staging and laydown area not used for permanent operation and maintenance activities would be restored to preconstruction conditions in accordance with applicable plans, such as a Habitat Restoration Plan, Vegetation Management Plan, and Invasive Species Management Plan. These plans would be developed by the Applicant prior to initiating onsite activities and would outline the procedures to be implemented upon the completion of construction to restore and revegetate areas of temporary disturbance and performance standards to measure revegetation success.



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Fountain Wind Project

Figure 2-5
Road Network

Additionally, during construction, 14 two-acre laydown (staging) areas would be located throughout the Project Site to stage building materials and equipment. The final dimensions of each laydown area would be based on site topography and may be graded and compacted or graveled depending on construction needs and soil conditions. Following construction, the laydown areas would be restored in accordance with the Applicant-proposed Habitat Restoration Plan and Vegetation Management Plan within 1 year following the conclusion of construction. Restoration may occur on a rolling basis as construction is completed in the locations served by each laydown area.

2.4.4.3 Operation and Maintenance Facility

A permanent operation and maintenance (O&M) facility, storage yard, and parking area would be located within an approximately 5-acre fenced area near SR 299. See Figure 2-2; see also Figures 8a, 8b and 8c of the Initial Study provided as part of the Notice of Preparation package in Draft EIR Appendix J, *Scoping Report*, which show the proposed O&M facility plan and profile, and Figure 9, which shows a conceptual site plan for the O&M facility. During the Project's operation and maintenance phase, maintenance equipment would be staged in the O&M storage yard. The O&M facility would be served by new or existing domestic wells or water storage tank and an onsite septic system in accordance with the rules and regulations of the Shasta County Department of Resource Management's Environmental Health Division.

2.4.4.4 Meteorological Equipment

Up to four permanent METs would be constructed within the Project Site to measure and record meteorological data to assess the performance of turbines and guide Project operation. These METs would be unguyed and freestanding to minimize impacts on avian species, would be up to 394 feet tall, and would comply with FAA lighting regulations. The Applicant would develop an FAA-approved lighting plan that is expected to specify the installation of flashing red lights on designated METs to improve nighttime visibility.

Mobile meteorological equipment, such as LiDAR and SoDAR systems, also may temporarily be deployed onsite during operation to supplement wind resource data gathered by the permanent METs. No ground disturbance would result from the use of these mobile units.

2.4.5 Site Preparation and Construction

2.4.5.1 Site Preparation

Fencing and Site Security

The Project would be located entirely on private property where public access is currently restricted. The onsite substation would be surrounded by a chain-link fence. Where necessary, safety and "No Trespassing" signs would be posted around towers, transformers, other high-voltage facilities, and along roads in accordance with federal and state regulations. Roads diverging from public access points such as SR 299 would be gated, locked, and setback from SR 299 a minimum 50 feet with a paved apron.

Timber Clearance and Harvesting

Existing commercial and pre-commercial timber would be harvested, treated, and/or removed from the Project Site to allow development of the Project. Areas that would be removed from timber production as a result of the Project would be harvested in accordance with a Timberland Conversion Permit (TCP) and Timber Harvesting Plan (THP) authorization from the California Department of Forestry and Fire Protection (CAL FIRE). The THP would be drafted in accordance with requirements set forth in the Forest Practice Act (Pub. Res. Code §4582) and the Forest Practice Rules (CAL FIRE, 2019), would be prepared by a Registered Professional Forester, and would be carried out by licensed timber operators. The THP would specify the location of timber to be harvested, how it would be harvested, and environmental best management practices (BMPs) that would be implemented during harvesting. The Applicant would provide the County with written documentation of CAL FIRE's approval of the THP prior to the commencement of onsite activities.

Ground-Disturbing Activities

Construction would include ground-disturbing activities such as clearing and grubbing, topsoil stripping, grading, compaction, utility trenching, soil borings, well-drilling, and the placement of turbine foundations and pads and aggregate surfacing. Grading activities would include the removal, storage, and disposal of soil, gravel, vegetation, organic matter, loose rock, and debris. Native soil excavated in one part of the Project Site would be used as fill in another area to minimize soil import and export. Cut and fill dimensions would be finalized along with engineering designs. Project disturbance areas that would be subject to ground disturbance as a result of these activities are summarized in Table 2-1.

Blasting may be necessary to loosen rock before excavation. If blasting is necessary, the Applicant would prepare a Blasting Plan that identifies the locations where blasting is anticipated to be needed and all applicable regulations for blasting procedures. The Blasting Plan also would specify the times and distances where explosives would be permitted to avoid impacts on sensitive environmental receptors and the human environment. The County and emergency responders would be notified at least 24 hours in advance of blasting. All blasting activities would be conducted in compliance with applicable federal, state, and local laws, and appropriate safety and environmental protection measures would be implemented, including weather restrictions in regards to wildfire risk.

Road Construction and Improvement

The Project Site would be accessed via existing, gated logging roads located off of SR 299. Existing gates may be replaced or reinforced and the roads may be graveled. During construction, new internal access roads would have a 40-foot-wide driving surface plus a 20-foot construction buffer on either side, resulting in an approximately 80-foot-wide disturbance area. In some areas, the construction cleared area could be up to 200 feet wide to accommodate significant cut and fill, stormwater controls, road design, and blade-delivery-vehicle turning radii. New road surfaces would be graded and graveled. The existing logging road network within the Project Site would be widened and modified according to the aforementioned specifications to safely accommodate turbine component delivery vehicles and heavy equipment. Road widening details are provided in

Table 2-1, *Project Components and Disturbance Areas*. Fugitive dust control would include application of appropriate dust suppressants, such as water or surfactants, as necessary during construction.

As new roads are built and existing roads are modified, existing culverts would be upgraded or replaced as needed to maintain a functional stormwater drainage system and meet fire safety and access standards. Individual crossings and culverts would follow appropriate BMPs and comply with all applicable independently enforceable requirements of the U.S. Army Corps of Engineers and California Department of Fish and Wildlife (CDFW) for in-stream activities, including CDFW requirements relating to fish passage. Drainage improvements would be made in accordance with the Project's erosion control plan pursuant to the NPDES permit described in Section 2.4.5.6, *Stormwater Control*.

During operation, access roads would continue to be used by service vehicles and equipment for maintenance activities. After construction, permanent access roads would be reduced to a 20-foot driving surface with a 1-foot shoulder. An additional 10 feet on either side may be required in some areas to accommodate stormwater drainage. Permanent access roads would be periodically graded and compacted to minimize erosion. Catch basins, roadway ditches, and culverts would be cleaned and maintained regularly. Permanent access roads would be used both for Project operation and continued timber management, and the Project operator and timber operator would share responsibility for maintaining these areas. Maintenance would be done at a frequency dictated by environmental conditions onsite.

Domestic Well Installation

New water wells may be required during construction and operation. Domestic well installation, if determined by the Applicant to be needed or desirable for Project purposes, would occur at the location of the proposed O&M facility and be performed using typical truck mounted drilling equipment and in accordance with the rules and regulations of the Shasta County Department of Resource Management's Environmental Health Division (Shasta County EHD, 2019). The number of new wells to be installed would be determined based on an agreement with the landowner. Alternatively, the Burney Water District could supply domestic water to serve Project needs. The Project's estimated water demand is discussed in Section 2.4.8.1, *Water and Wastewater*.

2.4.5.2 Construction Sequence

Initial construction activities would include widening existing access roads and constructing new access roads. Temporary staging and laydown areas also would be established to store turbine components and other Project equipment. A 5-acre area would be cleared around each turbine location to create a crane pad, construction laydown area, and rotor assembly area. Once turbine foundations are constructed, the turbines would be assembled and erected using forklifts and cranes. Construction of the substation, underground and overhead collection system, and O&M building would be concurrent with turbine installation. Upon the conclusion of construction, final testing would begin to ensure that all systems are functioning properly. As construction activities are completed, temporary staging and laydown areas would be restored to preconstruction conditions. As part of a final site cleanup, all waste materials would be removed from the Project Site.

Throughout construction, all construction activities would be implemented consistent with NPDES permit requirements and the Storm Water Pollution Prevention Plan (SWPPP) and Temporary Erosion and Sediment Control (TESC) Plan described in Section 2.4.5.5, *Stormwater Control*.

2.4.5.3 Materials Delivery

Delivery of Project components would be coordinated through the California Department of Transportation (Caltrans) and County encroachment permit processes and timed to minimize traffic disruptions. These permit processes would determine final trailer configuration, clearance requirements, emergency service access, lane closures (if necessary), California Highway Patrol escort (as required), and transportation times. For purposes of this analysis, all materials would be delivered to the Project Site by truck.

Turbines. Delivery plans would be finalized once a final turbine model and supplier is selected. In general, towers are expected to be delivered in three to six sections. Turbine components such as blades, nacelles, rotors, controllers, ladders and platforms, pad-mounted transformers, pad-mounted transformer vaults, and turbine switchgear would be delivered separately. Up to 15 separate delivery loads would be needed for each turbine. Of these, eight or nine deliveries would be classified as oversize according to California Vehicle Code Division 15, *Size, Weight, and Load*, for highway transportation, and would require oversize vehicle permits and/or variances[7] from Caltrans. Turbine component delivery vehicles would generally conform to road weight limits, and any deviations from these weight limits would be specified in oversize permit applications submitted to Caltrans. Additionally, cranes used to assemble turbine components would be delivered in multiple loads and assembled onsite.

Aggregate. Up to three temporary concrete batch plants (each between 3 and 5 acres) may be located within the onsite temporary construction and equipment area to facilitate cement delivery for foundations. Aggregate is expected to be sourced locally from the Burney area, but could be supplied from as far away as Redding. The batch plants would be removed following construction. Each batch plant would require a stand-alone generator as well as fuel, aggregate, cement, and water for operation. Stockpiles of sand and aggregate, which would be delivered by truck, would be located near each batch plant in a location that would minimize exposure to wind. Cement would be discharged via screw conveyor directly into an elevated storage silo without outdoor storage. The construction managers and crew would use BMPs and standard operating procedures to keep the plant, storage, and stockpile areas clean and to minimize the buildup of fine materials that could result in fugitive dust or offsite sedimentation.

Project construction is anticipated to generate approximately 12,070 total material delivery truck trips (east and west combined), or an average of 124 material delivery truck trips per day. Material delivery trucks could carry aggregate, turbine-related components, concrete, water, and other construction-related materials (**Appendix H**, *Transportation*). The Applicant anticipates that the bulk of materials would be delivered by truck from locations no more than 50 miles from the Project Site. Prior to arrival onsite, large components such as turbine blades are likely to be delivered by truck, barge, or rail to existing regional storage yards.

[7] Variances would be required for oversized loads, i.e., those with a width over 15 feet and/or length over 135 feet.

2.4.5.4 Construction Equipment

Equipment types and use assumptions by phase to construct the Project are identified in **Table 2-2**, *Construction Equipment List*.

TABLE 2-2
CONSTRUCTION EQUIPMENT LIST

Phase	Workdays	Equipment Type	Number	Hours/day
Timber Removal and Grubbing	80	Feller Buncher (logging)	2	8
		Logging Trucks	8	8
		Skidder	2	8
		Pickups	8	8
		Hydro Axe	2	8
Grading and Access Road Work	160	Road Grader	3	8
		Scraper	4	8
		Bulldozer (medium)	6	8
		Drum Compactor	4	8
		Rock Trucks	8	8
		Pickups	16	8
		Water Truck	6	8
Concrete Batch Plants	70	Concrete Pump Truck	2	8
		Mixer	10	8
		Generator	3	8
		Skid Steer Loader	3	8
		Pickups	6	8
		Water Truck	3	8
Turbine, Transformer, Substation, and O&M Foundations	70	Excavator	3	8
		Bulldozer (medium)	3	8
		Drum Compactor	4	8
		Skid Steer Loader	3	8
		Pickups	10	8
		Mobile Hydraulic Crane	3	4
Turbine and Transformer Installation	100	Mobile Hydraulic Crane	6	4
		Bulldozer (medium)	2	8
		Rubber Tired Forklifts	10	8
		Large Crawler Crane	4	8
		Pickups	20	8
		Turbine Delivery Vehicles	8	8
		Generator	4	8
Substation and O&M Building Installation	160	Mobile Hydraulic Crane	2	4
		Skid Steer Loader	2	8
		Pickups	8	8
		Rubber Tired Forklift	3	8

TABLE 2-2 (CONTINUED)
CONSTRUCTION EQUIPMENT LIST

Phase	Workdays	Equipment Type	Number	Hours/day
Underground Collector System	140	Trenching Equipment	4	8
		Rubber Tired Forklift	4	8
		Pickups	12	8
		Bulldozer (medium)	1	8
		Skid Steer Loader	4	8
Overhead Collection System	100	Backhoe Loader (includes setting collector system poles)	4	8
		Cable Reel Truck (includes auger for pole foundations)	3	8
		Mobile Hydraulic Crane	2	4
		Pickups	10	8
		Bulldozer (medium)	1	8
		Boom Lift	6	4
	5	Helicopter	1	8
Substation Aggregate and Security Fence	15	Skid Steer Loader	1	8
Transmission Line Connection	20	Mobile Hydraulic Crane	6	4
		Cable Reel Truck (includes auger for pole foundations)	4	8
		Boom Lift	6	4
		Pickups	8	8
		Bulldozer (medium)	1	8
		Excavator	2	8
	1	Helicopter	1	8

SOURCE: Fountain Wind, 2020, with revisions to use hours per day to reflect equipment operator breaks, etc., during the 10-hour workday.

2.4.5.5 Construction Schedule and Workforce

Project construction is expected to last 18 to 24 months. Generally, construction would occur during daylight hours from 7 am to 5 pm but could vary during summer or winter months, to accommodate specific construction needs or site conditions, to avoid traffic or high winds, or to facilitate the Project schedule. The Project would require up to 400 workers, some of whom would be local workers, and others would be specialized workers that may reside outside the local area. Non-local workers would stay at local hotels and commute to the Project Site. No new temporary worker lodging is expected to be constructed as part of the Project. Workers would most likely commute from Redding, Burney, Fall River Mills, or McArthur (**Appendix H**).

2.4.5.6 Stormwater Control

To minimize impacts on drainage and runoff, the Project would maintain onsite surface drainage patterns to the extent possible. Newly-constructed access roads would be designed to follow natural contours and minimize hill cuts. Ditches and culverts would be incorporated into road design to capture and convey storm water runoff. Except in areas where permanent recontouring is required, disturbed areas would be restored to preconstruction conditions.

In accordance with the Construction General Permit (USEPA, 2017), the Applicant would prepare a site-specific SWPPP for the Project that would identify BMPs to be used to minimize or eliminate pollution, erosion, and sedimentation. The Applicant also would prepare a TESC Plan, which would be implemented and maintained by the construction contractor throughout operation to further reduce the potential for erosion. Measures included in the TESC Plan would be comparable in effect to those described by the Center for Environmental Excellence by the American Association of State Highway and Transportation Officials (AASHTO, 2019).

2.4.6 Operation and Maintenance

Although upgrading and replacing equipment could extend the operating life of the wind energy facility indefinitely, for CEQA purposes, the life of the Project would be coterminous with the term of the use permit that is required for its operation, i.e., 40 years.

The Applicant would prepare a Project-specific Fire Prevention Plan (FPP) prior to the commencement of onsite activities that would remain in place for the life of the Project. The FPP would include procedures for emergency response, evacuation, fire agency notification, and fire prevention. Tree removal and maintenance of fire breaks also would be disclosed in the CAL FIRE TCP and THP. The FPP also would require the Applicant's and construction contractors' vehicles and personnel to be equipped with fire suppression equipment, radio and cellular access, and pertinent telephone numbers for reporting a fire. The Applicant's FPP would be prepared consistent with the directives in the Shasta County Fire Safety Standards (Shasta County, 2017), the Forest Practice Rules (CAL FIRE, 2019), and CAL FIRE's Shasta–Trinity Unit Strategic Fire Plan (CAL FIRE, 2017).

Project operation would require up to 12 full-time employees. Operation and maintenance activities would occur from Monday to Friday during normal working hours. The Project operator would monitor turbines through the SCADA monitoring system 24 hours a day, seven days a week. This system would allow the Applicant to perform self-diagnostic tests and would allow a remote operator to perform system checks, establish operating parameters, and ensure that the turbines are operating at peak performance. In the event of winds, gusts above the maximum operating parameters or red flag alerts, the turbines would automatically shut down.

Maintenance of turbines and associated infrastructure includes a wide variety of activities. The Applicant would develop an O&M protocol to be implemented throughout Project operation. This protocol would specify routine turbine maintenance and operation in accordance with the maintenance requirements prescribed by the turbine manufacturer. Some unscheduled maintenance and repair would be necessary. Routine maintenance activities are expected to include, but not be limited to: checking torque on tower bolts and anchors; checking for cracks and other signs of stress on the turbine tower and other turbine components; inspecting for leakage of lubricants, hydraulic fluids and other hazardous materials, and replacing them as necessary; inspecting the grounding cables, wire ropes and clips, and surge arrestors; cleaning; and repainting. Most routine maintenance activities would occur within and around the tower and the nacelle. Cleanup from routine maintenance activities would be performed at the time

maintenance is performed. While performing most routine maintenance activities, O&M staff would travel via pickup or other light-duty trucks.

Scheduled maintenance activities would include servicing the turbines twice a year or as needed, and may require the use of a crane within the 65- to 95-foot diameter maintained areas around the turbines. Turbine servicing would require maintenance staff to climb towers and service turbine parts by performing activities such as removing the turbine rotor and replacing generators and bearings. Project operation would require utility vehicles, cranes, and other equipment for Project maintenance activities. Non-routine maintenance such as repair or replacement of rotors or other major components, if needed, could involve use of one or more cranes and equipment transport vehicles. Permanent access roads would be periodically graded and compacted in order to minimize erosion. Catch basins, roadway ditches, and culverts would be cleaned and maintained regularly.

2.4.7 Decommissioning and Site Restoration

Proposed decommissioning of existing facilities and infrastructure and restoration of the Project Site would require approximately 18 to 24 months. Decommissioning refers to the dismantling and removal of the Project's facilities, including power generation equipment. Removal of turbine components and related infrastructure would include dismantling the turbines, support towers, transformers, substation, switching station, and foundations; excavating them to a depth of approximately 3 feet below grade; and removing them from the Project Site to be reused, recycled, or sold. Some roads no longer needed to access turbines, e.g., once turbines have been dismantled and removed, would be allowed to naturally revegetate. If a domestic well(s) is installed as described in Section 2.4.4.3, it would remain onsite. Underground collection and communication cables would be abandoned in place.

The types of equipment, vehicles, and workforce necessary to decommission the Project would be generally similar to the requirements for construction, except considerably less intensive in that no concrete batch plant(s), cable delivery, or concrete trucks would be required, and no cable trenching or similar work would occur. Moreover, existing service roads would be used; no new access roads or road widening would be required. All management plans and BMPs developed for Project construction also would apply during the decommissioning phase of the Project.

Site restoration refers to recontouring and revegetating the site upon completion of the Project's operational life to be as similar to preconstruction conditions as possible. In coordination with the land owner, disturbed areas would be replanted with trees or other appropriate vegetation. The goal of site revegetation would be to develop a vegetation cover, composition, and diversity similar to the area's ecological setting and consistent with the landowner's current and future land use practices.

Prior to operation of the Project, the Applicant would prepare a Draft Decommissioning Plan that details a restoration plan and how Project facilities and infrastructure would be removed. The Draft Decommissioning Plan would be revised and finalized prior to Project operations. The Applicant or its contractor would implement the Final Decommissioning Plan upon cessation of

Project operations. The Final Decommissioning Plan would include plans and procedures for facility dismantling and removal, disposal and recycling, site restoration, and habitat restoration and monitoring and would be developed in compliance with standards and requirements at the time of site decommissioning. The Director of Resource Management would review and approve the Final Decommissioning Plan. The applicant would be required to annually estimate the cost of decommissioning based on a scenario where it is necessary to implement the Final Decommissioning Plan as a public works project. The applicant would also be required to post and update a financial assurance mechanism to cover the cost of the annual decommissioning cost estimate. Both the annual estimate and financial assurance mechanism would be reviewed and approved by the Director of Resource Management in a manner similar as is carried out for reclamation plans concerning mining operations throughout the County.

2.4.8 Water, Wastewater, Waste, and Hazardous Materials

2.4.8.1 Water and Wastewater

Project construction and long-term operation includes the use of potable water from one or more new onsite water supply wells to be drilled at the O&M facility location or from the importation of water by truck from the Burney Water District, which is located approximately 6miles east-northeast of the Project Site. Any wells installed onsite would be constructed in accordance with the rules and regulations of the Shasta County Department of Resource Management's Environmental Health Division. A Water Supply Assessment has been prepared for the Project in accordance with Water Code requirements. A copy is provided in **Appendix I**.

Project construction would require up to 49 acre-feet of water for dust control, soils compaction, and concrete manufacture, emergency fire suppression, and other activities. Out of the 12,070 total material delivery trips, approximately 1,338 truck trips (each way) are estimated for the delivery of water during construction.

Operation and maintenance of the Project would require up to 5.6 acre-feet of water per year (approximately 5,000 gallons per day) for vehicle and equipment washing and maintenance, potable water supplies for 12 full-time employees, and water storage to meet Shasta County fire flow requirements.[8] Water for the O&M building would be supplied either by an onsite well or by a storage tank located at the O&M building that periodically (e.g., monthly) would be filled by a water truck. No additional permanent water tanks are proposed to be installed as part of the Project. Water use during decommissioning and site restoration would be limited to use for fire protection and dust suppression.

During construction, portable toilets would be provided for the construction workforce. These facilities would be serviced on a regular basis by a contractor who would dispose of sanitary wastewater pursuant to applicable regulations. Wastewater from the O&M facility would be processed using an onsite septic system.

[8] Fire flow requirements may be found in the Shasta County Code of Ordinances, Title 16 Buildings and Construction, Chapter 16.04.130 Fire Standards and Equipment (Ordinance No. 2019-06 [2019]) and the 2019 California Fire Code (24 Cal. Code Regs. Part 9).

2.4.8.2 Waste

During construction, approximately 10,000 pounds of solid waste would be generated per week. Construction debris (e.g., scrap lumber and metal) and operational debris (e.g., office waste and some paper waste) would be collected by either the construction contractor or Burney Disposal Inc. Waste would be transported to the Burney Transfer Station and ultimately disposed of or recycled at the Anderson Landfill in accordance with federal, state, and local solid waste regulations. Decommissioning and restoration would generate the same amount of solid waste as the construction phase (10,000 pounds per week). The Applicant would handle and dispose of solid waste in accordance with all regulatory requirements and would implement standard BMPs with regard to solid waste.

2.4.8.3 Hazardous Materials

Table 2-3, *Hazardous Materials*, depicts the types, uses, and quantities of hazardous materials that are expected to be used during the site preparation and construction, operation and maintenance, and decommissioning and site restoration phases of the Project.

During all Project phases, activities may involve the transportation, use, or storage of a variety of hazardous materials, including batteries, hydraulic fluid, diesel fuel, gasoline, propane, antifreeze, dielectric fluids, explosives, herbicides, grease, lubricants, paints, solvents, and adhesives.

In accordance with requirements contained in the Health and Safety Code and the California Code of Regulations, the Applicant would prepare a Hazardous Materials Business Plan/Spill Prevention Control and Countermeasures Plan (HMBP/SPCC) prior to construction. The HMBP would include BMPs for the transport, storage, use, and disposal of hazardous materials and waste. The HMBP also would include information regarding construction activities, worker training procedures, and hazardous materials inventory procedures. Prior to operation, the Applicant would update the HMBP (including the BMPs) with information about the types of hazardous materials that would be used during operation. The HMBP/SPCC would comply with the requirements of these federal, state, and local requirements (see, e.g., 40 CFR Part 112).

During construction, waste disposal and collection receptacles would be located onsite to ensure proper disposal of hazardous materials. Operation and maintenance of the Project would not require as many hazardous materials as construction or decommissioning. During operation, hazardous materials would be stored in the O&M facility and storage sheds. Nonhazardous batteries would be stored at the substation. Monthly inspections of each of these facilities would occur to check for leaks and spills.

During construction, operation, and decommissioning, all fuels, waste oils, and solvents would be collected and stored in tanks or drums within a secondary containment area consisting of an impervious floor and bermed sidewalls. Fuel would be stored in aboveground storage tanks. These tanks may have either a double wall or would be placed within temporary, lined, earthen berms for spill containment. Upon the conclusion of construction and decommissioning phases, excess fuels would be removed from the site and any surface contamination resulting from fuel handling operations would be remediated.

TABLE 2-3
HAZARDOUS MATERIALS

Hazardous Material	Uses	Typical Quantities
Diesel[a]	Fuel for construction and transportation equipment during construction and decommissioning. Used to power an emergency generator during operation, if needed.	Over 5,000 gallons would be stored in aboveground tanks during construction and operation. The amount of diesel to be stored onsite during decommissioning is unknown at this time but is assumed be similar to that of construction.[b]
Gasoline	Some construction equipment and transportation vehicles.	Gasoline would not be stored onsite during any phase of the Project.
Propane[a]	Ambient heating of the O&M building.	Approximately 500 to 1,000 gallons stored in an aboveground propane storage vessel.
Lubricating oils/ grease/hydraulic fluids/gear oils	Lubricating oil would be present in some turbine components, in the diesel engine of the emergency generator, and in engines of construction and transportation equipment.	Limited quantities would be stored in portable containers (capacity of 55 gallons or less) and maintained onsite during all phases of the Project.
Glycol-based antifreeze	Used in wind turbine components for cooling (approximately 5 to 10 gallons are present in the cooling system for the transmission. Used in the diesel engine for the emergency generator.	Limited quantities (10 to 20 gallons of concentrate) would be stored onsite during each phase of the project.
Lead-acid storage batteries and electrolyte solution	Present in construction and transportation equipment. Backup power source for control equipment, tower lighting, and signal transmitters.	Limited quantities of electrolyte solution (<20 gallons) for maintenance of construction and transportation equipment during construction and decommissioning.
Other batteries (e.g., nickel-cadmium batteries)	Used in some control equipment and signal-transmitting equipment.	These batteries would not be maintained onsite.
Cleaning solvents	Organic solvents would be used for equipment cleaning and maintenance when water-based cleaning and degreasing solvents cannot be used.	Limited quantities or organic solvents (<55 gallons) would be stored onsite during construction and decommissioning to maintain construction and transportation equipment. Limited quantities (<10 gallons) of water-based cleaning solvents would be stored onsite during operation.
Paints and coatings[c]	Used for corrosion control on exterior surfaces of turbine towers.	Limited quantities would be used for touch-up painting during construction (<50 gallons) and for maintenance during operations (<20 gallons).
Dielectric fluids[d]	Used in electrical transformers, bushings, and other electric power management devices as an electrical insulator.	Some transformers may contain more than 500 gallons of dielectric fluid. Onsite transformers each contain approximately 10,000 gallons of mineral oil.
Explosives	May be necessary for excavation of tower foundations in bedrock or creating construction access, onsite roads, or grade alterations.	Limited quantities necessary to complete the task would be stored onsite. Onsite storage is expected to occur only for limited periods of time and as needed for specific construction activities.
Herbicides	May be used for vegetation control around facilities for fire safety.	If deemed necessary, herbicides would be brought to the site and applied by a licensed applicator.

NOTES:

[a] Diesel fuel and propane would be replenished onsite by commercial vendors as necessary.

[b] These values represent the total onsite storage capacity, not the total amount of fuel which would be consumed during Project construction.

[c] It is presumed that all wind turbine components, nacelles, and support towers would be painted at their respective points of manufacture. No wholesale painting would occur onsite; only limited amounts would be used for touch-up purposes during construction and maintenance phases. It is assumed that the coatings applied by the manufacturer during fabrication would be sufficiently durable to last throughout the equipment's operational period and that no wholesale repainting would occur.

[d] It is assumed that the majority of transformers, bushings, and other electrical devices that rely on dielectric fluids would have those fluids added during fabrication and would not require dielectric fluid to be added onsite. It is assumed that servicing of electrical devices that involves wholesale removal and replacement of dielectric fluids would not occur onsite and that equipment requiring such servicing would be removed from the site and replaced. New transformers, bushings, or electrical devices are expected to contain mineral oil-based, or synthetic dielectric fluids that are free of polychlorinated biphenyls. Some equipment may instead contain gaseous dielectric agents (e.g., sulfur hexafluoride) rather than liquid dielectric fluids.

SOURCES: Stantec, 2018 (in Draft EIR Appendix J); ConnectGen, 2019.

All equipment (particularly equipment operating in or near a drainage or in a basin) would be maintained in good working condition, and free of leaks. All vehicles would be equipped with drip pans during storage to contain minor spills and drips. No refueling or storage would take place within 100 feet of a drainage channel or other sensitive resource. Spill kits would be located onsite and in vehicles for use in spill response. In addition, all maintenance crews working with heavy equipment would be trained in spill containment and response.

2.5 Description of Alternatives

CEQA requires a lead agency to analyze a reasonable range of alternatives to a proposed project that could feasibly attain most of the basic objectives of the project while substantially reducing or eliminating significant environmental effects. CEQA also requires an EIR to evaluate a "no project" alternative to allow decision-makers to compare impacts of approving a project with the impacts of not approving it. This section describes the key considerations used to identify and screen potential alternatives, explains why some potential alternatives were eliminated from further consideration, and describes the alternatives that were carried forward for additional analysis.

2.5.1 Alternatives Development and Screening

The County screened and thereafter selected alternatives to be discussed based on the following key provisions of the CEQA Guidelines (14 Cal. Code Regs. §15126.6):

- The discussion of alternatives shall focus on reasonable, feasible alternatives to the proposed project or its location that are capable of avoiding or substantially lessening any significant effects of the proposed project, even if these alternatives would impede to some degree the attainment of the proposed project objectives, or would be costlier.
- The No Project Alternative shall be evaluated, along with its impacts. The no project analysis shall discuss the existing conditions at the time the notice of preparation was published, as well as what would be reasonably expected to occur in the foreseeable future if the proposed project were not approved, based on current plans and consistent with available infrastructure and community services.
- The range of alternatives required in an EIR is governed by a "rule of reason," meaning the EIR must evaluate only those alternatives necessary to permit a reasoned choice.
- An EIR need not consider an alternative whose effects cannot be reasonably ascertained and whose implementation is remote and speculative.

The range of feasible alternatives is selected and discussed in a manner to foster meaningful public participation and informed decision making. Among the factors that may be taken into account when addressing the feasibility of alternatives (as described in CEQA Guidelines §15126.6[f][1]) are environmental impacts, site suitability, economic viability, social and political acceptability, technological capacity, availability of infrastructure, general plan consistency, regulatory limitations, jurisdictional boundaries, and whether the proponent could reasonably acquire, control, or otherwise have access to an alternative site.

Among the factors that may be considered in determining not to carry a potential alternative forward for more detailed consideration in an EIR are:

1. Whether the alternative would meet most of the basic project objectives. Section 2.3, Project Objectives, identifies nine Project objectives. Of these, the County has determined the following to be the "most basic" project objectives: Provide up to 216 MW of wind energy to PG&E's Northern California grid, create temporary and permanent jobs in the County, and contribute to the County's tax base. Any alternative determined not to meet these most basic of the Project objectives was not carried forward for more detailed review.

2. Whether it would be "feasible," where feasible means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors (Pub. Res. Code §21061.1; CEQA Guidelines §§15126.6, 15364). Any alternative determined to be infeasible was not carried forward for more detailed review.

3. Whether it would be able to avoid or substantially lessen any of the potentially significant impacts of the Project. The County used a liberal definition of "potentially significant" at the outset of the CEQA process that was informed in part by the Scoping Process to identify resource areas where the Project could have a potential to cause significant impacts. The results of this initial inquiry are provided in **Table 2-4**, Preliminary Summary of Potentially Significant Environmental Impacts. Any alternative determined not to avoid or substantially lessen the potential impacts identified in Table 2-4 was not carried forward for more detailed review.

4. Whether its implementation is remote or speculative. Any alternative determined to be remote or speculative was not carried forward for more detailed review.

TABLE 2-4
PRELIMINARY SUMMARY OF POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACTS

Issue Area	Impact - Would the alternative reduce potential project impacts on:
Aesthetics	• Daytime and nighttime views of the proposed turbines, overhead power lines, and areas cleared for Project purposes?
Air Quality	• Increased PM10 emissions in a region of non-attainment for the PM10 state ambient air quality standard?
Biological Resources	• Wildlife species including birds and bats that inhabit, nest in, pass or migrate through, or forage within the Project Site? • Forest habitat, including fragmentation and edge effects? • Aquatic habitats (e.g., lakes, streams, and associated riparian habitats, including wetlands) from erosion?
Hydrology and Water Quality	• Sources of drinking water from erosion or hydrologic disruption? • The water quality of headwaters and surface waters for: Hatchet Creek, Montgomery Creek, the South Fork of Montgomery Creek, Goat Creek, Indian Springs, Willow Creek, Cedar Creek, Blue Lake, Little Cow Creek, the North Fork of Little Cow Creek, Mill Creek, Cheddar Creek, Sawdust Creek, and Buffum Creek from erosion or other contamination?
Transportation Emissions/Noise	• Vehicle-emissions-related air quality, and noise due to anticipated delays on SR 299 during materials delivery?
Tribal Cultural Resources	• The viewshed of Yet-Tey-Cha-Na (Lassen Peak) and Kohm Yamani (Snow Mountain), which are held sacred by the Pit River Tribe and Tribal members? • The ridgetop trail identified by the Tribe and its members during scoping and as shown on General Land Office Maps? • Birds traditionally important to the Pit River culture (e.g., eagles and eagle nests, osprey, ducks, and geese)? • Audible and physical disruption of an area identified by Native Americans as culturally significant?

CEQA also makes clear that an EIR must include "sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the Project" (CEQA Guidelines §15126.6[d]). This EIR considers three alternatives to the Project. The No Project Alternative is described in Section 2.5.3.1; Alternative 1, *South of SR 299*, is described in Section 2.5.3.2; and Alternative 2, *Increased Setbacks*, is described in Section 2.5.3.3.

2.5.2 Alternatives Rejected from Detailed Consideration

2.5.2.1 Off-site Alternatives

Scoping comments suggested that the County consider off-site alternatives, including replacing the current proposal with an off-shore wind facility or with an on-shore facility far from the proposed site. Specific recommendations for more distant locations included Modoc County, Tehama County, Contra Costa County's Altamont Pass, Kern County's Tehachapi Pass, and Riverside County's San Gregorio Pass. However, off-site alternatives were not carried forward for more detailed consideration.

CEQA does not expressly require a discussion of alternative project locations (Pub. Res. Code §§21001[g], 21002.1[a], and 21061). CEQA Guidelines Section 15126.6(a) requires a description of "a range of reasonable alternatives to the project, or to the location of the project," suggesting that a lead agency may evaluate onsite alternatives, off-site alternatives, or both. For the Fountain Wind Project, the County has elected (consistent with CEQA) to evaluate only onsite alternatives. As the California Supreme Court has emphasized, "the keystone of regional planning is consistency—between the general plan, its internal elements, subordinate ordinances, and all derivative land-use decisions. Case-by-case reconsideration of regional land-use policies, in the context of a project-specific EIR, is the very antithesis of that goal." *Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal. 3d 553, 572–73. Because the land use and planning provisions that govern use of the proposed site contemplate potential wind energy use (Shasta County Code of Ordinances §17.08.030), the County has elected not to reconsider those determinations in the context of this EIR and instead is focusing on whether an environmentally superior version of the Project exists within the Project Site. This approach is consistent with the court's conclusion in *Mira Mar Mobile Community v. City of Oceanside* (2004) 119 Cal. App.4th 477, 492 ("Because the proposed project is consistent with the City's existing plans, policies and zoning, we conclude a review of alternative sites was not necessary.")

2.5.2.2 Repowering Alternative

Scoping comments suggested as an alternative to the Project that the Applicant repower one or more of its existing wind facilities, including Dillon, Tule Wind, Phoenix Wind, Manzana Wind, Mountain View III, and Shiloh. Information about each of these past projects is provided in **Table 2-5**, *Repowering Alternative Options*.

The potential Repowering Alternative was not carried forward for more detailed consideration for the same reasons the potential off-site alternatives were not (see Section 2.5.2.1).

TABLE 2-5
REPOWERING ALTERNATIVE OPTIONS

Project	Megawatts	Location
1. Dillon Wind	45	San Gorgonio Pass (Riverside County and the City of Palm Springs)
2. Phoenix Wind	2.1	Riverside County
3. Mountain View III	22.4	Riverside County
4. Tule Wind	131	San Diego County
5. Manzana Wind	189	Kern County
6. Shiloh Wind	505	Solano County

SOURCES: BLM, 2012; CEC, 2019a; EDF Renewables, 2019; Renewable Energy World, 2014; USGS, 2019a, 2019b.

The County elected not to carry a repowering alternative forward for additional, separate and independent reasons as well. For example, projects 1, 2, 3, 4, and 5, as identified in Table 2-5, were not carried forward for more detailed review because they would not meet the basic objectives of the Project because they would not provide 216 MW of wind energy to PG&E's Northern California grid (NP15) and would not create temporary or permanent jobs within the County: Projects 1 through 4 are located in Riverside and San Diego counties, which are not part of NP15 and are not in PG&E's electric service territory (PG&E, 2014); and project 5 was recently commissioned and does not provide sufficient capacity to meet the basic objectives of the Project. Project 6, as identified in Table 2-5, already is the largest re-powering project in the United States and also is not a current candidate for repowering: Shiloh Wind, originally installed in 1989, was repowered in four phases between 2005 and 2012 (CEC, 2019c). Research from the National Renewable Energy Laboratory (NREL) indicates that wind projects "less than 20 years old are expected to be capable of generating a favorable revenue stream for several more years" (Lantz et al., 2013). Because of where that project is in its overall "lifespan," repowering it was not carried forward for more detailed consideration. Finally, none of the six projects are owned or controlled by the Applicant or the County and thus neither has the legal means or right to repower them.

2.5.2.3 Alternative Technologies

Hydroelectric Power

Members of the public suggested during the scoping process that the County consider a hydroelectric power alternative to the Project. Several private hydroelectric projects are located in Shasta County. Of them, those that ring the Project Site to the north, west, and south include: H0240 Burney Creek (3 MW), H0321 Hatchet Creek (7 MW), H0168 Montgomery Creek (2.6 MW), H0271 Kilarc (3 MW), and H0507 Bear Creek (3.2 MW) (CEC, 2015; CEC, 2019b). The largest private hydroelectric projects in Shasta County are both on the Pit River: H0250 James B. Black (172 MW) and H0393 Pit 7 (112 MW) (CEC, 2015). Two federal hydroelectric projects also are located in Shasta County: Shasta Dam and Keswick Dam, both are U.S. Bureau of Reclamation public works projects that cross the Sacramento River. The Shasta Dam is capable of generating 710 MW (U.S. Bureau of Reclamation, 2020a); the Keswick Dam has capacity to generate 105 MW (U.S. Bureau of Reclamation, 2020b).

The County initially considered a hydroelectric power alternative, but did not carry it forward for more detailed review because it would not meet the basic objectives of the Project of providing up to 216 MW of wind energy. The largest of the existing private hydropower facilities in the County produces less than 80 percent of the proposed nameplate capacity of the Project. Further, the most significant waterways within the Project Site (i.e., the north and south forks of Montgomery Creek and Little Cow Creek) are much smaller and would not have the same generating capacity as the Pit River, where the two largest existing private hydropower projects are located, or the Sacramento River, where the two federal hydropower projects are located.

A hydropower alternative also has not been carried forward for detailed review because its feasibility would be speculative: while the potential alternative would avoid the potential significant aesthetic impact of the Project, its potential impacts on existing water rights holders, water quality, wildlife (including aquatic wildlife), and cultural and tribal cultural resources could be equally or more significant than those of the Project. As noted above, there also are questions about the site suitability for hydroelectric use, since onsite streams would not have sufficient hydropower generation capacity to provide a reasonable alternative to the Project.

Cogeneration

Members of the public suggested during the scoping process that the County consider a cogeneration alternative to the Project. Following initial consideration, the County elected not to carry a cogeneration alternative forward for more detailed review.

Cogeneration produces electricity from waste heat. Multiple biomass generators in Shasta County use cogeneration technology, including three facilities in Anderson and two in Burney.[9] These facilities range in power output from Shasta Renewable Resources LLC's 6 MW wood-fired cogeneration plant to Wheelabrator's 55 MW wood-fired power plant. Although cogeneration capability "does not allow these firms to be energy self-sufficient, the systems can generate enough energy to supply a major portion of plant needs during peak demand periods" (Shasta County, 2004a). As explained in General Plan Section 6.4, Energy (Shasta County, 2004a), the County encourages the development of cogeneration sources. Recent efforts have been made to expand the amount of cogeneration capacity available in the region. The Sierra Institute for Community and Environment conducted a Biomass Cogeneration Facility Location Assessment for Fall River Resource Conservation District and The State Wood Energy Team in 2014 (Sierra Institute, 2014). Noting an overabundance of biomass in the Shasta-Trinity and Lassen National Forests and on private ownerships in the region, the Sierra Institute evaluated potential sites for a new combined heat and power facility of up to 3 MW in the Burney-Hat Creek area. Two sites were identified as promising: The Covanta combined heat and power facility in Burney and the Hat Creek Construction Company land located 4 miles north of the SR 299/89 junction.[10]

[9] The Anderson facilities include Wheelabrator's 55 MW wood-fired power plant (Wheelabrator Technologies, 2019), Sierra Pacific Industries' 31 MW cogeneration power facility (County Use Permit 07-021), and Shasta Renewable Resources LLC's 6 MW wood-fired cogeneration plant (Central Valley RWQCB, 2016). The Burney facilities include Burney Forest Power's 31 MW biomass-fueled power plant (Bloomberg, 2019; Energy Justice Network, 2019) and a Sierra Pacific facility.

[10] A facility on the Hat Creek Construction Company land has received permit approval, but as of June 2020 has not moved forward to construction.

A cogeneration alternative to the Project was not carried forward for more detailed consideration because it would not result in a commercial wind energy generation facility capable of generating up to 216 MW of wind energy and would not provide emissions-free energy for approximately 86,000 households, since there is no basis to assume that the energy it would generate would even offset the power required to operate the associated biomass facility much less contribute to other PG&E ratepayers.

Solar

Members of the public suggested during the scoping process that the County consider a solar power alternative to the Project. A potential solar energy alternative to the Project was not carried forward primarily because it would not meet most of the basic objectives of the Project. A solar project alternative would not result in the development, construction, and operation of a commercial wind energy generation facility capable of generating up to 216 MW of wind energy and, based on geographic considerations, would not reasonably be expected to offset approximately 128,000 metric tons of carbon dioxide emissions generated by fossil fuels or provide emissions-free energy for approximately 86,000 households.

A successful solar project would require an appropriate site. It does not appear that the Project Site would be appropriate for a utility scale solar project of a size that could functionally replace the Project based on a variety of factors, including low solar resource (NREL, 2017) further constrained by shading from trees and ridges, local climate, and topography. Research published by the World Bank Group's International Finance Corporation (IFC, 2015) describes the avoidance of shading for a solar project site as "critical" because even small areas of shade, e.g., from trees or overhead cabling, "may significantly impair the output of a module or string of modules." The Project Site is surrounded by timberlands, crossed by power lines, and shadowed by ridges. The Project Site climate also is not particularly conducive to a successful utility scale solar project. IFC (2015) identifies high wind speeds and snow as among the weather events that could adversely affect site suitability: "Locations with a high risk of damaging wind speeds should be avoided. Fixed systems do not shut down at high wind speeds, but tracking systems must shut down when high wind speeds are experienced." Further, "a site that that has regular coverings of snow for a long period of time may not be suitable for developing a solar PV power plant" (IFC, 2015). The Project Site is subject to high winds, and regular heavy snows. Project Site topography also is not conducive to solar development, which "[i]deally… should be flat or on a slight south-facing slope" (IFC, 2015). Elevations within the Project area range from about 3,000 to 6,600 feet, and the Project Site includes steep ridges rather than slight slopes. The County's initial assessment that a solar development would not be a reasonable or feasible alternative to the Project is underscored by the market: In 2018, of the 45 California counties where solar power plants had been installed, Shasta ranked 30th with a total of 8 MW (CEC, 2019d).

2.5.2.4 Alternative Approaches

Conservation and Demand-side Management

Members of the public suggested during the scoping process that the County consider conservation and demand-side management as an alternative to the Project. Conservation and demand side management consists of a variety of approaches to reduce electricity use and shift

electrical demand to times of the day when energy demand is lower. It includes increased energy efficiency and conservation, building and appliance standards, fuel substitution, and load management. Implementation of conservation and demand side management techniques could result in a reduction in demand, thus reducing the need for new generation, and thereby serve the region's growing demand for power. Conservation and demand-side management was not carried forward for more detailed consideration because it would not meet most of the basic objectives of the Project and would be speculative as well as infeasible from a technical perspective.

Increased energy efficiencies and reductions in energy demand would not meet Project objectives. They would not result in the development, construction, and operation of a commercially financeable wind energy generation facility capable of generating up to 216 MW of wind energy for interconnection to the Northern California electrical grid, would not directly assist California in meeting the renewable energy generation targets set in SB 100, would neither create temporary and permanent jobs in the County nor contribute to the County's tax base, and would not support landowners through diversification of revenue streams.

This potential alternative also was not carried forward because reliance on conservation and demand side management alone would be speculative and a technically infeasible alternative to the Project. The State's long-term Energy Efficiency Strategic Plan, as adopted by the California Public Utilities Commission (CPUC), provides an integrated framework of goals and strategies for saving energy through 2020 (CPUC, 2008; CPUC, 2011). The plan champions specific programmatic initiatives for key market sectors (i.e., commercial, residential, industrial, and agricultural) and a series of "big bold energy efficiency strategies" including all new residential construction being zero net energy by 2020 and all new commercial construction being zero net energy by 2030. Given the aggressiveness of these goals, it would be speculative to assume that incremental savings beyond them could be achieved. While energy efficiency efforts have been effective and will continue to be part of California's overall energy future, conservation and demand-side management alone will not be sufficient to address California's rising energy demand.

Other Distributed Energy Resources

In addition to energy efficiency and demand response, the range of distributed energy resources includes energy storage and "behind the meter" options such as customer generation (e.g., rooftop solar) and alternative fuel vehicles (e.g., electric vehicles). There is some indication that distributed energy use is on the rise. According to the 2019 California Green Innovation Index (Next10, 2019), the number of rebates rose dramatically from 2017 to 2018 for both plug-in hybrid electric vehicles (up 39 percent) and battery electric vehicles (up 67 percent). Behind-the-meter energy storage also has been on the rise; however, the CPUC reported in 2018 that this type of storage has not had the intended benefits in achieving greenhouse gas (GHG) emissions reductions (and in fact actually has increased GHG emissions) because charging has not occurred at times when there is excess renewable energy on the grid (CPUC, 2018b). The fact that distributed energy resources may have a growing role in California's energy future does not mean that it is a viable alternative to the Project.

Other Distributed Energy Resources was not carried forward for more detailed consideration because it would not meet most of the basic objectives of the Project. It would not result in the development, construction, and operation of a commercially financeable wind energy generation

facility capable of generating up to 216 MW of wind energy for interconnection to the Northern California electrical grid, and would not support landowners through diversification of revenue streams.

Improving the Efficiency of Existing Energy Infrastructure

Members of the public suggested during the scoping process that the County consider improving the efficiency of existing energy infrastructure for the delivery and storage of excess power already generated in California as an alternative to the Project. Separate from and independent of this applicant's proposed development of this Project, the California Independent System Operator (CAISO) has identified 12 transmission projects in PG&E's service territory that are needed to maintain transmission system reliability, including a dynamic voltage support project at Round Mountain (Rivera-Linares, 2019). The Round Mountain 500 kV Dynamic Voltage Support project is expected to be in service in 2024. These efficiency and reliability projects would be considered with or without the Project, and are not a viable alternative to it.

Existing Infrastructure Efficiency Improvements was not carried forward for more detailed consideration because this potential alternative would not meet most of the basic objectives of the Project. It would not result in the development, construction, and operation of a commercially financeable wind energy generation facility capable of generating up to 216 MW of wind energy for interconnection to the Northern California electrical grid, would not assist California in meeting the renewable energy generation targets, and would not support landowners through diversification of revenue streams. The approval of such improvements also is likely to be subject to the CPUC's authority, and not the County's.

2.5.3 Alternatives Evaluated in Detail in this EIR

2.5.3.1 No Project Alternative

CEQA Guidelines Section 15126.6(e) requires consideration of a No Project Alternative. Under the No Project Alternative, Use Permit No. UP 16-007 would not be issued and the Project would not be built. None of the proposed wind turbines and associated transformers, associated infrastructure, or ancillary facilities would be constructed, operated and maintained, or decommissioned on the Project Site. FAA-required safety lighting would not be installed. The proposed overhead and underground electrical collector system and communications lines would not be developed; and the onsite collector substation, switching station, and operation and maintenance (O&M) facility would not be constructed. Foundations would not be excavated, laydown areas would not be cleared, no new access roads would be constructed, and no existing roads would be improved. No groundwater well, water storage tank, or septic system would be installed onsite, and no construction-related or other refuse would be removed from the site. No electric power would be needed at the Project Site, or delivered to the regional grid from the Project Site. Existing stormwater drainage patterns on the site would not be affected. No materials delivery-related or other construction trucks, equipment, or additional vehicle trips would be made to, from, or within the site relative to baseline conditions. None of the proposed construction workers and none of the full-time employees would travel to or be employed on the Project Site; decommissioning and site restoration phase workers similarly would not be present.

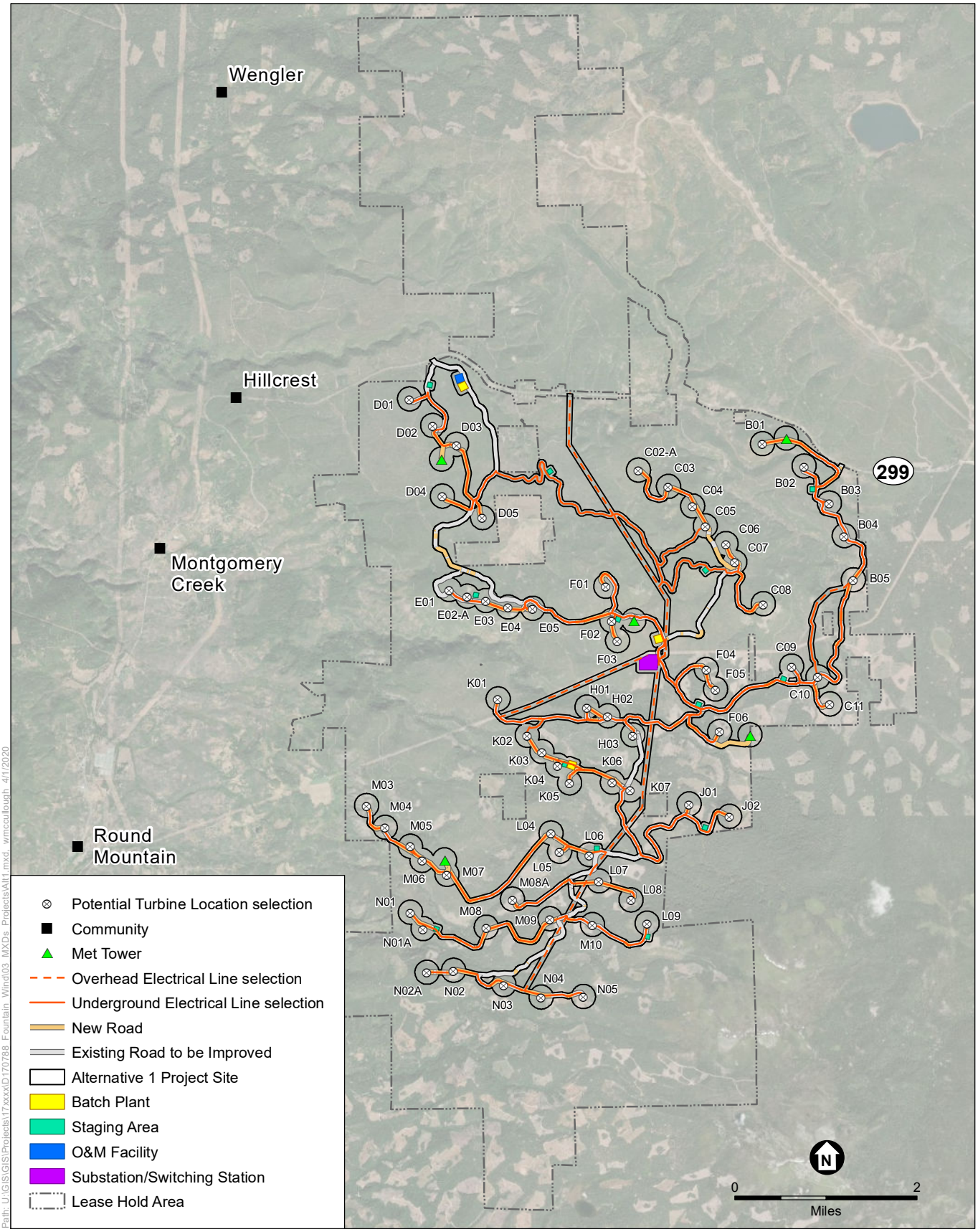
Instead, it is assumed that the land within the Project boundary would continue to be managed for timber production. The analysis of the No Project Alternative projects the environmental consequences of what reasonably would be expected to occur in the foreseeable future if the Project were not approved, based on the site's current General Plan designation as Timber (T), and its zoning designations of Timber Production (TP) (approximately 4,457 acres) and Unclassified (U) (approximately 6 acres). The same environmental benefits and impacts currently occurring would continue to occur. On the potential benefits side, for example, Section 6.2 of the Shasta County General Plan explains that "land dedicated to commercial forest management provides not only building materials, energy for industrial processes, firewood, County revenue for roads and schools, and employment opportunities, but also wildlife habitat, recreational opportunities, aesthetic enjoyment, and watershed." By contrast, the General Plan discussion continues, "Negative impacts from forest practices may affect surrounding land uses and resources and create special management problems for timberland operations. Harvesting practices and the associated noise, dust, and traffic can be potentially damaging to air and water resources, wildlife habitats, aesthetic enjoyment, and the health and safety of nearby residences, although state-required timber harvest plans are intended to mitigate timber harvesting impacts to acceptable levels. These problems can be magnified if incompatible land uses locate too close to one another." (Shasta County, 2004b).

In sum, the No Project Alternative would avoid all Project-related impacts but would cause impacts on the physical environment resulting from continued timber operations. No legal, regulatory, or technical feasibility issues were identified that would eliminate the No Project Alternative from consideration. However, the No Project Alternative would not meet any of the Project objectives.

2.5.3.2 Alternative 1: South of SR 299

Under Alternative 1, the South of SR 299 Alternative, the Project would be constructed, operated and maintained, and ultimately decommissioned as proposed south of SR 299, and none of the up to seven turbines proposed to the north of SR 299 (turbine numbers A01 through A07) or related infrastructure would be developed. The Alternative 1 Site would consist of the approximately 4,086 acres located south of SR 299, while the approximately 378 acres of the Project Site located north of SR 299 would continue to be managed for timber production. See **Figure 2-6**, *Alternative 1*. Each of Alternative 1's up to 65 turbines could be up to 679 feet tall, as measured from ground level to vertical blade tip (total tip height) (the same as the Project) and would have a generating capacity of 3 to 5.7 MW (also the same as the Project). Overall, Alternative 1 would have a total nameplate generating capacity of up to 195 MW and could provide emissions-free energy for approximately 9,880 fewer households relative to the Project (i.e., 91,746 households for Alternative 1 relative to the Project's 101,627 households).

The components and disturbance areas for Alternative 1 are summarized in **Table 2-6**, *Alternative 1 Components and Disturbance Areas*. For purposes of analysis, it is assumed that water, wastewater, and hazardous materials-related requirements would be substantially the same as for the Project; and that the number of workers and durations of construction, operation and maintenance, and decommissioning and site restoration also would be substantially the same as for the Project.



Fountain Wind Project

Figure 2-6
Alternative 1

TABLE 2-6
ALTERNATIVE 1 COMPONENTS AND DISTURBANCE AREAS

Project Component	Quantity	Area of Temporary Disturbance	Area of Permanent Disturbance
Turbines and pads (including temporary turbine construction areas)	Up to 65	5 acres per turbine (up to 325 total acres)	2.5 acres per turbine (up to 162.5 total acres)[a]
Underground electrical collector system[b]	Up to 48.9 miles	50-foot-wide corridor, up to a total of 297 acres	30-foot-wide corridor cleared of large vegetation, up to a total of 178 acres
Overhead electrical collector line and associated roads, work footprint, and permanent 2-track access road[c]	Up to 9.8 miles	100-foot-wide corridor, up to a total of 119 acres	80-foot-wide right of way cleared of large vegetation, up to a total of 95 acres
Onsite collector substation	1	8 acres	5 acres
Onsite switching station (including interconnection equipment)	1	11 acres	8 acres
Access roads (including crane roads)	Up to 22.2 miles of new roads	80-foot-wide disturbance area, up to a total of 215 acres. Nominally up to 200 foot-wide construction clear area in some locations to accommodate grading, slope stabilization, and blade delivery.	20-foot-wide drivable surface with a 1-foot shoulder on both sides and up to an additional 10 feet on either side where required for storm water drainage design, up to a total of 113 acres. Permanent disturbance width nominally up to 200 feet.
Widen existing access roads	Up to 28.9 miles of existing roads may be widened	80-foot-wide disturbance area, up to 224 acres of new disturbance. Nominally up to 200-foot-wide construction clear area in some locations to accommodate grading, slope stabilization, and blade delivery.	Permanently widen to 20 feet with up to 10 feet on either side where required for storm water drainage design, up to 84 acres. Permanent disturbance width nominally up to 200 feet in some locations.
O&M facility	1	5 acres	5 acres (including a 5,460-square foot O&M building and two 0.5-acre Operations storage sheds)
Temporary construction and equipment area, construction trailer area, and associated parking area	1	10 acres	0 acres
Temporary laydown areas	13	2 acres per laydown area (26 acres total)	0 acres
Temporary batch plant, if necessary	3	3 to 5 acres per batch plant (up to 15 acres total)	0 acres
MET Towers	4	1 acre per structure (4 acres total)	0.5 acre per structure (2 acres total)
Anticipated Total Temporary Construction Disturbance[d]: 1,259 acres (a reduction of 125 acres relative to the Project)			
Anticipated Total Permanent Disturbance: 652.5 acres (a reduction of 60.5 acres relative to the Project)			

NOTES:

[a] Includes defensible fire space around each turbine

[b] Portions of the underground collector system would be located within the access road construction buffer in order to minimize impacts. No additional permanent impacts would occur in these areas. This acreage includes the co-located overhead communications system.

[c] Acreage includes co-located underground communications system. An 80-foot-wide corridor centered on the transmission line is assumed for disturbance calculations.

[d] Timber harvested and timberland to be coverted is included within the anticipated disturbance areas.

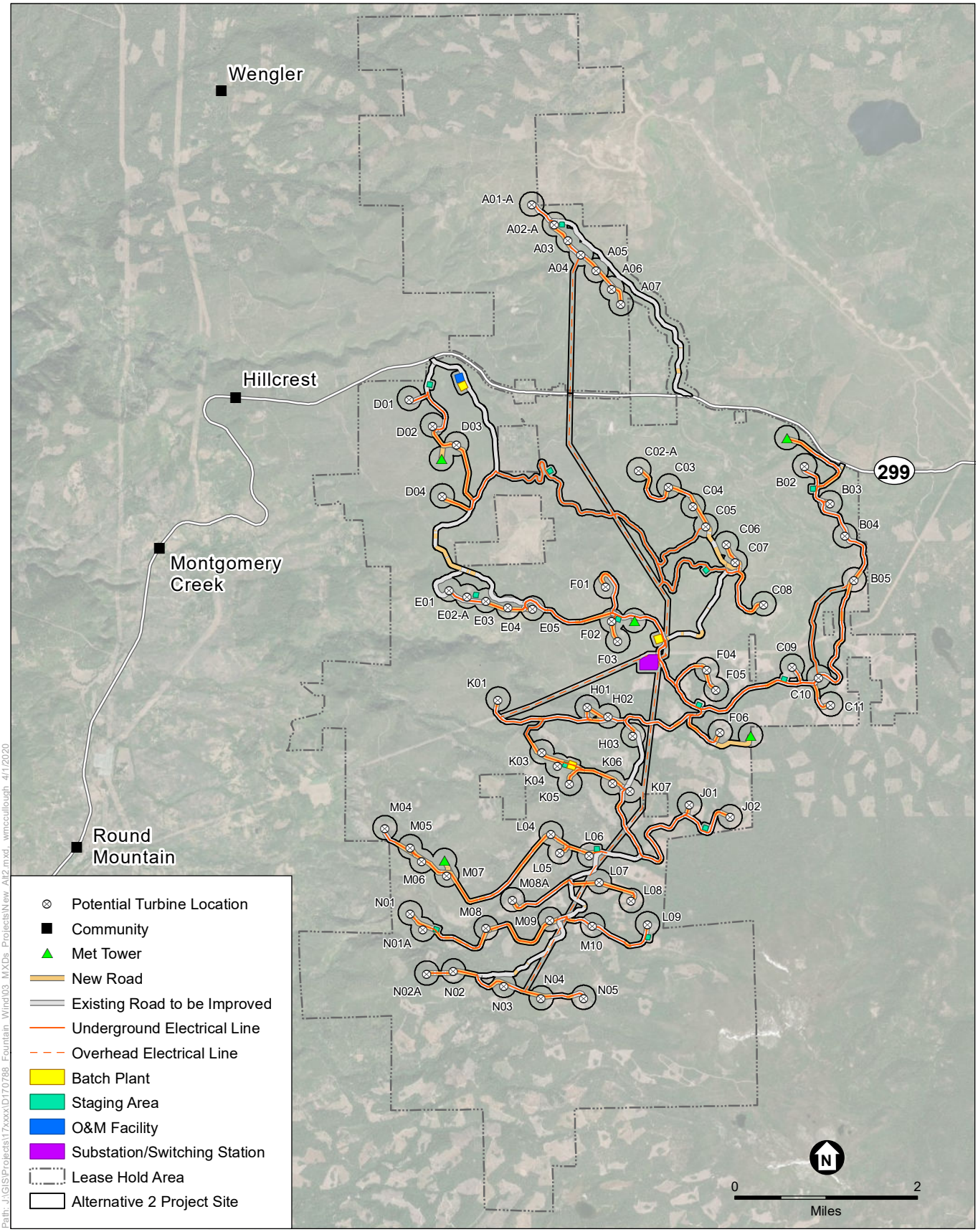
SOURCES: Table 2-1, as modified in accordance with assumptions described for Alternative 1.

Scoping comments suggested that the County consider a reduced-project alternative (i.e., one with fewer turbines and/or a more concentrated placement of turbines) and a modified project alternative that would relocate the proposed turbines to the south relative to the existing proposal. Alternative 1 responds to these suggestions. Relative to the screening criteria outlined in Section 2.5.1, the County preliminarily has determined that Alternative 1 may be feasible even if it would impede to some degree the attainment of the Project objectives relating to generating capacity, carbon dioxide emissions offset, and the number of households that could be served with clean energy if the Project were approved. Alternative 1 has been designed to avoid all Project impacts north of SR 299 and to lessen any significant effects of the Project to aesthetics, avian and other wildlife species and to Tribal Cultural Resources, including to birds traditionally important to the Pit River culture (e.g., eagles, eagle nests, and osprey) and audible and physical disruption of an area identified by Native Americans as culturally significant.

2.5.3.3 Alternative 2: Increased Setbacks

Under Alternative 2, the locations of four individual turbines would not be constructed due to their proximity to residential property and public roadways. The proposed setbacks would be increased relative to the Project to preclude turbine construction within three times the height of the turbine (i.e., within 2,037 feet) of a residential property line and within 1.5 times the height of the turbine (i.e., within 1,018.5 feet) of State Route 299, Supan Road, Terry Mill Road, or any other publicly maintained public highway or street. These setback distances would be among the largest in the State based on a comparison of setback requirements included in county ordinances in California for large wind projects as compiled by WINDExchange, a resource of the Wind Energy Technologies Office of the U.S. Department of Energy (DOE, 2020). Implementation of these setbacks would remove proposed turbines M03, D05, and B01 based on the residential property line setback, and would remove turbine K02 based on the roadway setback. Related infrastructure and work areas for these turbines (including temporary turbine construction areas, access roads and crane roads) would not be needed. The remaining turbines, infrastructure and other improvements would be the same as proposed for the Project. **Figure 2-7**, *Alternative 2.* The components and disturbance areas for Alternative 2 are summarized in **Table 2-7**, *Alternative 2 Components and Disturbance Areas*. Each of Alternative 2's up to 68 turbines could be up to 679 feet tall, as measured from ground level to vertical blade tip (total tip height) (the same as the Project) and would have a generating capacity of 3 to 5.7 MW (also the same as the Project). Overall, Alternative 2 would have a total nameplate generating capacity of up to 204 MW and could provide emissions-free energy for approximately 5,646 fewer households relative to the Project (i.e., 95,981 households for Alternative 2 relative to the Project's 101,627 households).

Scoping comments suggested that the County consider a project alternative that would move turbines further away from Moose Camp, and expressed concerns about noise, vibration, and safety. Alternative 2 has been designed to respond to these suggestions. Relative to the screening criteria outlined in Section 2.5.1, the County preliminarily has determined that Alternative 2 may be feasible even if it would impede to some degree the attainment of the Project objectives relating to generating capacity, carbon dioxide emissions offset, and the number of households that could be served with clean energy if the Project were approved.



Fountain Wind Project

Figure 2-7
Alternative 2

TABLE 2-7
ALTERNATIVE 2 COMPONENTS AND DISTURBANCE AREAS

Project Component	Quantity	Area of Temporary Disturbance	Area of Permanent Disturbance
Turbines and pads (including temporary turbine construction areas)	Up to 68	5 acres per turbine (up to 340 total acres)	2.5 acres per turbine (up to 170 total acres)[a]
Underground electrical collector system[b]	Up to 48.9 miles	50-foot-wide corridor, up to a total of 297 acres	30-foot-wide corridor cleared of large vegetation, up to a total of 178 acres
Overhead electrical collector line and associated roads, work footprint, and permanent 2-track access road[c]	Up to 9.8 miles	100-foot-wide corridor, up to a total of 119 acres	80-foot-wide right of way cleared of large vegetation, up to a total of 95 acres
Onsite collector substation	1	8 acres	5 acres
Onsite switching station (including interconnection equipment)	1	11 acres	8 acres
Access roads (including crane roads)	Up to 23 miles of new roads	80-foot-wide disturbance area, up to a total of 223 acres. Nominally up to 200 foot-wide construction clear area in some locations to accommodate grading, slope stabilization, and blade delivery.	20-foot-wide drivable surface with a 1-foot shoulder on both sides and up to an additional 10 feet on either side where required for storm water drainage design, up to a total of 117 acres. Permanent disturbance width nominally up to 200 feet.
Widen existing access roads	Up to 28.9 miles of existing roads may be widened	80-foot-wide disturbance area, up to 224 acres of new disturbance. Nominally up to 200-foot-wide construction clear area in some locations to accommodate grading, slope stabilization, and blade delivery.	Permanently widen to 20 feet with up to 10 feet on either side where required for storm water drainage design, up to 84 acres. Permanent disturbance width nominally up to 200 feet in some locations.
O&M facility	1	5 acres	5 acres (including a 5,460-square foot O&M building and two 0.5-acre Operations storage sheds)
Temporary construction and equipment area, construction trailer area, and associated parking area	1	10 acres	0 acres
Temporary laydown areas	13	2 acres per laydown area (26 acres total)	0 acres
Temporary batch plant, if necessary	3	3 to 5 acres per batch plant (up to 15 acres total)	0 acres
MET Towers	4	1 acre per structure (4 acres total)	0.5 acre per structure (2 acres total)
Anticipated Total Temporary Construction Disturbance[d] 1,282 acres: (a reduction of 102 acres relative to the Project)			
Anticipated Total Permanent Disturbance 664 acres: (a reduction of 49 acres relative to the Project)			

NOTES:
[a] Includes defensible fire space around each turbine
[b] Portions of the underground collector system would be located within the access road construction buffer in order to minimize impacts. No additional permanent impacts would occur in these areas. This acreage includes the co-located overhead communications system.
[c] Acreage includes co-located underground communications system. An 80-foot-wide corridor centered on the transmission line is assumed for disturbance calculations.
[d] Timber harvested and timberland to be coverted is included within the anticipated disturbance areas.

SOURCES: Table 2-1, as modified in accordance with assumptions described for Alternative 1.

2.6 Permits and Approvals

Permits and approvals that could be required for site preparation, construction, operation, maintenance, and decommissioning of the Project are summarized in **Table 2-8**, *Summary of Permits and Approvals*.

TABLE 2-8
SUMMARY OF PERMITS AND APPROVALS

Agency	Permit/Approval
Federal	
Federal Aviation Administration (FAA)	Notice of Proposed Construction or Alteration; Determination of No Hazard.*
U.S. Army Corps of Engineers (USACE)	Clean Water Act, Section 404 Nationwide Permit if jurisdictional waters of the U.S. could be affected by construction or operation of the Project.
U.S. Fish and Wildlife Service (USFWS)	Section 7 or Section 10 permits may be required if project results in take of a species listed under the federal Endangered Species Act (FESA).
State	
California Department of Forestry & Fire Protection (CAL FIRE)	Application for timberland conversion (Pub. Res. Code §4621 et seq.); approval of a timber harvesting plan (Pub. Res. Code §4582).
State Water Resources Control Board and/or Regional Water Quality Control Board (SWRCB and/or RWQCB)	Construction Stormwater General Permit; Notice of Intent to Comply with Section 402 of the Clean Water Act, SWPPP and SPCC Plan; Industrial Stormwater General Permit; Approval of O&M SWPPP and SPCC Plan. Section 401 certification if USACE determines jurisdictional waters of the U.S. would require a Clean Water Act Section 404 permit.
California Department of Fish and Wildlife (CDFW)	Streambed Alteration Agreement (Fish & Game Code §1600 et seq.); permit authorization if "take" of endangered, threatened, or candidate species could result incidental to an otherwise lawful activity (Fish & Game Code §2081).
California Department of Transportation	Oversize load permit(s) and variances for loads with a width over 15 feet and/or length over 135 feet. Encroachment Permit for utility line crossing state right-of-way.*
California Highway Patrol	Notification of Transportation of Oversize/Overweight Loads.*
California Public Utilities Commission	Approval of construction of switching station for transfer to PG&E (i.e., General Order 131-D).
Local	
Shasta County Air Quality Management District	Authority to Construct and/or Permit to Operate as needed.
Shasta County	Use Permit.
Shasta County Department of Resource Management, Environmental Health Division	Hazardous Materials Business Plan, septic system permit, well permit.*
Shasta County Building Division	Building and grading permits.*
Shasta County Hazardous Materials Program, CUPA	Hazardous Materials Business Plan and Permit for handling hazardous materials above threshold quantities (includes hazardous waste management).*
Shasta County, Public Works Department	Encroachment Permit.*

NOTE: * Typically processed as ministerial permits

2.7 References

Avian Power Line Interaction Committee (APLIC), 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, DC and Sacramento, CA.

APLIC, 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, DC. Available online: http://www.aplic.org/uploads/files/11218/Reducing_Avian_Collisions_2012watermarkLR.pdf.

APLIC, 2019. APLIC Recommendations for Power Pole Configurations at Wind Energy Projects. Available online: https://www.aplic.org/riser-poles-wind.php.

Bloomberg, 2019. Company Overview of Burney Forest Products. Available online: https://www.bloomberg.com/profile/company/1352492D:US. March 21, 2019.

California Department of Forestry and Fire Protection (CAL FIRE), 2017. Shasta–Trinity Unit Strategic Fire Plan. Available online: http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fpppdf1597.pdf. May 8, 2017.

CAL FIRE, 2019. California Forest Practice Rules 2019. Available online: http://calfire.ca.gov/resource_mgt/downloads/2019%20Forest%20Practice%20Rules%20and%20Act_FINAL.pdf. February 2019.

California Energy Commission (CEC), 2014. Energy Infrastructure Map of Northern California. Available online: https://ww2.energy.ca.gov/maps/infrastructure/3part_northern.html. May 21, 2014.

CEC, 2015. California Hydroelectric Generation Facilities. Available online: https://www.energy.ca.gov/maps/powerplants/hydroelectric_facilities.pdf. September 3, 2015.

CEC, 2019a. California Energy Commission Staff Report: Productivity and Status of Wind Generation in California 2014 through 2016. Available online: https://ww2.energy.ca.gov/2019publications/CEC-200-2019-002/CEC-200-2019-002.pdf. February 2019.

CEC, 2019b. Hydroelectric Power in California. Available online: https://www.energy.ca.gov/hydroelectric/. March 14, 2019.

CEC, 2019c. Shiloh Wind Power Plant. Available online: https://ww2.energy.ca.gov/tour/shiloh/. Accessed December 9, 2019.

CEC, 2019d. Solar PV and Solar Thermal Electricity Production by County. Available online: https://ww2.energy.ca.gov/almanac/renewables_data/solar/index_cms.php. Accessed December 9, 2019.

California Independent System Operator (CAISO), 2008. California (CAISO) Electric Regions. February 2008.

California Public Utilities Commission (CPUC), 2008. California Long-term Energy Efficiency Strategic Plan. Available online: https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=5305. September 2008.

CPUC, 2011. California Energy Efficiency Strategic Plan: January 2011 Update. Available online: https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=5303. January 2011.

CPUC, 2018a. Delivery, Consumption & Prices for Utility Service within California. Available online: https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/About_Us/Organization/Divisions/Policy_and_Planning/PPD_Work/PPD_Work_Products_(2014_forward)/California%20Regions%20Final.pdf. January 18, 2018.

CPUC, 2018b. Self-Generation Incentive Program Greenhouse Gas Staff Proposal. Available online: http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M226/K705/226705393.pdf. September 6, 2018.

Center for Environmental Excellence by the American Association of State Highway and Transportation Officials (AASHTO), 2019. Chapter 4: Construction Practices for Environmental Stewardship. Available online: https://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/4_5.aspx. Accessed March 14, 2019.

Central Valley Regional Water Quality Control Board (RWQCB), 2016. Order No. R5-2016-0034 Waste Discharge Requirements for Shasta Renewable Resources LLC and Anderson Plant LLC. Available online: https://www.waterboards.ca.gov/rwqcb5/board_decisions/adopted_orders/shasta/r5-2016-0034.pdf. April 21, 2016.

EDF Renewables, 2019. Shiloh Wind. Available online: https://www.edf-re.com/project/shiloh-i-wind/. Accessed March 20, 2019.

Energy Justice Network, 2019. Burney Forest Power. Available online: http://www.energyjustice.net/map/displayfacility-67151.htm. Accessed March 21, 2019.

Federal Aviation Administration (FAA), 2016. Advisory Circular No. 70/7460-1L, Obstruction Marking and Lighting with Change 2. Available online: https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_70_7460-1L_-_Obstuction_Marking_and_Lighting_-_Change_2.pdf. October 8, 2016. Accessed December 9, 2019.

International Finance Corporation (IFC), 2015. Utility-Scale Solar Photovoltaic Power Plants: A Project Developer's Guide. Available online: https://www.ifc.org/wps/wcm/connect/a1b3dbd3-983e-4ee3-a67b-cdc29ef900cb/IFC+Solar+Report_Web+_08+05.pdf?MOD=AJPERES&CVID=kZePDPG.

Lantz, Eric, Michael Leventhal, and Ian Baring-Gould, 2013. Wind Power Project Repowering: Financial Feasibility, Decision Drivers, and Supply Chain Effects. Available online: https://www.nrel.gov/docs/fy14osti/60535.pdf. December 2013.

Moose Recreational Camp, Ltd., 2012a. 2012 New Articles of Incorporation Restated Articles of Incorporation of Moose Recreational Camp, Ltd., a California Non-Profit Mutual Benefit Corporation. Available online: http://moosecamp.net/Site/Records_files/MooseCamp.AmdArticles.pdf. Accessed March 13, 2019.

Moose Recreational Camp, Ltd., 2012b. Rules & Regulations - Revised Summer 2012. Available online: http://moosecamp.net/Site/Records_files/Rules%20and%20Regulations%20% 202012.pdf. Accessed March 13, 2019.

National Renewable Energy Laboratory (NREL), 2017. Direct Solar Resource of California. Available online: https://www.nrel.gov/gis/solar.html. April 4, 2017.

Next10, 2019. 2019 California Green Innovation Index. Available online: https://www.next10.org/sites/default/files/2019-10/2019-california-green-innovation-index-final.pdf. October 8, 2019.

Pacific Gas & Electric Company (PG&E), 2014. Service Area Map. Available online: https://www.pge.com/tariffs/tm2/pdf/ELEC_MAPS_Service_Area_Map.pdf. Effective December 17, 2014.

Renewable Energy World, 2014. The Project: Manzana Wind Power Project Creates Renewable Energy and Local Jobs. Available online: https://www.renewableenergyworld.com/articles/print/volume-17/issue-2/wind-power/the-project-manzana-wind-power-project-creates-renewable-energy-and-local-jobs.html. December 24, 2014.

Rivera-Linares, Corina, 2019. California ISO draft plan identifies 12 transmission projects needed for reliability. Available online: https://www.transmissionhub.com/articles/2019/02/california-iso-draft-plan-identifies-12-transmission-projects-needed-for-reliability.html. February 5, 2019.

Shasta County, 2004a. Section 6.4 of the Shasta County General Plan, as amended through September 2004. Available online: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/64energy.pdf. Accessed March 21, 2019.

Shasta County, 2004b. Section 6.2 of the Shasta County General Plan, as amended through September 2004. Available online: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/62timber.pdf. Accessed January 28, 2019.

Shasta County, 2017. Fire Safety Standards. Available online: http://shastacountyfire.org/wp-content/uploads/2017/10/FireSafetyStandards_Chapter6.pdf. Revised June 27, 2017.

Shasta County Department of Resource Management, 2019. Department of Environmental Health (EHD), 2019. Wells and Public Water Systems. Available online: https://www.co.shasta.ca.us/index/drm_index/eh_index/ehd_programs/wells.aspx. Accessed March 15, 2019.

Sierra Institute, 2014. Biomass Cogeneration Facility Location Assessment for Fall River Resource Conservation District and The State Wood Energy Team. Available online: https://ucanr.edu/sites/swet/files/214104.pdf. November 14, 2014.

U.S. Bureau of Land Management (BLM), 2012. Right-of-Way Grant Issued for the Tule Wind Project. Available online: http://www.tulewindeccmp.com/right-of-way%20(ROW) %20grant.pdf. April 10, 2012.

U.S. Bureau of Reclamation, 2020a. Reclamation: Managing Water in the West. Shasta Dam: A Tour Through Time. Available online: https://www.usbr.gov/mp/ncao/docs/virtual-tour.pdf. Accessed June 17, 2020.

U.S. Bureau of Reclamation, 2020b. Projects and Facilities. Keswick Dam. Available online: https://www.usbr.gov/projects/index.php?id=185. Accessed June 17, 2020.

U.S. Department of Energy (DOE), 2020. WINDExchange Ordinances Database. Available online: https://windexchange.energy.gov/policies-incentives?utf8=%E2%9C%93&search=california. Accessed January 17, 2020.

U.S. Environmental Protection Agency (USEPA), 2017. National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities. Available online: https://www.epa.gov/sites/production/files/2017-06/documents/2017_cgp_final_permit_508.pdf. February 16, 2017.

U.S. Fish and Wildlife Service (USFWS), 2005. Avian Protection Plan Guidelines.

U.S. Geological Survey (USGS), 2019a. Palm Springs Area. Mapping tool available online: https://eerscmap.usgs.gov/uswtdb/viewer/#12.31/33.94404/-116.61225. Accessed March 20, 2019.

USGS, 2019b. Raw Data & Metadata Downloads. Available online: https://eerscmap.usgs.gov/uswtdb/data/. Accessed March 20, 2019.

Wheelabrator Technologies, 2019. Wheelabrator Shasta. Available online: https://www.wtienergy.com/plant-locations/independent-power/wheelabrator-shasta. Accessed March 21, 2019.

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CHAPTER 3
Environmental Analysis

3.1 Introduction to Environmental Analysis

3.1.1 Overview

This chapter describes and analyzes the direct, indirect, and cumulative environmental impacts of the Project and alternatives, including the No Project Alternative, as they relate to the following areas of environmental consideration: Aesthetics, Agriculture and Forestry Resources, Air Quality, Biological Resources, Communications Interference, Cultural and Tribal Cultural Resources, Energy, Geology and Soils, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Mineral Resources, Noise, Population and Housing, Public Services, Recreation, Transportation, Utilities and Service Systems, and Wildfire.

3.1.2 Environmental Assessment Methodology

3.1.2.1 Environmental Baseline

The analysis of each issue area begins with a description of the actual physical environmental conditions in the area where a project and its alternatives would be implemented. These conditions also are referred to as the "baseline" relative to which Project-caused changes are analyzed to determine whether the change is significant for purposes of CEQA (CEQA Guidelines §§15125, 15126.2). For this Project, baseline conditions are those as they existed in January 2019 when the Notice of Preparation (NOP) was published unless as otherwise noted. The effects of the Project and alternatives are defined as changes to the environmental setting that are attributable to Project components or activities. Consistent with CEQA, an EIR need not analyze the effects of the existing environment on a project (including its users or occupants) unless the project exacerbates those conditions.

3.1.2.2 Impact Significance Criteria

CEQA lead agencies rely on impact significance criteria as benchmarks to determine whether changes to the existing environment caused by a project or an alternative would cause a significant adverse effect. A significant effect on the environment is "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project" (CEQA Guidelines §15382).

To guide the Lead Agency in determining whether the Project or an alternative may cause a significant impact on the environment, the preparers of this EIR (identified in Chapter 5, *Report Preparation*) have considered the series of questions provided in CEQA Guidelines Appendix G, as supplemented to consider whether the Project or an alternative could interfere with communications, including emergency communications.[1]

3.1.2.3 Impact Significance Conclusions

This EIR evaluates whether the Project and alternatives would cause a change in the environment. Conclusions reached are based on information in the record, including scientific and factual data as well as professional knowledge and judgment. Consistent with CEQA and the CEQA Guidelines, significance conclusions are characterized as one of the following:

1. **No Impact:** This signifies that a project or an alternative would not cause any change in the environment relative to the applicable significance criterion; under these circumstances, no mitigation measures would be required or may be imposed and the project or alternative could not cause or contribute to any cumulative effect.
2. **Less-than-Significant Impact:** This signifies that a project or an alternative could cause an adverse change in the environment, but not one that would be substantial, relative to the applicable significance criterion. Under these circumstances, no mitigation measures would be required or may be imposed. The analysis considers whether the project or alternative could cause or contribute to a potential cumulative effect.
3. **Less than Significant with Mitigation Incorporated:** This signifies that a project or an alternative could cause an adverse change in the environment that would be substantial relative to the applicable significance criterion, but that the implementation of one or more feasible mitigation measures would reduce the significance of the impact below the established threshold. The analysis considers whether the project or alternative could cause or contribute to a potential cumulative effect.
4. **Significant and Unavoidable:** This signifies that a project or an alternative could cause a substantial adverse change in the environment relative to the applicable significance criterion; however, either no feasible mitigation measures are available, or, even with implementation of feasible mitigation measures, the significance of the impact would remain above the established threshold. The analysis considers whether the project or alternative could cause or contribute to a potential cumulative effect.
5. **Cumulatively Considerable:** This signifies that a project-specific or alternative-specific contribution to a significant cumulative effect would be considerable when viewed in connection with the incremental impacts of past projects, the impacts of other current projects, and the impacts of reasonably foreseeable probable future projects (as defined in CEQA Guidelines §15130).

To avoid or reduce potential significant impacts where feasible, alternatives have been considered or mitigation measures have been recommended to address them. The effectiveness of recommended mitigation measures has been evaluated by analyzing the impact remaining after the implementation of the measure. In some cases, the implementation of more than one

[1] Case law interpreting CEQA has recognized that lead agencies generally have broad discretion to formulate significance thresholds, including the discretion to depart from the precise language of Appendix G questions.

mitigation measure may be needed to reduce the significance of an impact below an established threshold. The mitigation measures recommended in this document are identified on a resource-by-resource basis in this Chapter 3, *Environmental Analysis.* Potential significant impacts of the Project and associated mitigation measures are summarized in Table ES-2, *Summary of Project Impacts and Mitigation Measures*.

3.1.2.4 PG&E Interconnection Infrastructure

In each resource section included in this chapter, a subsection called "PG&E Interconnection Infrastructure" follows the analysis of the direct and indirect effects of the Project and precedes the analysis of the direct and indirect effects of the Alternatives. The purpose of this subsection is to call out the direct and indirect impacts of the Project as a whole, the mitigation of which would be within the jurisdiction of the California Public Utilities Commission (CPUC), which has permitting authority over a portion of the Project and which therefore is a Responsible Agency for purposes of CEQA. The CPUC regulates private investor-owned utilities in the state of California, including electric power companies like PG&E as well as natural gas, telecommunications, and water companies. PG&E's construction of the electrical connections to its infrastructure (as described in Section 2.4.3, *Project Substation, Switching Station and Interconnection Facilities*) would be subject to the CPUC's authority and oversight. Aspects of the Project to be constructed by the Applicant (such as the switching station and collector lines) would not be subject to the CPUC's authority and oversight. The impacts identified in the PG&E Interconnection Infrastructure subsections of this Chapter 3 are a subset of, not in addition to, the direct and indirect impacts of the Project as a whole.

3.1.3 Cumulative Effects Approach

As defined in CEQA Guidelines Section 15355, the term "cumulative impacts" refers to two or more individual effects, which, when considered together, are considerable or that compound or increase other environmental impacts. The cumulative impact from multiple projects is the change in the physical environment that results from the incremental impact of the proposed project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time (CEQA Guidelines §§15355[b], 15130[a][1]).

The analysis in this chapter evaluates potential cumulative impacts on a resource-by-resource basis by considering the incremental impacts of the Project together with the ongoing effects of past, present, and reasonably foreseeable probable future projects that could cause environmental impacts that are closely related to those caused by the Applicant's proposal. Factors considered in determining whether a project is included in the cumulative scenario include whether it would cause impacts of the same nature as the Project in the same area at the same time.

3.1.3.1 Cumulative Scenario

The cumulative scenario consists of trends; projections contained in one or more local, regional, or statewide planning documents; and the incremental effects of past, present, and reasonably foreseeable probable future projects summarized below by activity type.

Timber Management and Harvesting

Private ownership accounts for 39 percent of California's forestlands and has provided most of the State's timber since the 1940s (Taylor, 2018). While subject to annual variation, total timber harvesting statewide has declined by more than two-thirds since the late 1950s, and harvest rates have dropped from over 4.8 billion board feet in 1988—its recent peak—to approximately 900 million in 2009, when the harvest rate was at its lowest in recent history (Taylor, 2018). The Legislative Analyst's Office reports that "timber harvesting rates have picked up somewhat [since 2009], but have not returned to earlier levels" (Taylor, 2018).

The County General Plan designates the Project Site as "Timberlands." As of June 2020, approximately 58 percent of Shasta County were zoned for private timber production (1,454,680 acres of a total of 2,492,822 acres). Past, present, and reasonably foreseeable future timber harvesting plans (THPs) associated with the Project Site have been identified by the landowner. They are listed in **Table 3.1-1**, *Timber Harvest Plans in the Immediate Vicinity of the Project*. As explained in General Plan Section 6.2.2, "Negative impacts from forest practices may affect surrounding land uses and resources and create special management problems for timberland operations. Harvesting practices and the associated noise, dust, and traffic can be potentially damaging to air and water resources, wildlife habitats, aesthetic enjoyment, and the health and safety of nearby residences, although state-required timber harvest plans are intended to mitigate timber harvesting impacts to acceptable levels" (Shasta County, 2004). Ongoing impacts of past and current forest management activities within and near the Project Site are reflected in the baseline conditions described in the environmental setting on a resource-by-resource basis throughout this Chapter 3, *Environmental Analysis*.

TABLE 3.1-1
TIMBER HARVEST PLANS IN THE IMMEDIATE VICINITY OF THE PROJECT

THP Name	Acres	THP Number	THP Status	Year Submitted
Cedar Boots	378	2-16-077-SHA	Active	2016
South Ox	Unknown	2-16-075-SHA	Active	2016
Little Ox	431	2-17-077-SHA	Active	2017
Bunchgrass	439	n/a	In Preparation	n/a
East Lookout	Unknown	n/a	In Preparation	n/a
Forks	Unknown	n/a	In Preparation	n/a

SOURCE: ConnectGen, 2019.

National Forest System (NFS) lands account for approximately 38 percent of the commercial forest lands in Shasta County (Shasta County, 2004). The Project Site is within approximately 10 miles of three NFS forest management projects in the Shasta Trinity National Forest. First, the Project Site is approximately 7 miles from the southern boundary of the Chalk Mountain Plantation Thin and Underburn Project which includes thinning and underburning over approximately 2,834 acres to: (1) restore a more diverse and less dense forest stand structure and increase resilience to insect and disease infestations; (2) promote structural and species diversity;

(3) reduce overall fuel levels; and (4) restore eco-cultural systems upon which the tribal community depends (USFS, 2018a).

Second, the Project Site is approximately 7.5 miles from the northeastern boundary of the Green-Horse Restoration Project, which would entail prescribed burning and thinning on approximately 41,836 acres to reduce wildfire risk and protect, enhance, or maintain wildlife habitat quality (USFS, 2016).

Finally, while slightly outside the 10-mile boundary, the Project Site is approximately 10.4 miles from the southeastern boundary of the Bagley Hazard Tree Abatement Project which is intended to reduce risks to public safety along NFS roads affected by the Bagley Fire of 2012 by abating the hazards from dead and defective hazard trees (USFS, 2013).

Timber Land Conversion

Between 1969 and 1998, 112,866 acres of California's privately-owned timberland were converted to a variety of other uses, primarily grazing and subdivision development. Approximately 49 percent of these conversions occurred in the northern region, which includes Shasta County (Shih, 2019). Over the most recent decade of the 30-year period, the average conversion statewide was 2,256 acres per year; within the northern region, the average conversion 237 acres per year (Shih, 2019). Regarding this conversion trend, a technical working paper of CAL FIRE's Fire and Resource Assessment Program concluded, "The impact of conversions on timber supply is not significant, but in many local areas, conversions are a major land use issue" (Shih, 2019). Project-related timber conversion would be temporary rather than permanent, with the expectation that the Project Site would be returned to timberland use following the conclusion of the Use Permit term.

Fire History

Shasta County, which CAL FIRE has designated a "Very High Fire Hazard Severity Zone," experiences extreme fire weather conditions, particularly between May and September (Shasta County, 2016). Between 1992 and 2003, Shasta County experienced an average of 333 wildland fires per year (Shasta County, 2018). Other notable fires in Shasta County include, but are not limited to, the following (CAL FIRE, 2014, 2016, 2019a, 2019b; USFS, 2018b; Shulman, 2018):

1. Carr Fire, 2018 (229,651 acres burned, the seventh largest fire in California history)
2. Fountain Fire, 1992 (64,000 acres)
3. Delta Fire, 2018 (63,311 acres)
4. Hirz Fire, 2018 (46,150 acres)
5. Bald Fire, 2014 (39,736 acres)
6. Eiler Fire, 2014 (32,416 acres)
7. Bully Fire, 2014 (12,661 acres)
8. Hat Fire, 2018 (1,900 acres)
9. Fiddler Fire, 2016 (303 acres)
10. Montgomery Creek Fire, 2018 (51 acres)

Ongoing environmental impacts of wildfire may continue to be observable on the landscape, potentially including degraded air quality, wildlife habitat, and watersheds as well as increased GHG emissions and reduced carbon sequestration capacity (Shasta County, 2016). With the current urbanization in and around Round Mountain and Montgomery Creek, the area near the Project Site "can expect future fires to be more damaging" (CAL FIRE and Shasta County Fire, 2018). Ongoing impacts of past wildland fires within and near the Project Site are reflected in the baseline conditions described in the environmental setting on a resource-by-resource basis throughout this Chapter 3.

Weather Extremes

The 60-month period between January 2012 and December 2016 was the hottest on record in California, with an average temperature of approximately 60.2 degrees Fahrenheit (°F); it was also the 11th driest since 1895 (Pacific Institute, 2017a). Governor Brown lifted the drought emergency for most of the state, including Shasta County, on April 7, 2017, when he issued Executive Order B-40-17. However, environmental damage had already occurred. For example, the U.S. Department of Agriculture (USDA) reported a finding of the U.S. Forest Service that in "2016 alone, 62 million trees have died, representing more than a 100 percent increase in dead trees across the state from 2015. Millions of additional trees are weakened and expected to die in the coming months and years" (USDA, 2016). The prolonged drought also harmed fish, wildlife, and their habitats; threatened water supplies; and created environmental strains that increased the potential of high-intensity fires across the state (Executive Order B-40-17; Shasta County, 2016). Due to limited hydropower capacity during the drought, electric generation relied increasingly on natural gas – a more carbon-intensive option that led to a 10 percent increase in CO2 emissions from power plants (Pacific Institute, 2017b).

When it came, the end of the drought came quickly. The 2016/17 water year (which began on October 1, 2016) was the wettest on record (CDEC, 2019). Severe winter storms that year caused the water content in the state's mountain snowpack to achieve 164 percent of the season average, and flooding that nearly caused Oroville Dam, the nation's tallest, to fail (Executive Order B-40-17; Pacific Institute, 2017a). The impacts of these weather extremes are reflected in the environmental baseline and may have ongoing impacts that could combine with impacts of the Project to adversely affect existing conditions in the physical environment. These changes in weather patterns also may affect the State's wind resources. Based on 36 years of data that showed wind regime changes consistent with global warming and information from "several wind farm sites," research published by the California Energy Commission (CEC) projects that wind power generation capacity throughout California is expected to increase during the summer and decrease during fall and winter (CEC, 2018a).

Other Wind Projects

Considering in-state power plants with a nameplate capacity of 1 MW or greater, CEC data reports that wind energy generated 7.31 percent of the in-state total power generation in 2018, with wind energy power plants having a total capacity of 6,004 MW (CEC, 2019a). The wind energy generation contributions of Shasta County and other counties in the State are shown in **Table 3.1-2**, *California's Total Wind Production by County*.

TABLE 3.1-2
CALIFORNIA'S TOTAL WIND PRODUCTION BY COUNTY

County	Capacity (MW)
Kern	3,474.00
Solano	1,035.30
Riverside	643
Imperial	265.4
Alameda	228.1
San Diego	182.1
Shasta	101.2
Contra Costa	38
Merced	18.4
San Bernardino	7.2
Monterey	3.9
San Joaquin	3.5
Los Angeles	1.9
Tehama	1
Yolo	1
TOTAL	6,004.0

SOURCE: CEC, 2019a

The Hatchet Ridge Wind Project is Shasta County's only existing wind project. It began commercial operation in 2010, and its 44 wind turbines have the capacity to generate 101.2 MW of electricity within a permanent project footprint of approximately 75.6 acres. Consistent with FAA regulations, the project includes rapid-discharge flashing red safety lighting and can be seen from some vantages day and night. Following construction, avian and bat mortality monitoring occurred for three years and site reforestation efforts took place, including the planting of more than 62,000 pine trees, including commercial Christmas trees. Approximately 6 to 10 local people operate and maintain the facility. They normally work from 7 a.m. to 5 p.m. The project interconnects with a PG&E transmission line that crosses the site. PG&E purchases 100 percent of the electricity generated by the project (Pattern Energy, 2019; Shasta County, 2008). Ongoing impacts of this existing project may combine with the incremental impacts of the Project to cause or contribute to cumulative effects.

Power Lines and Electrical Infrastructure

The California Independent System Operator (CAISO) manages the operation of California's power grid, including the generation and transmission of electricity by PG&E. The CAISO divides the state into three regions: NP15, a key segment of California's north-south power transmission corridor, corresponds to PG&E's electric service territory (CAISO, 2008; PG&E, 2014).

Existing electrical infrastructure on and near the Project Site include two, 230 kV transmission lines that cross the Project Site south of SR 299 (CEC, 2014). The Project would interconnect to the grid along these lines. Other PG&E 230 kV infrastructure in the area includes the Carberry switching station, which is connected to the Hatchet Ridge Wind Project substation as well as the Burney Substation and points to the northeast, and the Round Mountain Substation (Dashiell

Corporation, 2019; CEC, 2014). Other area electrical infrastructure includes PG&E's Cedar Creek Substation (33 kV to 92 kV), Burney Forest Power's substation (220 kV to 287 kV), Sierra Pacific BFP (220 kV to 287 kV), and PG&E's Burney Substation (33 kV to 92 kV) (CEC, 2014; CEC, 2019b). A "bulk dynamic reactive voltage system" project has been proposed in connection with the Round Mountain Substation to address existing voltage issues on the 500 kV network in Northern California. This additional transmission reliability project is separate from and independent of the Project and would be considered by the CPUC regardless of the County's consideration of the Project. None of the current projects identified by the California Public Utilities Commission (CPUC) suggests that additional work is proposed along PG&E's transmission line in the vicinity of the Project Site (CPUC, 2019a).

Surface Mining and Reclamation Projects

Active mining projects, including extraction and reclamation, are considered because they could generate impacts similar to the impacts of the Project, e.g., traffic, ground disturbance, or lighting. Idle mines are not considered because the absence of activity on an idle site would not contribute incremental impacts to cumulative conditions. Additional details are provided in **Table 3.1-3**, *Active and Reclaimed Mines in Shasta County*.

TABLE 3.1-3
ACTIVE AND RECLAIMED MINES IN SHASTA COUNTY

Project ID	APN	CA Mine ID# 91-45-	Shasta County Reclamation Plan #	Use Permit	Mine Name	Status
1	307340004000	0001	2-88	85-73	SWA Mountain Gate Quarry	Active
2	23320036000	0006	6-88	37-89	Brush Mountain (Packway)	Active
3	307360003000	0012	00-03	63	Gray Rocks Quarry	Active
4	307010004000	0013	03-001	297-78	Falkenbury Quarry	Active
5	55240003000	0014	2-77	69-73A	Shea Sand and Gravel	Active
6	208230023000	0016	4-78	288-77	Shea Sand and Gravel Plan II (aka Hinds Pit)	Active
7	307350016000	0017	2-91	52-91B	Fawndale Quarry	Active
8	22200008000	0018	1-78A	185-78A	Dicalite	Active
9	30110006000	0020	4-94		Brush Mountain - BLM	Active
10	65250002000	0021	07-002	07-020	Crystal Creek Aggregate	Active
11	18350005000	0022	5-94		Blue Sand Cinder Pit	Active
12	23350001000	0024	4-92	64-92	Braden Sand Pit	Active
13	704150019000	0028	2-93		Black Butte Cinders	Active
14	97310032000	0029	4-93A		Oak Run Quarry	Active
15	704230003000	0036	3-94	39-94	Wildcat Pit	Active
16	30110005000	0045	2-95	22-95A	"Brush Mountain - Fruit Growers"	Active
17	23320024000	0049	97-1	97-28	Hidden Valley Quarry	Active
18	23250014000	0052	99-01	99-17	Eastside Aggregates	Active
19	22130025000	0053	01-001	01-016	Bales Mountain Quarry	Active
20	206350035000	0056	02-002	02-035	West Valley Sand & Gravel	Reclamation has begun
21	91050024000	0057	05-001	05-010	Shasta Ranch Pit	Active
22	50090027000	0058	06-001	06-038A	Wakeboard Park 3	Active

TABLE 3.1-3 (CONTINUED)
ACTIVE AND RECLAIMED MINES IN SHASTA COUNTY

Project ID	APN	CA Mine ID# 91-45-	Shasta County Reclamation Plan #	Use Permit	Mine Name	Status
23	60020044000	0059	05-004	05-039	Twin Mine	Active
24	30090020000	0005	1-85	105-85	Jack Rabbit Flat Lava Rock	Reclamation has begun
25	16250004000	0042	01-002		Ben Bridge Trust Cinder Pit	Reclamation has begun

NOTES:
[a] Table footnote text

SOURCE: Shasta County, 2019a.

Other Present and Reasonably Foreseeable Probable Future Projects

Projects within the Shasta County permit system as of the date of the NOP (January 15, 2019), were evaluated to identify projects that would cause environmental impacts that could combine with those of the Project (**Table 3.1-4**).

TABLE 3.1-4
POTENTIALLY CUMULATIVE COUNTY PROJECTS

Project ID	APN	Status	Date Applied	Project Name	Site Address
1	207170008000.00	Applied	4/23/2019	Amendment to UP10-001	18703 Cambridge Rd
2	76260002000.00	Approved	4/18/2019	TR1945 EOT #2 (11 Parcel Land Division)	
3	58300060000.00	Approved	4/16/2019	TR1992 EOT #2 (Eleven Lot Subdivision)	8589 Silver Bridge Rd
4	83240006000.00	Applied	4/8/2019	Small RV Park	
5	59110082000.00	Applied	12/6/2018	Parcel Map Commercial	
6	704280013000.00	Approved	12/5/2018	TR1989 EOT (38 Lot Subdivision with Remainder)	
7	31610010000.00	Approved	10/4/2018	Hat Creek Radio Observatory	
8	111290011000.00	Approved	9/24/2018	Resubmittal and Amendment to TR1977 – Unit 2 Phase 2	
9	30390042000.00	Approved	9/5/2018	UP13-001 E1	37750 Highway 299 E
10	74100007000.00	Approved	8/20/2018	UP47-88A	
11	57140019000.00	Approved	8/15/2018	PM07-035E2 (3 Parcel Split)	
12	306050005000.00	Approved	8/2/2018	TR1973EOT	Union School Rd
13	306050003000.00	Approved	8/2/2018	TR1985EOT (4 Lots Plus Remainder Parcel)	
14	28370024000.00	Approved	5/31/2018	20,000 sq. ft. Grocery Store/Parking/Loading Dock	State Highway 299 E
15	50100015000.00	Approved	10/10/2017	Reclamation Plan for UP17-005	
16	85270003000.00	Applied	6/19/2019	T-Mobile Wireless Mono Pole	17211 Chapman Ln

SOURCES: Shasta County, 2019; Environmental Science Associates, 2019

In addition to evaluating potential projects in the Shasta County permit system, CEQANet was consulted to identify other projects within Shasta County with lead agencies other than the County. Additionally, the City of Redding, CALFIRE, Caltrans, and the Shasta-Trinity National Forest, and Lassen National Forest were contacted to identify projects that could have environmental impacts that could overlap with impacts resulting from the Project. **Table 3.1-5**, *Other Potentially Cumulative Projects within Shasta County*, includes the projects that were identified as part of this process.

TABLE 3.1-5
OTHER POTENTIALLY CUMULATIVE PROJECTS WITHIN SHASTA COUNTY

Project ID	Project Name/ Applicant	Location/Approximate Distance from Project Site	Description	Status
1	Dignity Health North State Pavilion Project	At the intersection of Cypress/ Hartnell just west of I-5 in Redding. Approximately 33 miles southwest from the Project Site.	Hospital campus including three buildings with parking and landscaping on an approximately 10.55-acre site.	Construction is expected to begin Spring 2020 and be completed in 2022
2	River Crossing Marketplace Specific Plan	Northeast corner of South Bonnyview Road and Bechelli Lane just off of I-5 in Redding. Approximately 34 miles southwest of the Project Site.	222,000 square feet of retail use including a discount warehouse store with up to 15 fuel pumps and retail pads accommodating up to 70,000 square feet of retail, restaurants (some with drive through lanes), and service uses	Unknown
3	Redding Rancheria Fee-to-Trust and Casino Project	Strawberry Fields Site, just west of I-5. Approximately 34 miles southwest of the Project Site.	232-acre site to be developed with a casino, hotel, and conference and event center	Unknown
4	NCPA Solar Project 1 - Redding Airport Site	Redding Airport. Approximately 34 miles southwest of the Project Site.	Development of 11.4 MW of PV panels on approximately 54.7 acres	Unknown
5	Shasta College Facilities Master Plan Amendment One Initial Study & Mitigated Negative Declaration	Old Oregon Trail & SR 299. Approximately 29 miles southwest of the Project Site.	Demolition of some existing campus buildings, renovation of existing buildings, construction of new buildings and features.	Demolition (2019-2030), Construction and renovation (2019-2030)
6	Bethel Church of Reddinq Colyer Drive Campus Planned Development	2080 Collyer Drive, Redding, Shasta County, CA. Approximately 29 miles southwest of the Project Site.	Construction and operation of a new church campus on 39.3 acres	Unknown
7	Sun Oaks Subdivision	3600 Argyle Road. Approximately 32 miles southwest of the Project Site.	Divide 26.9 acres into 51 single family lots	NOD approved 3/15/2019
8	02-0J200 Hatchet Mountain AR Chip, PM 60-67.8	State Route (SR) 299 at post mile (PM) 60.0/67.8 in Shasta County	Caltrans will place an asphalt rubber (AR) chip seal over the existing asphalt from edge of travelled way (ETW) to ETW. All work will be done within the existing edge of pavement. No work will be performed on bridge decks. There will be no increase in disturbed soil area.	NOE filed 9/26/19. Construction period 2021
9	02-1H570 Burney CapM, PM 67.8-77.8	State Route (SR) 299 at post mile (PM) 67.8-77.8 in Shasta County	The Project will not result in new disturbed soil or new impervious surfaces.	Construction period 2022-2023
10	Landvest Helicopter Dip Tank Installation	Within and adjacent to the Project Site	Landvest (owner of the Project Site) has installed and will be installing helicopter dip tanks throughout its ownership to aid fire suppression, including within the Project Site.	Ongoing

SOURCES: CEQANet, 2019; Bonin, 2019, Caltrans, 2019.

3.1.3.2 Cumulative Impacts Analysis

Incremental impacts resulting from initial site preparation and construction, operation and maintenance, and decommissioning and site restoration could combine with the incremental impacts of other projects to cause or contribute to cumulative effects. Direct and indirect effects of the Project are analyzed on a resource-by-resource basis throughout this Chapter 3. Where the Project would cause no impact to a given resource, it could not cause or contribute to any cumulative impact related to such resources. See, e.g., Section 3.1.3, *Environmental Topics Removed from Consideration*.

For the remaining resource areas, this Draft EIR analyzes potential incremental impacts of the Project and alternatives combined with the incremental impacts of past, other present, and reasonably foreseeable future projects, and determines whether the incremental impacts of the Project would be significant and, if so, whether the incremental contribution of the Project would be cumulatively considerable. As noted above, the geographic scope of the cumulative effects analysis for each resource area is tailored to the natural boundaries of the affected resource. Unless otherwise noted in the analysis, potential cumulative effects could occur at any time during the conditional use permit period, from the moment on-site activities begin to the conclusion of post-Project site restoration activities. Existing conditions within the cumulative impacts area reflect a combination of the natural condition and the ongoing effects of past actions in the affected area.

3.1.4 Environmental Considerations Unaffected by the Project or Not Present in the Project Area

CEQA Guidelines Appendix G suggests that lead agencies consider potential impacts to 20 different aspects of the physical environment to guide thinking and disclosure about a wide range of potential environmental consequences. The 20 suggested resource areas include: Aesthetics, Agriculture and Forestry Resources, Air Quality, Biological Resources, Cultural Resources, Energy, Geology/Soils, Greenhouse Gas Emissions, Hazards & Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Transportation, Tribal Cultural Resources, Utilities/Service Systems, and Wildfire. The County has analyzed potential impacts in each of these areas, as well as potential impacts to Communications Interference (see Section 3.5). However, there are some resources that are not present in the relevant area, or that would not be affected by implementation of the Project. This is true, for example, with respect to Agricultural Resources, Land Use and Planning, Mineral Resources, Population and Housing, Public Services, and Recreation. Analysis and explanation of why the project would result in no impact to each of these resource categories is provided below. The Project also would have no impact to some (but not all) of the considerations identified in CEQA Guidelines Appendix G checklist for other resources, such as Air Quality, Biological Resources, and others. Analysis and explanation of the individual "no impact" considerations within resource groups also are provided below to focus the sections that follow on areas where the Project could result in a potential significant impact. See, e.g., Section 3.3, *Air Quality*, and Section 3.4, *Biological Resources*.

3.1.4.1 Agriculture and Forestry Resources

Agriculture

According to CEQA Guidelines Appendix G Section II, a project would result in a significant impact to agriculture resources if it would: a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use; b) Conflict with existing zoning for agricultural use, or a Williamson Act contract; or c) Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Farmland to non-agricultural use. Neither the Project nor Alternative 1 or 2 would result in any impact relative to these considerations.

Maps produced by the California Resources Agency pursuant to the Farmland Mapping and Monitoring Program show that there is no Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) in the Project Site (California Department of Conservation, 2016), nor is any land in the Project Site zoned for agricultural use or subject to a Williamson Act contract. The nearest area designated as Prime Farmland is an approximately 110-acre site 0.25 mile southeast of the closest proposed turbine. Therefore, the Project and Alternatives 1 and 2 would have no impact on agricultural resources and could not cause or contribute to any cumulative impact to such resources.

Forestry

CEQA Guidelines Appendix G Section II also considers potential impacts to forestry resources. For example, according to CEQA Guidelines Appendix G Section II(c), a project would result in a significant impact to forest resources if it would: "Conflict with existing zoning for, or cause rezoning of, forest land…, timberland…, or timberland zoned Timberland Production." For purposes of this analysis, forest land is described in Public Resources Code Section 12220(g) as "land that can support 10-percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits." Timberland is defined in Section 4526 of the Z'Berg-Nejedly Forest Practice Act (Pub. Res. Code §4526) as "land, other than land owned by the federal government and land designated by the board as experimental forest land, which is available for, and capable of, growing a crop of trees of a commercial species used to produce lumber and other forest products…." Timberland Production is defined by Government Code Section 51104(g) as "an area which has been zoned [timberland production] pursuant to Section 51112 or 51113 and is devoted to and used for growing and harvesting timber, or for growing and harvesting timber and compatible uses." In this context, "compatible uses" are expressly defined in Section 51104(h) to include the "erection, construction, alteration, or maintenance of gas, electric, water, or communication transmission facilities."

Neither the Project nor Alternatives 1 or 2 would result in any impact relative to consistency with existing zoning for Forest Resources. The Shasta County General Plan designates the Project Site as Timber (T); the zoning designations are Timber Production (TP) (approximately 4,457 acres) and Unclassified (U) (approximately 6 acres). Existing land uses within the Project Site consist

exclusively of managed forest lands. Unpaved logging roads and transmission lines cross the Project Site. Chapter 17.08, Timber Production District, in the Shasta County Zoning Ordinance identifies the uses allowed in the TP district if a use permit is issued, including "the erection, construction or alteration of a gas, electrical, water or communication facility, or other public improvements, in accordance with Government Code §51152." Neither the Project nor alternatives would cause an impact because the uses allowed on the Project Site by the County's General Plan and zoning designation are consistent with the state's definitions of forest land, timberland, and timberland zoned Timber Production.

See Section 3.8, *Forestry Resources*, for analysis of other forest resource-related considerations identified in CEQA Guidelines Appendix G Section II.

3.1.4.2 Air Quality

Scoping comments from the Shasta County Air Quality Management District (AQMD) suggested that onsite fuel dispensing and storage must meet California Phase 1 vapor recovery requirements. However, the Vapor Recovery Program controls vapor emissions from gasoline marketing operations (gasoline dispensing facilities or service stations, tanker trucks [cargo tanks], bulk plants, and terminals), where gasoline vapor is a precursor to the formation of ozone and contains benzene, a constituent of gasoline vapor that has been identified as a toxic air contaminant (TAC). As shown in Table 2-3, *Hazardous Materials*, gasoline would not be stored onsite during any phase of the Project. Therefore, the requirements of the Vapor Recovery Program do not apply to the Project or Alternatives 1 or 2.

Scoping comments from the Shasta County Air Quality Management District also recommended, in the event that proposed operations would be conducted in an area containing naturally occurring asbestos, that a plan be submitted that meets the requirements of the Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations. The Project Site is not located in such an area. Asbestos is a term used for several types of naturally occurring fibrous minerals that are a human health hazard when airborne. The most common type of asbestos is chrysotile, but other types such as tremolite and actinolite are also found in California. Asbestos is classified as a known human carcinogen by state, federal, and international agencies and was identified as a TAC by the California Air Resources Board (CARB) in 1986. All types of asbestos are hazardous and may cause lung disease and cancer. Serpentinite may contain chrysotile asbestos, especially near fault zones. Ultramafic rock, a rock closely related to serpentinite, may also contain asbestos minerals. According to the California Division of Mines and Geology, nearest units of ultramafic rocks are mapped approximately 60 miles to the west of the Project Site (DMG, 2000). Because Project operations would not occur in an area containing naturally occurring asbestos, the Project and Alternatives would have no impact relating to naturally-occurring asbestos, and the preparation of a plan like the one suggested by the Air District has not been recommended as part of this CEQA process.

See Section 3.3, *Air Quality*, for analysis of the air quality-related considerations identified in CEQA Guidelines Appendix G Section III.

3.1.4.3 Biological Resources

According to CEQA Guidelines Appendix G Section IV, a project would result in a significant impact to biological resources if it would: "(e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance" or "(f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan." The Project and alternatives would have no impact in either respect because Shasta County does not have a tree protection ordinance, nor any language regarding tree preservation or heritage trees in the General Plan (see Section 3.4.1.3, *Regulatory Setting*). Further, there is no adopted Habitat Conservation Plan, Natural Community Conservation Plan or other approved habitat conservation plan covering the Project Site. Thus, there would be no impact to either of these biological resources-related considerations.

See Section 3.4, *Biological Resources*, for analysis of the other considerations identified in CEQA Guidelines Appendix G Section IV.

3.1.4.4 Cultural Resources

According to CEQA Guidelines Appendix G Section V(a), a project would result in a significant impact to cultural resources if it would: "Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5." In this context, a significant impact would occur if the Project caused a substantial adverse change to a historical resource, herein referring to historic-era architectural resources or the built environment, including buildings, structures, and objects. Based on the results of the cultural resources analysis completed for the Project (Stantec, 2019), there are no historic-era architectural resources that qualify as historical resources within the Project Site. Thus, there would be no direct impact to historical resources relating to the built environment from any phase of the Project or Alternative 1 or 2, including site clearing and construction, as well as operation\maintenance, decommissioning or site reclamation.

See Section 3.6, *Cultural and Tribal Cultural Resources*, for analysis of the other considerations identified in CEQA Guidelines Appendix G Section V and Section XVIII.

3.1.4.5 Electric and Magnetic Fields

Scoping comments enquired about and suggested potential impacts of electromagnetic radiation (electric and magnetic fields [EMFs]) from high voltage power lines and turbines and their potential to cause neurological problems, cancer, Alzheimer's disease, dementia, Parkinson's disease, and depression (Appendix J). It does not appear that any of the studies identified in scoping comments have undergone peer review (i.e., none has been scrutinized with normal scientific rigor, met outside scientific review, been submitted to a scientific journal for review by independent scientists, or published in a scientific journal) and none of the studies identified in scoping comments rises to the level of substantial evidence.

EMFs consist of waves of electric and magnetic energy moving together. On the electromagnetic spectrum, power lines result in 50 to 60 cycles per second (or "hertz," Hz, which is an extremely

low-frequency (ELF) EMF exposure. By comparison, television and radio broadcasts, mobile phones, and wireless local area networks (wi-fi) all cause higher frequency exposures, and x-rays and therapeutic radiation each cause still-higher frequency exposures (National Cancer Institute, 2019). Electric charges produce electric fields; the flow of electrical current through wires or electrical devices produce magnetic fields. For this reason, EMF occurs close to power lines. Because the strength of the EMF is proportional to the amount of electrical current passing through the power line and decreases as you move farther away, potential exposure to an EMF field from a power line decreases with distance (USEPA, 2019; CPUC, 2019b).

Although no federal, state, or local standards regulate EMF from power lines or related facilities, such as substations, the CPUC regularly revisits the question of whether there is a sufficient scientifically verifiable relationship between EMF exposure and negative human health consequences to support regulation. On January 15, 1991, the CPUC initiated an investigation to consider its role in mitigating the health effects, if any, of electric and magnetic fields from utility facilities and power lines (CPUC, 1991). The California EMF Consensus Group was created to advise the CPUC on this issue. The Group consisted of 17 stakeholders representing citizen groups, consumer groups, environmental groups, state agencies, regulated utilities, and others (CPUC, 1993). Its fact-finding process was open to the public, and its report incorporated public concerns. Based on the work of the Group, written testimony, and evidentiary hearings, the CPUC issued a decision (D.93-11-013) on November 2, 1993, in which it found no scientific link between power frequency EMFs and adverse human health effects: "We do not find it appropriate to adopt any specific numerical standard in association with EMF until we have a firm scientific basis for adopting any particular value" (CPUC, 1993). The CPUC reaffirmed its conclusion in 2006: "[A]t this time, we are unable to determine whether there is a significant scientifically verifiable relationship between EMF exposure and negative health consequences" (CPUC, 2006). This continues to be the case. As reported in 2019, "The Commission is unable to determine whether there is a significant scientifically verifiable relationship between EMF exposure and negative health consequences" (CPUC, 2019c).

Others agree. The World Health Organization (WHO) explored the potential link between prolonged exposure to ELF EMF (0 Hz to 100 Hz) and neurodegenerative disorders (e.g., Alzheimer disease, Parkinson disease, and amyotrophic lateral sclerosis [ALS]) and with neurobehavioural effects (e.g., depression and suicide) (WHO, 2007). Regarding neurodegenerative disorders, the WHO report concluded, "No study has provided clear evidence of an association with above-average exposure to extremely low frequency EMFs and, in the absence of laboratory evidence to the contrary, it seems unlikely that such fields are involved in the disease" (WHO, 2007). Regarding neurobehavioural disorders, the WHO report concluded that the literature reflects findings that are not consistent and that cannot easily be resolved (WHO, 2007). The National Institute of Environmental Health Sciences (NIEHS), which is part of U.S. Department of Health and Human Services, cites "power lines" as an example of a source of EMF of the type that "is generally perceived as harmless due to its lack of potency" (NIEHS, 2018). Separately, the National Cancer Institute reviewed numerous epidemiologic studies and comprehensive reviews of the scientific literature evaluating possible associations between exposure to non-ionizing EMFs and risk of cancer in children before concluding, "No consistent evidence for an association between any source of non-ionizing EMF and cancer has been found"

(National Cancer Institute, 2019). Similarly, from the U.S. Environmental Protection Agency, "Scientific studies have not clearly shown whether exposure to EMF increases cancer risk. A few studies have connected EMF and health effects, but they have not been able to be repeated. This means that they are inconclusive. Scientists continue to conduct research on the issue" (USEPA, 2019).

This EIR does not consider potential impacts relating to EMF in further detail because: (a) there is no agreement among scientists that EMF creates a potential risk to human health, (b) there are no defined or adopted CEQA standards for defining health risk from EMF, and (c) the County has determined that the potential for health effects associated with EMF exposure is too speculative to allow for a meaningful evaluation of the potential impacts.

3.1.4.6 Energy Resources

According to CEQA Guidelines Appendix G Section VI(b), a project would result in a significant impact to energy if it would: "Conflict with or obstruct a state or local plan for renewable energy or energy efficiency." Neither the Project nor Alternatives 1 or 2 would have any impact in this respect.

Although the Project would provide a new source of renewable energy in the state, the specific existing sources of energy that could be replaced by this Project are unknown. The Project would supply wind energy to PG&E's northern California grid, and would be available to reduce the potential demand of nonrenewable generated power. According to CARB, for the most part, the power being displaced due to renewable energy generation would be comprised of incremental power provided by generators to address load changes (natural gas power plants typically serve as the incremental power source) (CARB, 2010). Therefore, the Project would directly support Senate Bill (SB) 100 and California's Renewables Portfolio Standard (RPS) goal of increasing the percentage of electricity procured from renewable sources to 100 percent by 2045.

The Project would require diesel and gasoline fuel, as well as minimal amounts of electricity through the life of the Project. (See Section 3.7, *Energy*, for related analysis.) However, these energy inputs would be offset by the anticipated Project generation of approximately 605,491,200 kilowatt-hours (kWh) per year.

In terms of mobile energy usage, as described above, the National Highway Traffic Safety Administration (NHTSA) required manufacturers of light duty vehicles to meet an estimated combined passenger car and light truck average fuel economy level of 34.1 miles per gallon (mpg) by model year 2016. In the course of more than 30 years, the National Energy Conservation Policy Act (NECPA) regulatory program has resulted in improved fuel economy throughout the United States' vehicle fleet, and has also protected against inefficient, wasteful, and unnecessary use of energy.[2] The projected fleet-wide mpg for light duty vehicles is expected to reach 41.7 mpg by 2020 (USEPA, 2012). Vehicles used for Project construction, maintenance,

[2] The NECPA (42 U.S.C. §8201 et seq.) serves as the underlying authority for federal energy management goals and requirements and is the foundation of most federal energy requirements. The NECPA establishes energy-efficiency standards for consumer projects and energy-efficiency standards for new construction.

and decommissioning workers to travel to and from the Project Site would already incorporate these standards; therefore, the Project would not impede the efficient use of mobile fuel.

The O&M building on the Project Site would be subject to the Building Energy Efficiency Standards required by regulations (24 Cal. Code Regs. Part 6) implementing the California Energy Code. These standards are intended to save energy, increase electricity supply reliability, and avoid the need to construct new fossil-fueled power plants (CEC, 2018b). Pursuant to the California Building Standards Code and the Energy Efficiency Standards, the County would review the design components of the Project's energy conservation measures when the Project's building plans are submitted. These measures could include: insulation, use of energy-efficient heating, solar-reflective roofing materials, energy-efficient indoor and outdoor lighting systems, and other measures. The Project also would be subject to CALGreen during construction and decommissioning activities, which requires 65 percent construction and demolition waste diversion.[3]

Since the Project would provide a new source of renewable energy supporting SB 100 and the State's energy goals, offset its fuel usage, and comply with fuel and energy efficiency regulations, the Project would not conflict with or obstruct a State or local plan for renewable energy or energy efficiency, and no impact would occur (SB 100 is described in Section 3.7.1, *Regulatory Setting*). The same would be true of Alternatives 1 and 2.

See Section 3.7, *Energy*, for analysis of other energy-related considerations identified in CEQA Guidelines Appendix G Section VI.

3.1.4.7 Geology, Soils, and Paleontological Resources

According to CEQA Guidelines Appendix G Section VII(a)(1), a project would result in a significant impact to geology and soils if it would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area. Neither the Project nor an alternative would cause an impact in this respect because no Alquist-Priolo Earthquake Fault Zones have been mapped as intersecting or adjacent to the Project Site. The closest mapped fault zones are located approximately 8.5 miles (Rocky Ledge Fault Zone) and 15 miles (the Hat Creek Fault Zone) from the Project Site. Accordingly, the Project would not directly or indirectly cause substantial adverse effects related to fault rupture. See Section 3.9, *Geology and Soils*, for additional analysis of potential impacts relating to geology and soils.

According to CEQA Guidelines Appendix G Section VII(f), a project would result in a significant impact to paleontological resources if it would directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. Geologic mapping published by the CGS indicates a majority of the Project Site is underlain by two types of volcanic rock (i.e.,

[3] The California Green Building Standards Code (CALGreen, Title 24 Cal. Code Regs. Part 11) is a statewide regulatory code for all buildings. CALGreen is intended to encourage more sustainable and environmentally-friendly building practices, require use of low-pollution emitting substances that cause less harm to the environment, conserve natural resources, and promote the use of energy-efficient materials and equipment (CBSC, 2019).

andesite and basalt, which are discussed in Section 3.9.1.2, *Environmental Setting*). In general, rocks of igneous origins like volcanic rocks have low to no paleontological potential and sensitivity, due to the extremely high temperatures associated with the formation of the rocks and the nature of lava flows. Nonetheless, the online collections database of the University of California Museum of Paleontology (UCMP) was searched for fossil localities from geologic units mapped as occurring in the Project Site. Data provided through the UCMP's online database includes taxonomic identification, locality number and name, age, and county, and sometimes geologic formation. Precise locality data is not provided; however, in some cases the locality name can be used to further refine the general vicinity of the locality within the county. The results of this search indicate no previously recorded vertebrate fossil discoveries within the geologic formations within the Project Site (UCMP, 2020). For these reasons, implementation of the Project or Alternatives 1 or 2 would result in no impact to paleontological resources.

3.1.4.8 Hazards and Hazardous Materials

According to CEQA Guidelines Appendix G Section IX, a project would result in a significant impact to hazards and hazardous materials if it would: c) emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school; d) be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment; or e) for a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, result in a safety hazard or excessive noise for people residing or working in the project area. Neither the Project nor alternatives would result in any impact relative to these considerations.

There are no schools, existing or proposed, within 0.25 mile of the Project Site. The nearest school is Montgomery Creek Elementary School, which is located approximately 1.5 miles from the western boundary of the Project Site. The Project Site is not included on a list of hazardous materials sites compiled pursuant to the Cortese List (Government Code §65962.5). The nearest airport to the Project Site, the Fall River Mills Airport, is located approximately 20 miles northeast of the Project Site. Additionally, the Project Site is not located within an airport land use plan. For these reasons, the Project would cause no impact related to these considerations. The same would be true of Alternatives 1 and 2.

See Section 3.11, *Hazards and Hazardous Materials*, for analysis of other considerations identified in CEQA Guidelines Appendix G Section IX.

3.1.4.9 Hydrology and Water Quality

According to CEQA Guidelines Appendix G Section X, a project would have a significant impact to hydrology and water quality if it would: d) risk release of pollutants due to project inundation in flood hazard, tsunami, or seiche zones. Neither the Project nor alternatives would result in any impact relative to these considerations because the Project Site is not located in a flood hazard, tsunami, or seiche zone. Nor would the project become inundated in the event of a dam failure due to its elevation and location relative to the Haynes Reservoir, which is located approximately

3.3 miles northeast of the Project Site. In the unlikely event of a dam failure, projected inundation would extend north and down gradient, away from the Project Site. Therefore, there would be no impact pertaining to this criterion.

See Section 3.12, *Hydrology and Water Quality*, for analysis of other considerations identified in CEQA Guidelines Appendix G Section X.

3.1.4.10 Land Use and Planning

According to CEQA Guidelines Appendix G Section XI, a project would have a significant impact relating to land use and planning if it would: a) Physically divide an established community; or b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect. Neither the Project nor an alternative would have an impact in either respect.

The Project Site is privately-owned timberland located approximately 6 miles west of Burney, 35 miles northeast of Redding, and near the private recreational facility of Moose Camp.[4] Other communities near the Project Site include Montgomery Creek, Round Mountain, Wengler and Big Bend. None would be physically divided by the Project.

The Shasta County General Plan designates the Project Site as Timber (T). The zoning designations are Timber Production (TP) (approximately 4,457 acres) and Unclassified (U) (approximately 6 acres). Consistent with General Plan Policy 6.2.4, T-d, the proposed power generation facilities are an allowed use. Regarding the TP district, Shasta County Code Section 17.08.030(D) conditionally allows the construction of "gas, electrical, water, or communication transmission facility, or other public improvements, in accordance with Government Code Section 51152." Regarding the U zone district, Code Section 17.64.040, conditionally permits wind energy systems so long as the system is not otherwise prohibited by law and would not be inconsistent with any portion of the General Plan. Code Section 17.88.035 requires a Use Permit in all districts for all large scale wind energy facilities, like the Project, that would be larger than 50 kilowatts (Shasta County, 2019c). Consistent with Code Section 17.92.020, the Applicant has submitted a Use Permit application for the County's consideration. Consistency with other relevant General Plan policies and regulations adopted for the purpose of avoiding or mitigating an environmental effect are considered in the context of the relevant resource area elsewhere in this Chapter 3. For these reasons, no impact would result from the Project or from Alternative 1 or 2.

3.1.4.11 Mineral Resources

According to CEQA Guidelines Appendix G Section XII, a project would result in a significant impact to mineral resources if it would result in the loss of availability of: a) a known mineral resource that would be of value to the region and the residents of the state; or b) a locally-important

[4] Moose Camp is an approximately 146-acre private recreational facility owned and operated by Moose Recreational Camp, Ltd., a California Non-Profit Mutual Benefit Corporation, for the benefit of its approximately 75 members and their families (Moose Recreational Camp, Ltd., 2012a, 2012b; Appendix J, Scoping Report [Letters P17, P23, P37, P43, P55]). In Moose Camp, 50 cabin residences are used year-round (Appendix J, Letters P17, P23, P37, P43, P55).

mineral resource recovery site delineated on a local general plan, specific plan or other land use plan. Neither the Project nor alternatives would result in any impact relative to these considerations.

Neither the Project nor Alternatives 1 or 2 would be located within a significant mineral, oil, or gas resources area (DMG, 1997; DOGGR, 2020). Furthermore, local land use plans do not indicate presence of locally important mineral resources near the Project Site (Shasta County, 2004). Therefore, the Project and alternatives would not result in the loss of availability of a known mineral resource, nor would result in the loss of locally important mineral resource recovery site. Accordingly, the Project would have no impact related to mineral resources. The same would be true of Alternatives 1 and 2.

3.1.4.12 Noise

According to CEQA Guidelines Appendix G Section XIII(c), a project located in the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport would result in a significant impact to noise if it would expose people residing or working in the project area to excessive noise levels. The nearest airport to the Project Site, the Fall River Mills Airport, is located approximately 20 miles to the northeast. Based on the distance between the two locations, neither the Project nor Alternative 1 or 2 would involve any activities in an airport land use compatibility plan area, and neither would have the potential to expose people residing or working on or near the Project Site to excessive noise levels generated by airport operations.

See Section 3.13, *Noise and Vibration*, for analysis of the other considerations identified in CEQA Guidelines Appendix G Section XIII.

3.1.4.13 Population and Housing, Growth Inducement

According to CEQA Guidelines Appendix G Section XIV, a project would result in a significant impact to population and housing if it would: a) induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure); or b) displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere. Further, Section 15126.2(e) of the CEQA Guidelines suggests that an EIR discuss the ways that a proposed project could foster economic or population growth, or the construction of additional housing, in the surrounding environment because increases in the population may tax existing community service facilities, and thereby require the construction of new or expansion of existing facilities that could cause significant environmental effects. Projects are considered growth inducing, consistent with Section 15126.2(e), when they would remove obstacles to population growth. Growth inducement can be a result of new development that increases employment levels, removes barriers to development, or provides resources that lead to secondary growth. Neither the Project nor alternatives would result in any impact relative to these considerations.

The Project and Alternatives 1 and 2 would not induce substantial unplanned population growth in Shasta County either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., by extending public roads or other infrastructure). No new homes are proposed as part of the

Project, and none would be removed. No one lives within the Project Site. Therefore, neither the Project nor an alternative would displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere.

With respect to employment, the Project would require up to 400 on-site personnel, comprised of a combination of local and specialized (non-local) workers, during the projected 18- to 24-month construction period. The existing construction labor pool in Shasta County is sufficient to meet the Project's non-specialized labor needs.[5] Non-local workers would stay at local hotels and commute to the Project Site from Redding, Burney, Fall River Mills, or McArthur.[6] Operation and maintenance of the Project would require up to 12 full-time employees. Non-routine (emergency) maintenance could require additional workers. Decommissioning and site restoration activities are expected to require a smaller workforce than construction; decommissioning and site restoration-related activities are expected to take approximately 18- to 24-months to complete.

Because the operations and maintenance workforce would be small, and because the construction and decommissioning workforces would be temporary and include local workers, the Project would not cause substantial numbers of people to relocate to Shasta County. Therefore, the Project would not result in a large increase in employment levels that would significantly induce growth. Nonetheless, even if all workers were to migrate into Shasta County, the existing available housing supply could accommodate them without requiring new construction.[7] Therefore, the Project is not expected to induce population growth, the housing and provision of services for which could cause significant adverse environmental impacts. The same would be true of Alternatives 1 and 2.

Although as discussed in Section 3.7, *Energy*, the Project would contribute to the energy supply, which supports growth, the development of power infrastructure is a response to increased market demand, and the availability of electrical capacity by itself does not ensure or encourage growth within a particular area. Other factors such as economic conditions, land availability, population trends, availability of water supply or sewer services, and local planning policies have a more direct effect on growth.

3.1.4.14 Public Services

According to CEQA Guidelines Appendix G Section XV, a project would result in a significant impact to public services if it would result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response

5 Shasta County comprises the Redding, California Metropolitan Statistical Area. The 2018 annual average unemployment rate in the Redding Metropolitan Statistical Area was 4.9 percent as compared to 4.2 percent for California and 3.9 percent for the nation during the same period (State of California Employment Development Department 2020; U.S. Department of Labor Bureau of Labor Statistics, 2019). While the number of construction jobs has been on the rise since 2011, it has not recovered to 2007/2008 levels (U.S. Department of Labor Bureau of Labor Statistics 2017). The number of individuals employed in the construction in the Redding Metropolitan Statistical Area in 2019 fluctuated from 3,000 in January, 2019 to 3,900 in July, 2019 (EDD, 2019).

6 A review of hotels in Burney, Fall River Mills, McArthur, and Redding using Google Travel indicated that there are 49 hotels and motels within the four towns (Google Travel, 2020).

7 Shasta County's vacancy rate for residential rentals is higher than the national average: 3.82 percent compared to 2.34 percent (Sperling's BestPlaces 2017).

times or other performance objectives for any of the public services: a) fire protection, b) police protection, c) schools, d) parks, or e) other public facilities. Neither the Project nor alternatives would require the construction of new or physical alteration of existing public services facilities. As explained below, no impact would result relative to these considerations.

Fire Protection Services

Fire control agencies in Shasta County operate at the federal, state, and local level. While State and Federal agencies are primarily tasked with responding to wildland fires, in practice, all agencies work together in times of need (Shasta County, 2018).

The U.S. Forest Service (USFS) is responsible for wildland fire control on Forest Service-administered lands and, pursuant to an agreement with the California Department of Forestry and Fire Protection (CAL FIRE), on approximately 200,000 acres of private lands adjacent to or within USFS boundaries. The National Park Service provides protection for Lassen National Park and Whiskeytown National Recreation Area (Shasta County, 2018).

CAL FIRE is responsible for wildland fire control on approximately 1.1 million acres of private lands outside of USFS or city boundaries. CAL FIRE protects an additional 250,000 acres of federal lands through an agreement with the USFS and Bureau of Land Management. There are five CAL FIRE Battalions in Shasta County. They support fire-fighting equipment and personnel with eight seasonal fire stations, and one Battalion with three additional stations that serve the County, although they are located outside its boundaries (Shasta County, 2018). Performance objectives for fire protection include the following:

1. According to the Shasta Trinity Unit 2018 Strategic Fire Plan, “CAL FIRE's goal is to contain 95 percent of all wildfires at 10 acres or less.” (CAL FIRE and Shasta County Fire, 2018).
2. According to CAL FIRE Chief Ken Pimlott, CAL FIRE’s statewide Initial Attack Fire Policy goal is to aggressively attack all wildfires, with the goal of containing 95 percent of all fire starts to 10 acres or less (NPR, 2018).

Local fire agencies serving the unincorporated areas of Shasta County include 12 community fire districts (including Burney), 19 volunteer fire companies (including Montgomery Creek), and one Shasta County Fire District station at the Redding Station 43. Several of the local fire agencies overlap with CAL FIRE and USFS jurisdictions. The Burney Fire Protection District provided initial input for the County’s environmental review process shortly after the Use Permit application was filed for the Project (Burney Fire Protection District, 2018). Later, in response to the issuance of notice of intention to prepare this Draft EIR, the County received scoping input noting that the California Office of Emergency Services (Cal OES) provides community support, including disaster response and recovery, and that the local community is served by a volunteer fire department (the Montgomery Creek Fire Company). All scoping input received, including regarding Public Services, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

The Project and Alternatives 1 and 2 would result in no impact relating to the maintenance of acceptable performance objectives for fire protection services because they would not provide or

require the construction of new or physical alteration of existing governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for fire protection. As described in Section 3.18, *Wildfire*, the Project Site is within an area classified as a Very High Fire Hazard Severity Zone. As an example, the Fountain Fire destroyed approximately 600 structures in Round Mountain, Montgomery Creek, and the surrounding area and burned approximately 64,000 acres in 1992. A burn scar from that fire remains evident on the landscape within the Project Site. The Project could increase the demand for fire protection and response services due to the possibility that Project-related vehicles or infrastructure could ignite a fire. However, this increase in potential demand would be moderated by the proposed preparation of a Project-specific Fire Prevention Plan to be prepared consistent with the directives in the Shasta County Fire Safety Standards (Shasta County, 2017), the Forest Practice Rules (CAL FIRE, 2019), CAL FIRE's Shasta–Trinity Unit Strategic Fire Plan (CAL FIRE, 2017), and maintenance of adequate firebreaks and other fire prevention precautionary measures. Further, increases in long-term demand for fire protection services typically are associated with substantial increases in population, which would not occur as a result of the Project. See Section 3.1.3.6, *Population and Housing, Growth Inducement*. Because no new or modified fire protection facilities would be required, the Project would result in no impact relating to the construction of new or modification of existing governmental fire protection facilities.

Police Protection Services

Increases in long-term demand for police protection services typically are associated with substantial increases in population, which would not occur as a result of the Project. See Section 3.1.3.6, *Population and Housing, Growth Inducement*. The Project could cause an increase in the demand for police services associated with security issues during construction or decommissioning (e.g., theft of equipment or materials from the Project Site) or operation and maintenance (e.g., to police illegal trespassing). However, because the Project would be located entirely on private property and public access would be restricted by gates and posted "no trespassing" signs, any such increase in demand is not expected to be substantial and could be met by existing services. Therefore, there would be no need to modify existing, or provide new, police protection facilities to maintain acceptable performance objectives, the construction of which facilities could cause substantial adverse physical impacts. Because no new or modified police protection facilities would be required, the Project would result in no impact in this regard. The same would be true of Alternatives 1 and 2.

Other Public Services

Neither the Project nor Alternatives 1 or 2 would result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for other public services, including schools, parks, hospitals, or libraries. The Shasta County Office of Education supports 101 public schools, 17 public charter schools, and 19 preschools. Five public schools and two preschools are located within 20 miles of the Project Site, and two Head Start childhood education facilities are located within 10 miles of the Project Site. Regarding parks, the Big Bend Community Park, located

approximately 6.5 miles north of the Project Site, is the only developed community park within 20 miles of the Project Site. The hospital nearest to the Project Site is Mayers Memorial District Hospital, 20 miles northeast in Fall River Mills. Mayers Memorial Hospital provides essential hospital and emergency room care, as well as outpatient services. There is one public library within 20 miles of the Project Site. The Burney Branch Library is located approximately 6 miles east of the Project Site. As noted above, the Project would not result in an increase in the permanent population of the area. See Section 3.1.3.6, *Population and Housing, Growth Inducement*. Therefore, any Project workforce-generated demand on such facilities and services is likely to be part of the baseline condition and any temporary increase in population could be accommodated by existing or planned capacity within those systems and services. Because no new or modified schools, parks, hospitals, or libraries would be required, neither the Project nor Alternatives 1 or 2 would result in any impact regarding these public services.

3.1.4.15 Recreation

According to CEQA Guidelines Appendix G Section XVI, a project would result in a significant impact to recreation if it would: a) increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated; or b) include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment. Neither the Project nor Alternatives 1 or 2 would result in any impact relative to these considerations.

The Project and Alternatives 1 and 2 would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated because, as discussed above, the Project would not generate new residents in nearby communities or in the greater Shasta County area. Further, as described in Chapter 2, no recreational facility construction or expansion is proposed or would be required by the Project or alternatives. Accordingly, no impact would result to any of the significance criteria listed in CEQA Guidelines Appendix G Section XVI.

Although there are no parks on or in the immediate vicinity of the Project Site, scoping input suggests that the Project would affect areas that provide recreation based on swimming, hunting and fishing, hiking, biking, cross-country skiing, snowmobiling, and bird watching (Appendix J). The Project Site is private property. Indications of the landowner's intent to exclude the general public from the Project Site include fences, locked gates, and no trespassing signs. Because there is no right to trespass, the proposal to enforce restrictions of public access is not considered an impact to recreation as anticipated in CEQA Guidelines Appendix G Section XVI.

3.1.4.16 Utilities and Service Systems

According to CEQA Guidelines Appendix G Section XIX, a project would result in a significant impact to utilities and service systems if it would: a) require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects; or b) fail to comply with federal, state, and local

management and reduction statutes and regulations related to solid waste. Neither the Project nor Alternatives 1 or 2 would result in any impact relative to these considerations.

See Section 3.17, *Utilities and Service Systems*, for analysis of other the utilities and service systems-related considerations identified in CEQA Guidelines Appendix G, Section XIX.

Water and Wastewater Treatment Facilities

Project Site clearing and construction would require water for dust control, batch concrete mixing, emergency fire suppression, and other activities. This water would be provided by a new on-site well(s) or would be delivered by a contractor using water trucks and sourced from an existing water right. The potential construction of one or more on-site wells and a septic system are included as part of the Project description and impacts are analyzed where appropriate throughout this EIR. Well construction would occur in accordance with the requirements of the water well permitting program administered by the Shasta County Environmental Health Division (EHD). Portable toilets would be provided for construction workers and would be serviced on a regular basis by a licensed contractor who would dispose of sanitary wastewater pursuant to applicable regulations. The Project would not connect permanently to any water or wastewater treatment facilities and would not result in the relocation or construction of new water or wastewater treatment facilities to serve direct Project-related demand that would have any impact not already addressed on a resource-by-resource basis in this EIR. As the construction workers are anticipated to be predominantly local and from the surrounding areas (i.e., Redding, Burney, Fall River Mills, or McArthur), the Project would not result in the need for additional wastewater treatment facilities in order to serve indirect Project-related demand. Therefore, the Project would not result in additional demand for wastewater treatment facilities and have no impact from construction of new wastewater facilities during construction. The same would be true of Alternatives 1 and 2.

Operation and maintenance of the Project would require water for the O&M facility, equipment maintenance and washing, and emergency fire suppression. The O&M facility would be served either by the onsite well, as discussed above, or by an onsite storage tank that would be filled periodically by water trucks from an existing water right. The O&M facility also would utilize an onsite septic system. The construction of storage tanks and an onsite septic system is included as part of the Project description and impacts are analyzed where appropriate throughout this EIR. Both the onsite storage tanks and septic system would be operated and maintained in accordance with the rules and regulations of the Shasta County Department of Resource Management's Environmental Health Division. The Project would not connect permanently to any water or wastewater treatment facilities and would not result in the relocation or construction of new water or wastewater treatment facilities to serve direct Project-related demand that would have any impact not already addressed on a resource-by-resource basis in this EIR.

The Project would not result in a permanent increase in the populations of local areas such as Redding, Burney, Fall River Mills, or McArthur. The Project would not result in the need for additional water or wastewater treatment facilities in order to serve indirect Project-related demand during operation and maintenance. Therefore, the Project would not result in additional demand for water or wastewater treatment facilities and have no impact from construction of new water or wastewater facilities during operation and maintenance.

Water and wastewater use during decommissioning would be limited to use for fire protection, dust suppression, and portable toilets. If a domestic well is installed during construction, operation, or maintenance, it would remain on-site. Decommissioning of the Project would not result in the construction or relocation of any additional permanent water or wastewater treatment facilities which could cause a significant environmental effect. Therefore, no impact would occur.

Storm Water Drainage Facilities

During site clearing and construction, the Project would maintain onsite stormwater drainage patterns to the extent possible to minimize impacts on runoff and drainage, but new storm water drainage facilities such as ditches and culverts would be constructed to capture and convey stormwater runoff. The construction of stormwater drainage ditches and culverts is included as part of the Project description and impacts are analyzed where appropriate throughout this EIR. As described in Section 2.4.5.6, *Stormwater Control*, the Applicant would prepare a site-specific Storm Water Pollution Prevention Plan (SWPPP) for the Project that would identify best management practices (BMPs) to be used to minimize or eliminate pollution, erosion, and sedimentation during road construction. The Applicant also would prepare a Temporary Erosion and Sediment Control (TESC) Plan, which would be implemented and maintained by the construction contractor throughout operation to further reduce the potential for erosion. For more information regarding the SWPPP or the TESC Plan, see Section 3.12, *Hydrology and Water Quality.* The Project would not create a new connection to any stormwater drainage system and would not result in the relocation or construction of new stormwater drainage facilities due to an increase in runoff from the site. No impact would result.

Decommissioning of the Project would involve removal of turbines, support towers, transformers, substation, switching station, and foundations. No new access roads or road widening would be required. Therefore, decommissioning of the Project would not result in the relocation or the construction of any new stormwater drainage facilities. Under this criterion, there would be no impact.

Electric Power and Telecommunications Facilities

The Project would include site clearing for and construction of 34.5 kV overhead (approximately 12 miles) and underground (approximately 51 miles) collector lines, fiber optic communication cabling, an onsite substation, a switching station, and four permanent Meteorological Equipment (MET) towers. Additionally, a relay microwave tower or overhead fiber optic communication circuits could be required as part of the interconnection facilities. These electrical power and telecommunication facilities are part of the Project description and are analyzed where appropriate throughout this EIR. Construction of other Project components would not result in the need for additional electric power or telecommunication facilities. Therefore, no impact would occur during construction.

Operation and maintenance of the Project would use electrical power supplied by the connections installed during construction as described above. No additional electrical power or telecommunication facilities would be constructed or relocated during operation and maintenance; therefore, no impact would occur.

Decommissioning of the Project would result in removal of all facilities listed above (i.e., overhead and underground collector lines, relay microwave tower, fiber optic cabling, substation, switching station, and MET towers). The decommissioning phase of the Project would not result in any need for additional construction or relocation of new electric power or telecommunication facilities. Under this criterion, there would be no impact.

In response to its notice of intention to prepare this Draft EIR, the County received scoping input asking whether existing electrical infrastructure is adequate to transmit electricity to be generated by the Project reliably and safely once it hits the Round Mountain station operated by PG&E. It is suggested that these lines are at or over electrical capacity during peak times 7 months or more of the year. The County is aware of a Round Mountain 500 kV Area Dynamic Reactive Support project that is being considered as part of the California Independent System Operator's transmission planning process (CAISO, 2019a, 2019b) to maintain reliability for the transmission system in response to increasing variable loading on the transmission system and in anticipation of retiring the Diablo Canyon nuclear power plant in 2025. The County anticipates that the CPUC would analyze the potential environmental impacts of any transmission reliability work proposed to take place in connection with the Round Mountain Substation once sufficient details about such a proposal are known. That project would be proposed many miles away from the Project Site and would have a different applicant, a different CEQA lead agency, and different objectives than the Project analyzed in this EIR. It is anticipated that any reliability upgrades that could be proposed in connection with the Round Mountain substation would be evaluated whether or not the Project proceeds. Although overall electrical system capacity and issues of grid reliability are beyond the scope of the County's consideration under CEQA of impacts of the proposed wind project, the County further notes that a regional grid reliability project at or near the Round Mountain Substation appears to be proceeding (TransmissionHub, 2020).

Natural Gas Facilities

No new or relocated natural gas facilities are proposed or would be required for construction, operation and maintenance, or decommissioning of the Project or Alternatives. Therefore, no impact would result regarding the relocation or construction of such facilities.

Regulatory Compliance and Solid Waste

No federal regulations governing solid waste apply to the Project, so there would be no impact to federal statutes and regulations related to solid waste. As discussed in connection with Impact 13.7-3 in Section 3.17, *Utilities and Service Systems*, the Project would be consistent with both the Forest Practice Act of 1973 regarding non-biodegradable waste, as well as the California Green Building Standards Code regarding biodegradable waste. The Project also would comply with the Shasta County EHD regarding disposal of solid waste. Therefore, there would be no impact as the Project would comply with all federal, State, and local management regulations related to solid waste. The same would be true of Alternatives 1 and 2.

3.1.4.17 "Wind Turbine Syndrome"

Scoping comments identified an unspecified condition called "wind turbine syndrome" as having the potential to cause sleep disturbance, headaches, tinnitus, a sense of quivering or vibration, dizziness, nausea, nervousness, high blood pressure or rapid heartbeat, difficulty with concentration, memory loss, irritability and anger, and seizures (Appendix J).

The term "Wind Turbine Syndrome" was coined by a pediatrician in 2009 in a report that hypothesized that wind turbines generating low frequency sound cause a multitude of symptoms, such as headache and dizziness. An article in the *Journal of Environmental Health* (Roberts and Roberts, 2013) summarizes the study method used in the 2009 report (i.e., a collection of subjective responses from 37 participants interviewed by phone) and summarized peer-reviewed literature examining the relationship between human health effects and exposure to sound generated from the operation of wind turbines. The journal article concluded that "exposure to wind turbine sound and the mere presence of wind turbines" can cause a significant annoyance response among study participants, but that no specific health condition has been documented in the peer-reviewed literature that has been classified as a disease caused by exposure to sound levels and frequencies generated by the operation of wind turbines (Roberts and Roberts, 2013). An article in the May–June 2016 volume of *Neurotoxicology and Teratology* (a bimonthly peer-reviewed scientific journal) also investigated the possibility of an association between residential proximity to wind turbines and symptoms of unknown or uncertain origin (Blanes-Vidal and Schwartz, 2016). This article also reports having found no observed significant relationship between residential proximity to wind turbines and symptoms complained of. That symptoms may be attributed to something other than the wind turbines also is suggested by an article published in *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine* (a bimonthly peer-reviewed scientific journal): "In the research interviews examined, even though interviewees treat those who report experiencing symptoms from wind farms as having primary rights to narrate their own experience, this epistemic primacy does not extend to the ability to 'correctly' identify symptoms' cause. As a result, the legitimacy of health complaints is undermined. Wind turbine syndrome is an example of a contested illness that is politically controversial." (Clark and Botterill, 2018).

With regard to annoyance from wind turbines, the County of San Diego Public Health Office authored a Public Health Position Statement in 2019 that contained a systematic and comprehensive look at claims of adverse health impacts from wind turbines. The Public Health Position Statement states that there is a convincing body of evidence to show that annoyance is strongly related to visual cues and attitude as well as the wind turbine noise itself. "In particular, this was highlighted by the fact that people who benefit economically from wind turbines (e.g., those who have leased their property to wind farm developers) reported significantly lower levels of annoyance than those who received no economic benefit, despite increased proximity to the turbines and exposure to similar (or louder) sound levels" (County of San Diego, 2019). The "body of evidence" referenced by the 2019 Position Statement includes studies by the Minnesota Department of Public Health, Maschke, Havas, the Danish Energy Agency, Niemann, the World Health Organization, and the National Research Council.

Based on the current state of the science, this EIR does not consider potential impacts relating to "Wind Turbine Syndrome" in further detail because: (a) there is no agreement among scientists that Wind Turbine Syndrome is a risk to human health, (b) there are no defined or adopted CEQA standards for defining health risk from wind turbine–generated sound, and (c) the County has determined that the potential for health effects associated with "wind turbine syndrome" as characterized in scoping comments is too speculative to allow for a meaningful evaluation of potential impacts.

3.1.5 Irreversible Impacts

Section 15126.2(d) of the CEQA Guidelines requires an EIR to consider whether a proposed project, if implemented, would result in significant irreversible environmental changes. Such changes are likely to occur for example, following the dedication of a large commitment of non-renewable resources because "a large commitment of such resources makes removal or nonuse thereafter unlikely." Secondary impacts (such as highway improvements, which provide access to a previously inaccessible area) generally commit future generations to similar uses.

For the Fountain Wind Project, the use permit period ultimately would be established by County decision-makers; a 40-year permit duration has been requested. Upon the expiration of the use permit period, the Project would be decommissioned and the Project Site restored to a condition suitable for commercial timber land use (see Section 2.4.7, *Decommissioning and Site Restoration*). Internal roads that would not be needed to serve the future timber land use of the site would be removed and the area restored, including by natural recruitment. Therefore, the Project-specific commitment of non-renewable resources (e.g., oil, gas, and other fossil fuels) would not preclude the removal of Project infrastructure or the site's future use in a way that is comparable to its current use. Irreversible impacts also can result from damage caused by environmental accidents caused by a proposed project (CEQA Guidelines §15126.2[d]). Potential impacts relating to hazards and hazardous materials are analyzed in Section 3.11, which identifies no significant unavoidable adverse effect. For these reasons, the Project would not, if implemented, result in significant irreversible impacts.

3.1.6 References

Blanes-Vidal, V., and J. Schwartz, 2016. Wind turbines and idiopathic symptoms: The confounding effect of concurrent environmental exposures. Neurotoxicology and Teratology. Vol. 55. Abstract available online: https://www.ncbi.nlm.nih.gov/pubmed/27046778. May-June 2016.

Burney Fire Protection District, 2018. Letter from Monte Keady, Fire Chief, to Shasta County Department of Resource Management. January 15, 2018.

Bonin, Zachary. Email communication between Zachary Bonin and Jessica O'Dell. June 5, 2019.

California Air Resources Board (CARB), 2010. Proposed Regulation for a California Renewable Electricity Standard, Staff Report: Initial Statement of Reasons, June 2010. Available online: https://ww3.arb.ca.gov/regact/2010/res2010/res10isor.pdf, accessed March 24, 2020.

California Department of Conservation (DOC), 2016. Shasta County Important Farmland 2016. Available online: https://www.conservation.ca.gov/dlrp/fmmp/Pages/Shasta.aspx

California Data Exchange Center (CDEC), 2019. Northern Sierra Precipitation: 8-Station Index. Available online: http://cdec.water.ca.gov/reportapp/javareports?name=PLOT_ESI.pdf. Accessed May 23, 2019.

California Department of Forestry and Fire Protection (CAL FIRE), 2014. 2014 Wildfire Activity Statistics. Available online: http://www.fire.ca.gov/downloads/redbooks/2014Redbook/2014_Redbook_Complete.pdf. Accessed May 23, 2019.

CAL FIRE, 2016. 2016 Wildfire Activity Statistics. Available online: http://www.fire.ca.gov/downloads/redbooks/2016_Redbook/2016_Redbook_FINAL.PDF. Accessed May 23, 2019.

CAL FIRE, 2019a. Top 20 Largest California Wildfires. Available online: http://www.fire.ca.gov/communications/downloads/fact_sheets/Top20_Acres.pdf. March 14, 2019.

CAL FIRE, 2019b. Incident Information: Hat Fire. Available online: http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=2208. Updated January 4, 2019.

CAL FIRE and Shasta County Fire, 2018. Shasta-Trinity Unit 2018 Strategic Fire Plan. Available online: http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fpppdf1624.pdf. May 10, 2018.

CEC, 2014. California Transmission Lines and Substations. Available at www.energy.ca.gov/maps/

CEC, 2018a. Energy Research and Development Division Final Project Report: Understanding and Reducing Barriers to Wind Energy Expansion in California an Investigation of How Wind Resources Vary by Year and Are Impacted by Climate Change. Report No. CEC-500-2018-035. Available online: https://www.energy.ca.gov/2018publications/CEC-500-2018-035/CEC-500-2018-035.pdf. December 2018.

CEC, 2018b. 2019 Nonresidential Compliance Manual for the 2019 Building Energy Efficiency Standards, Title 24, Part 6, and Associated Administrative Regulations in Part 1, December 2018. Available online: https://ww2.energy.ca.gov/2018publications/CEC-400-2018-018/Compliance_Manual-Complete_without_forms.pdf, accessed March 22, 2020.

CEC, 2019a. Electricity from Wind Energy Statistics & Data. Available online: https://www.energy.ca.gov/almanac/renewables_data/wind/. Accessed May 24, 2019.

CEC, 2019b. Substations - California Energy Commission. Available online: https://ww2.energy.ca.gov › maps › powerplants › Operational_Substations. Accessed December 11, 2019.

CEQANet, 2019. Search for Environmental Documents in the City of Redding and City of Anderson. Accessed July 26, 2019.

California Independent System Operator (CAISO), 2019a. 2018-2019 Transmission Plan. Available online: http://www.caiso.com/Documents/ISO_BoardApproved-2018-2019_Transmission_Plan.pdf. March 29, 2019.

Caltrans, 2019. Email communication between Marcelino Gonzalez and Jessica O'Dell. May 28, 2019.

CAISO, 2019b. Round Mountain 500 kV Area Dynamic Reactive Support Description and Functional Specifications for Competitive Solicitation Revision 1. Available online: http://www.caiso.com/Documents/RoundMountain500kVAreaDynamicReactiveSupportDescriptionandFunctionalSpecs-Revision1.pdf. May 14, 2019.

California Department of Conservation, Division of Mines and Geology (DMG), 2000. A General Location Guide for Ultramafic Rocks in California - Areas More Likely to Contain Naturally Occurring Asbestos Compiled By Ronald K. Churchill and Robert L. Hill, August 2000, Available online at: ftp://ftp.consrv.ca.gov/pub/dmg/pubs/ofr/ofr_2000-019.pdf. Accessed on March 1, 2020.

California Independent System Operator (CAISO), 2008. California (CAISO) Electric Regions. February 2008.

California Public Utilities Commission (CPUC), 1991. Order Instituting Investigation on the Commission's own motion to develop policies and procedures for addressing the potential health effects of electric and magnetic fields of utility facilities. CPUC Investigation I.91-01-012. January 15, 1991.

CPUC, 1993. Order Instituting Investigation on the Commission's own motion to develop policies and procedures for addressing the potential health effects of electric and magnetic fields of utility facilities. Decision No. 93-11-013, Investigation No. 91-01-012. November 2, 1993.

CPUC, 2006. Opinion on Commission Policies Addressing Electromagnetic Fields Emanating from Regulated Utility Facilities. Rulemaking 04-08-020. Available online: file:///C:/Users/jas/Downloads/PUC_Decision_EMF.pdf. January 26, 2006.

CPUC, 2019a. Current Projects. Available online: https://www.cpuc.ca.gov/General.aspx?id=4389. Accessed December 11, 2019.

CPUC, 2019b. What are EMFs? Available online: https://www.cpuc.ca.gov/Environment/emf/whatemfs.htm. Accessed May 30, 2019.

CPUC, 2019c. PUC Actions Regarding EMFs. Available online: https://www.cpuc.ca.gov/General.aspx?id=3810. Accessed May 30, 2019.

Clark, S. and L. C. Botterill, 2018. Contesting facts about wind farms in Australia and the legitimacy of adverse health effects. Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine. Abstract available online: https://www.ncbi.nlm.nih.gov/pubmed/28401817. July 2018.

ConnectGen, 2019. Email from J. Kuba to L. Salazar and J. Scott. Fountain Wind - LandVest THPs. October 24, 2019.

County of San Diego, 2019. Public Health Position Statement: Human Health Effects of Wind Turbines. February 25, 2019. Available online: https://www.sandiegocounty.gov/content/dam/sdc/pds/advance/2019%20Public%20Health%20Position%20Statement%20on%20Human%20Health%20Effects%20of%20Wind%20Turbines.pdf.

Dashiell Corporation, 2019. Hatchet Ridge Wind Farm - Shasta County, California. Available online: https://www.dashiell.com/index.php?id=187. Accessed December 11, 2019.

Division of Mines and Geology (DMG), 1997. DMG OPEN-FILE REPORT 97-03. Mineral Land Classification of Alluvial San and Gravel, Crushed Stone, Volcanic Cinders, Limestone, and Diatomite within Shasta County, California. 1997. Available online: ftp://ftp.consrv.ca.gov/pub/dmg/pubs/ofr/OFR_97-03/OFR_97-03_Text.pdf

Division of Oil, Gas, and Geothermal Resources (DOGGR), 2020. DOGGR Wellfinder. Available online: https://maps.conservation.ca.gov/doggr/wellfinder/#/-122.12159/40.64470/9

Environmental Science Associates, 2019. Fountain Wind Cumulative Scenario. August 1, 2019.

National Cancer Institute (NCI), 2019. Electromagnetic Fields and Cancer. Available online: https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/electromagnetic-fields-fact-sheet Accessed on May 30, 2019.

National Institute of Environmental Health Sciences (NIEHS), 2018. Electric & Magnetic Fields. Available online: https://www.niehs.nih.gov/health/topics/agents/emf/. November 26, 2018.

National Public Radio (NPR), 2018. NPR's Ailsa Chang speaks with Cal Fire Chief Ken Pimlott about the raging wildfires in California. Available online: https://www.npr.org/2018/11/12/667118339/cal-fire-chief-ken-pimlott-discusses-wildfires-ravaging-california. November 12, 2018.

Pacific Gas & Electric Company (PG&E), 2014. Service Area Map. Available online: https://www.pge.com/tariffs/tm2/pdf/ELEC_MAPS_Service_Area_Map.pdf. Effective December 17, 2014.

Pacific Institute, 2017a. An Era of Extremes. Available online: http://www.californiadrought.org/drought/past-updates/. April 26, 2017.

Pacific Institute, 2017b. Impacts of California's Five-Year (2012-2016) Drought on Hydroelectricity Generation. Available online: https://pacinst.org/wp-content/uploads/2017/04/pi_impacts_of_california_s_five-year__2012-2016_drought_on_hydroelectricity_generation.pdf. April 2017.

Pattern Energy, 2019. Hatchet Ridge Wind, Shasta County, California. Available online: https://patternenergy.com/learn/portfolio/hatchet-ridge-wind. Accessed May 24, 2019.

Roberts, J. D., and M. A. Roberts, 2013a. Wind turbines: is there a human health risk? Journal of Environmental Health. Volume 75, pp. 8-17. April 2013.

Shasta County, 2004. Shasta County General Plan, as Amended through September 2004, Section 6.2 Timberlands and Section 6.3, Minerals. Available online: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/62timber.pdf?sfvrsn=95dea1b0_0. Accessed April 23, 2019.

Shasta County, 2008. Final Environmental Impact Report for the Hatchet Ridge Wind Project. Available online: https://tethys.pnnl.gov/sites/default/files/publications/Shasta-County-2008_0.pdf. June 2008.

Shasta County, 2016. Shasta County Communities Wildfire Protection Plan 2016. Available online: http://www.westernshastarcd.org/Docs/ShastaCWPPs-2016.pdf. Accessed May 22, 2019.

Shasta County, 2017. Fire Safety Standards. Available online: http://shastacountyfire.org/wp-content/uploads/2017/10/FireSafetyStandards_Chapter6.pdf. Revised June 27, 2017.

Shasta County, 2018. General Plan Element 5.0, Public Safety Group. Available online: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/54firesafety.pdf?sfvrsn=204962bd_0. Updated December 11, 2018.

Shasta County, 2019a. Selected Mining Projects from Shasta County Permit System. Retrieved August 16, 2019.

Shasta County, 2019b. FWP-cumulative list-draft-06.24.19. June 24, 2019.

Shasta County, 2019c. Memorandum of Paul A. Hellman, Director of Resource Management, to Leonard Moty, Chairman, and Members of the Board of Supervisors regarding Consistency of Large Scale Wind Energy Facilities with the General Plan and Zoning Plan. August 15, 2019.

Shih, T.-T., 2019. Timberland Conversion in California from 1969 to 1998. California Department of Forestry and Fire Protection Fire and Resource Assessment Program Technical Working Paper 1-01-02:

Shulman, 2018. UPDATE: Evacuation orders lifted for Montgomery Creek residents. Redding Record Searchlight. July 24, 2018.

Stantec Consulting Services (Stantec), 2019. *Fountain Wind Energy Project Cultural Resources Phase 1 Inventory of 4,463 Acres, Shasta County, California.* Prepared for Fountain Wind LLC. December 2019.

Taylor, M., 2018. Report of the Legislative Analyst's Office: Improving California's Forest and Watershed Management. Available online: https://lao.ca.gov/reports/2018/3798/forest-watershed-management-040418.pdf. April 2018.

TransmissionHub, 2020. California ISO selects LS Power subsidiary to build 500-kV dynamic reactive support project. Available online: https://www.transmissionhub.com/articles/2020/03/california-iso-selects-ls-power-subsidiary-to-build-500-kv-dynamic-reactive-support-project.html. March 3, 2020.

U.S. Department of Agriculture (USDA), 2016. More than 100 million dead trees in California from drought. Science Daily. November 25, 2016.

U.S. Environmental Protection Agency (USEPA), 2012. EPA and NHTSA Set Standards to Reduce Greenhouse Gases and Improve Fuel Economy for Model Years 2017-2025 Cars and Light Trucks, August 2012. Available online: https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZ7C.PDF?Dockey=P100EZ7C.PDF, accessed March 24, 2020.

USEPA, 2019. Electric and Magnetic Fields from Power Lines. Available online: https://www.epa.gov/radtown/electric-and-magnetic-fields-power-lines. March 26, 2019.

U.S. Forest Service (USFS), 2013. Decision Notice: Finding of No Significant Impact, Bagley Hazard Tree Abatement Project. August 29, 2013. Available online: https://www.fs.usda.gov/projects/stnf/landmanagement/projects Accessed: January 7, 2020.

USFS, 2016. Record of Decision Green-Horse Habitat Restoration and Maintenance Project. November 2016. Available online: https://www.fs.usda.gov/projects/stnf/landmanagement/projects Accessed: January 7, 2020.

USFS, 2018a. Decision Memo: Chalk Mountain Plantation Thin and Underburn Project. December 3, 2018. Available online: https://www.fs.usda.gov/projects/stnf/landmanagement/projects Accessed: January 7, 2020.

USFS, 2018b. InciWeb-Incident Information System: Hirz Fire. Available online: https://inciweb.nwcg.gov/incident/6116/. November 26, 2018.Valavanidis, 2018. Glyphosate, the Most Widely Used Herbicide. Health and safety issues. Why scientists differ in their evaluation of its adverse health effects. Available online: file:///C:/Users/jscott/Downloads/GLYPHOSATE-REVIEW-12-3-2018.pdf. December 3, 2018.

University of California Museum of Paleontology Localities (UCMP), 2020. Results for Shasta County, California. Accessed March 12, 2020.

World Health Organization (WHO), 2007. Environmental Health Criteria 238: Extremely Low Frequency Fields. Available online: https://www.who.int/peh-emf/publications/Complet_DEC_2007.pdf. December 2007.

3.2 Aesthetics

This section identifies and evaluates issues related to Aesthetics in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. The information and analysis presented in this section are based in part on the Visual Resources Technical Report provided in **Appendix A**, *Aesthetics*. The County independently reviewed this and other materials prepared by or on behalf of the Applicant and determined them to be suitable for reliance on (in combination with other materials included in the formal record) in the preparation of this Draft EIR.

The County received scoping input about aesthetic and visual resources. All scoping input received, including regarding aesthetic and visual resources, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

3.2.1 Visual Concepts and Terminology

Individuals' values, familiarity with a landscape, concern for a landscape, or interpretation of scenic quality can lead to varying individual determinations of scenic quality and varying individual responses to changes made to a landscape. Due to unique individual attachments to values for a particular landscape, visual changes will inherently affect viewers differently. However, general assumptions can be made about viewer sensitivity to scenic quality and visual changes. For the purpose of this analysis, visual or aesthetic resources are defined as both the natural and built features of the landscape that contribute to the public's experience and appreciation of a given environment. Definitions of the following terms and concepts are provided in order to aid the readers' understanding of the content in this section. The following definitions are adapted slightly from the Federal Highway Administration *Guidelines for the Assessment of Highway Projects* (FHWA, 2015).

Visual Character is a description of the visible attributes of a scene or object typically using artistic terms such as form, line, color, and texture.

Visual Resources can be either natural visual resources such as land, water, and vegetation. Visual Resources that are primarily geological or biological in origin are considered natural.

Cultural Visual Resources can include buildings structures, and artifacts. Generally, visual resources that are manmade are considered cultural visual resources. Land, water, and vegetation may contribute to the importance of cultural visual resources.

Visual Quality is defined as the overall visual impression or attractiveness of an area as determined by the particular landscape characteristics, including landforms, rock forms, water features, and vegetation patterns. The attributes of line, form and color combine in various ways to create landscape characteristics whose variety, vividness, coherence, uniqueness, harmony, and pattern contribute to the overall visual quality of an area. Different viewers may evaluate visual resource differently depending on their interests in natural harmony (generally harmony is considered

desirable; disharmony is undesirable), cultural order (orderly is considered desirable; disorderly is undesirable) and project coherence (coherent is considered desirable; incoherent is undesirable).

Viewer Exposure addresses the variables that affect viewing conditions from potentially sensitive areas. Viewer exposure considers the following factors:

- Landscape visibility (i.e., the ability to see the landscape)
- Viewing distance (i.e., the proximity of viewers to the Project)
- Viewing angle – whether the Project would be viewed from above (superior), below (inferior), or from a level line of sight (normal)
- Extent of visibility – whether the line of sight is open and panoramic to the Project area or restricted by terrain, vegetation and/or structures
- Duration of view

Viewer Types and Volumes of use pertain to the types of use (e.g., public viewers including recreationalist and motorist) and amounts of use (e.g., number of recreational users or motorists) that various land uses receive. Generally, recreational users are expected to be highly concerned with scenery and landscape character whereas people who commute through a landscape daily to work are expected to have a lower concern for visual, scenic quality.

Visual Sensitivity is the overall measure of an existing landscape's susceptibility to adverse visual changes. People in different visual settings, typically characterized by different land uses surrounding a project, have varying degrees of sensitivity to changes in visual conditions depending on the overall visual characteristics of the place. In areas of more distinctive visual quality, such as designated scenic highways, designated scenic roads, parks, and recreation and natural areas, visual sensitivity is characteristically more pronounced. In areas of more indistinctive or representative visual quality, sensitivity to change tends to be less pronounced, depending on the level of visual exposure. This analysis of visual sensitivity is based on the combined factors of visual quality, viewer types and volumes, and visual exposure to the Project. Visual sensitivity is reflected according to high, moderate, and low visual sensitivity ranges.

Definitions for the following terms also are provided as they are used to describe and assess the aesthetic setting and impacts from the Project and alternatives.

Color is the property of reflecting light of a particular intensity and wavelength (or mixture of wavelengths) to which the eye is sensitive. It is the major visual property of surfaces.

Contrast is the opposition or unlikeness of different forms, lines, colors, or textures in a landscape. The contrast can be measured by comparing the project features with the major features in the existing landscape.

Form is the mass or shape of an object or objects which appear unified.

Vividness is the strength of memorability of the visual impression created by the visual elements that create the visual character of a landscape.

Unity is the degree to which the visual resources and elements of the landscape join to form a coherent, harmonious visual pattern.

Intactness refers to the integrity of visual order in the natural and human-built environment.

Texture is the visual manifestations of the interplay of light and shadow created by the variations in the surface of an object or landscape.

Line is the path, real or imagined, that the eye follows when perceiving abrupt differences in form, color, or texture. Within landscapes, lines may be found as ridges, skylines, structures, changes in vegetative types, or individual trees and branches.

Landscape Unit refers to an area with similar visual features, a homogenous visual character, and frequently a single viewshed, or "seen" area.

A ***Key Observation Point (KOP)*** is a viewpoint selected for use in a visual impact analysis because it is either critical or representative of the visual character of either the environment of the project. KOPs for this Project are shown in **Figure 3.2-1**, *Project Location, Visual Resources, and Key Observation Points.*

Character Views are not relied upon in the formal visual analysis as a KOP but rather serve to supplement discussions of existing visual character.

Scenic vista is an area that is designated, signed, and accessible to the public for the purposes of viewing and sightseeing.

A ***scenic highway*** is any stretch of public roadway that is designated as a scenic corridor by a federal, state, or local agency.

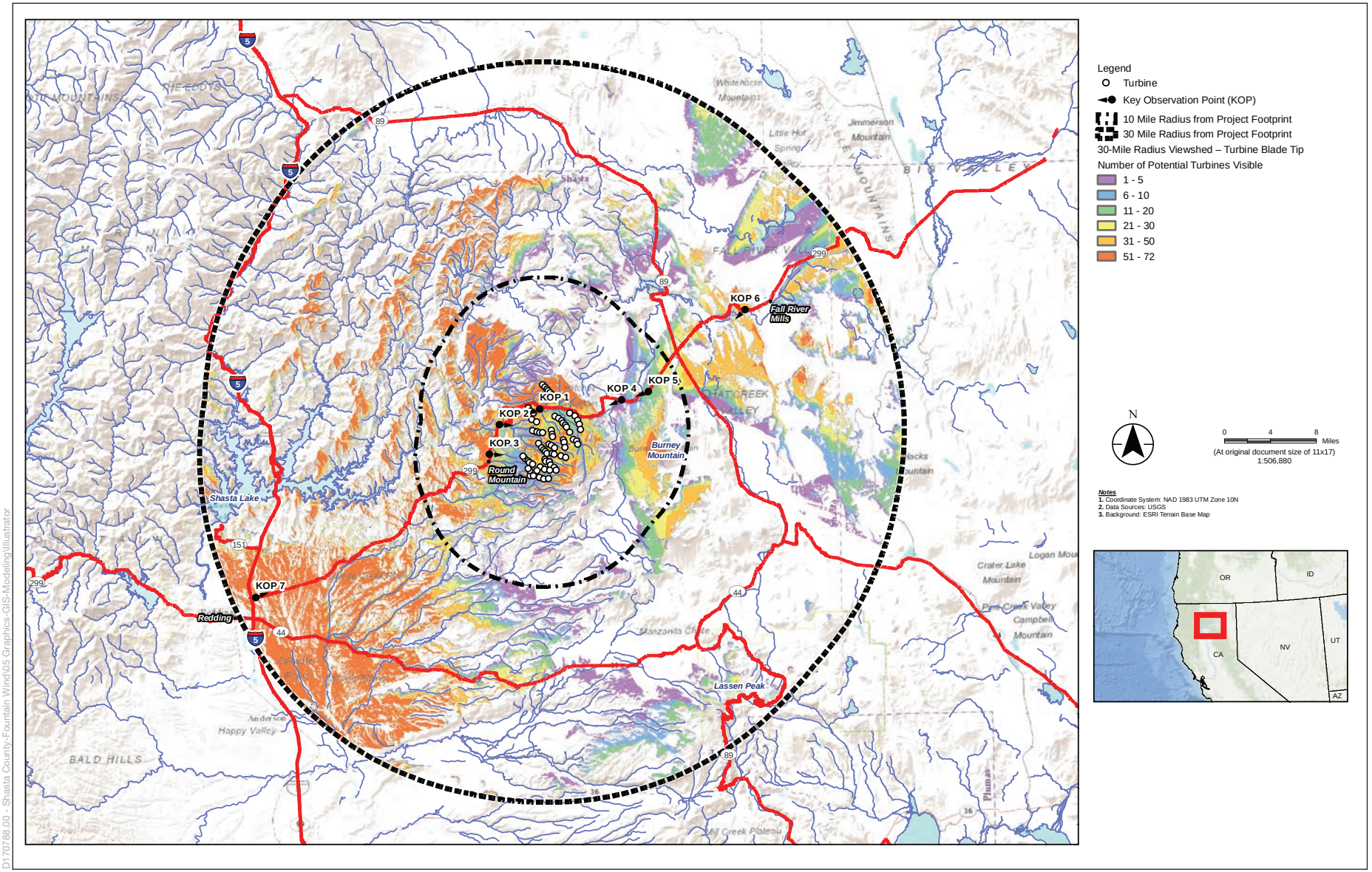
Sensitive receptors or sensitive viewpoints include individuals or groups of individuals that have views of a site afforded by a scenic vista, scenic highway, residence, or public recreation area.

The ***viewshed*** for a project is the surrounding geographic area from which the project is likely to be seen, based on topography, atmospheric conditions, land use patterns, and roadway orientations.

3.2.2 Setting

3.2.2.1 Study Area

The study area for this visual resources analysis is consistent with the study area defined in the Visual Resources Technical Report. i.e., the presumed maximum viewshed for the Project, including the areas within which the Project is likely to be seen, and the areas of presumed or known visual concern. As an example, for an on-shore, utility-scale wind energy project, the viewshed is typically the area within a 10- to 20-mile radius of the Project. The topography of the region (a mountainous project location with valley regions both east and west of the Project Site and elevated areas with direct lines of sight to the east) and the size of the Proposed turbines could result in a greater amount of visibility of the Project and, therefore, a larger theoretical



SOURCE: Stantec

Fountain Wind

Figure 3.2-1
Project Location, Visual Resources, and Key Observation Points

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viewshed than for other wind projects. Additionally, scoping comments received from the public discussed the long range views available from the Sacramento Valley of the Project Site and mountains to the east. As a result, the study area was increased to include a 30-mile radius from the Project Site for this analysis.

Within this 30-mile radius, the landscape character varies widely based on the topography, landscape character, and land uses. Therefore, within the Visual Resources Technical Report, three distinct landscape units were defined in order to inform a selection of viewpoints which are representative of diverse views within the study area. These landscape units include the Mountain Communities, Hat Creek and Pit River, and Sacramento Valley.

3.2.2.2 Environmental Setting

This section discusses the environmental conditions related to aesthetics within the study area defined above. It summarizes setting information provided in Appendix A. Information in the appended technical report is re-ordered within this section to flow geographically west to east. Therefore, the numbering of some KOPs and Character Views is not presented sequentially.

Representative Viewpoints

Visual resource specialists from Stantec Consulting Services, Inc. (Stantec) conducted two site visits where they collected photographs of the Project Site from 37 viewpoints including viewpoints from representative or visually sensitive areas within the study area. Photographs from additional viewpoints were collected to account for potentially sensitive receptors and views identified as particularly sensitive during the public scoping period. From this set of 37 viewpoints, Stantec then coordinated with Shasta County to identify seven views that are representative of the range of viewer sensitivities, landscapes, and land uses in the Project viewshed. Appendix G of the CEQA Guidelines suggests that an aesthetics analysis analyze impacts to public views, and defines public views as "those that are experienced from publicly accessible vantage points." Consistent with CEQA's focus on potential impacts to the public at large rather than to individual members of the public, and consistent with the definition provided in the CEQA Guidelines, the seven viewpoints selected for more detailed consideration in the technical report represent publicly accessible views and locations; they do not assess visual impacts to private views. The locations of each of these seven KOPs are demonstrated on Figure 3.2-1 and in other figures that have been brought forward from the technical report with naming intact for ease in cross-referencing should readers elect to refer to Appendix A for additional detail. To view the 7 KOP locations, see **Figure 3.2-2**, *Character Views 5 and 6*, and **Figure 3.2-3**, *Character Views 1 and 2*. Additionally, from the 37 viewpoints originally photographed, Stantec identified views from six locations in the different landscape units that represent the visual character typical of views within each landscape unit.

Environmental conditions include the regional and local visual environment organized according to the distinct landscape units described above- the Sacramento Valley, Mountain Communities, and Hat Creek and Pit River area. Other components of environmental conditions include sources of light and glare within the Project Site; sensitive visual receptors; visual quality of the study area; KOPs selected to determine existing environmental conditions; and to assess impacts of the

Character View 5: View from eastbound SR 299, just east of Bella Vista. Urban and suburban development, rangelands, foothills, and mature trees are typical of the visual character east of Redding. Hatchet Ridge Wind project turbines are faintly detectable along the ridgeline in the left side of the view.

Character View 6: View from Hilltop Drive facing east, just east of I-5 in Redding. Burney Mountain is visible in the right side of the view, approximately 41 miles away. Hatchet Ridge Wind turbines are detectable along the ridgeline in the left of the view, approximately 36 miles away.

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SOURCE: Stantec

Fountain Wind

Figure 3.2-2
Character Views 5 and 6

Character View 1: View along eastbound SR 299, approaching Hatchet Summit from the west. Hatchet Ridge Wind project turbines are visible to the northeast; however, most views from the highway corridor are obstructed by trees.

Character View 2: View along westbound SR 299, near the community of Johnson Park and just east of the SR 299 / SR 89 junction. Trees line the highway corridors throughout this area, which narrows or eliminates views to the west.

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SOURCE: Stantec

Fountain Wind Project

Figure 3.2-3
Character Views 1 and 2

Project and alternatives. This environmental setting section and the following analysis analyze the existing visual quality and potential Project impacts to views from publicly accessible viewpoints and does not consider the impacts to private views or the views from individual residences. **Table 3.2-1**, *Key Observation Points*, outlines the three landscape units, the KOPs located in each landscape unit, typical viewers at each KOP, and the distance from each KOP to the Project Site.

TABLE 3.2-1
KEY OBSERVATION POINTS

Landscape/KOP	Distance from Nearest Project Turbine (miles)	Visual Resources	Typical Viewer
Mountain Communities			
KOP 1	0.8	Designated overlook just off of SR 299	Residents, tourists
KOP 2	3.1	Elementary school	Residents, tourists, commuters, workers
KOP 3	3.1	Hill Country Clinic/ Community Center	Residents, tourists, commuters, workers
KOP 4	4.5	Rural mountain landscape	Tourists, commuters, workers
KOP 5	7.1	Main population center east of Project	Residents, tourists, commuters, workers
Hat Creek and Pit River			
KOP 6	18.6	Eligible State Scenic Highway	Recreationists, tourists, commuters
Sacramento Valley			
KOP 7	27.8	Main population center west of project	Residents, tourists, commuters, workers

Ownership in the surrounding Trinity and Cascade ranges is a mix of both private and public ownership including both state and national forest land. Land uses in this area primarily consist of timber production, rangeland, open space and recreation, and rural land uses. Designated recreation areas in the area include McArthur-Burney Falls (approximately 12.5 miles from the Project Site) and Ahjumawi Lava Springs State Parks (approximately 26 miles from the Project Site), Lassen Volcanic National Park (approximately 21.5 miles from the Project Site), Whiskeytown-Shasta-Trinity National Recreation Area (approximately 35 miles from the Project Site), and the Pacific Crest National Scenic Trail (approximately 21 miles from the Project Site).

Viewer Sensitivity

Residential Viewers

Residential neighbors live within viewing distance of the Project. The visual preferences of residents tend toward a desire to maintain the existing landscape as it is. Depending on their location, residential neighbors often are interested in cultural order and natural harmony with less emphasis on project coherence unless it affects their ability to appreciate the other two aspects of visual quality.

Recreational viewers

Recreationalists may participate in organized activities, indoor or outdoor leisure activities or cultural activities. The visual preference of recreationalists tends to be focused on and associated with their recreational activity. They tend to prefer the status quo and are leery of visual encroachments that may cause adverse effects on the setting of their activity. Depending on the type of recreation, recreational neighbors are very interested in cultural order and natural harmony, with some emphasis on project coherence as it affects their experience traveling to their recreational activity.

Tourists

Tourists travel on a highway, primarily for enjoyment usually to a pre-determined destination. Tourist trips tend to be more adventuresome, cover longer distances, and take more time than commuting trips. Tourists frequently travel in groups with both a driver and passenger(s), and are equally interested in project coherence, cultural order, and natural harmony.

Workers

Viewers of a project can include agricultural neighbors, timber workers, or construction workers who spend time outside. Some workers are permanent; many are migratory but may return to the same area again and again over the years. Outdoor workers regard cultural order and natural harmony as critical components of the landscape. They are less interested in project coherence.

Commuters

Commuters are regular travelers of the same route. The frequency of the travel may vary, but there tend to be peaks- such as morning and evening rush hours and holidays. Commuters, like all travelers are particularly interested in project coherence. They are also interested in cultural order and natural harmony to the extent that it contributes to wayfinding.

With regard to viewer sensitivity, residents, recreationists, and tourists are assumed to have moderately high to high sensitivity to visual change, based on the context of specific views. Workers and commuters are assumed to have more moderate sensitivity to visual change.

Sacramento Valley Character

The Project Site is located in rural, unincorporated Shasta County, approximately 28 miles northeast of Redding. Within the region, Redding is the largest city at the northern end of the Sacramento Valley, approximately 26 miles southwest of the Project Site. Communities in the region generally are located along the main transportation routes of Interstate 5 (I-5) and State Route (SR) 299. The major north-south route in the region is I-5, a four-lane divided highway located approximately 28 miles west of the Project Site. SR 299 runs east to west from the valley floor into the Cascade Range, climbing in altitude as it passes through the foothills into the mountains. The City of Redding area has a relatively flat topography and includes primarily a mix of commercial/institutional development in the downtown area west of the Sacramento River and mix of commercial development in the central business district east of the river. The outer ring region of both downtown and central business district is developed primarily with single-family

residential development. Surrounding communities in the valley (such as in the greater Anderson, Redding, and Shasta Lake areas, Cottonwood, and Palo Cedro) consist of a mix of rural agricultural, residential, commercial and industrial development. The community of Bella Vista is located east of Redding in the transitional foothills between the valley and the Cascade Mountains. Development in Redding and the surrounding area includes built features such as structures, and vertical and linear features such as light poles, transmission lines, and roadways. These features occasionally block views of the surrounding foothills and mountains.

Due to the low elevation of the valley floor, views of the Cascade Range and Trinity Mountains are available from Redding and the surrounding areas. From many locations in urban Redding, views to the east are blocked by structures and vegetation; however, from some locations in urban Redding, the mountains to the east can be seen as a mostly uninterrupted skyline with rangelands and foothills in the foreground (see Figure 3.2-2, *Character View 5*). The Hatchet Ridge Wind Project turbines are faintly visible from along the ridgeline in these views. Visual character within this landscape unit is defined by the urban and suburban development surrounding Redding and the ridgelines and forms of surrounding mountains.

Redding is the largest population center near the Project Site, and viewer types present in the landscape unit including residents, workers, travelers, and commuters. Views toward the Project within this landscape unit would primarily be brief and intermittent along roads. More sustained views within this landscape unit may be accessible for pedestrians or cyclists traveling east along roadways or from stationary locations such as parks.

KOP 7 is located within the Sacramento Valley and represents views from Redding toward the Project Site, located 28 miles to the east. The viewpoint is located along a bike path near the eastbound lanes of SR 299, just under 0.5 mile east of I-5. Nearby neighborhoods are obscured by dense trees. Built features such as signage, light poles, and transmission and distribution lines, roads and other development. Sources of nighttime lighting in this view would include the Hatchet Ridge turbines, light poles, surrounding development, and cars traveling on SR 299 and I-5. Views such as those represented by KOP 7 would primarily be experienced by residents, workers, and travelers and commuters.

Mountain Communities Character

This landscape unit includes the portion of the study area between the foothills east of Bella Vista and SR 89 east of the Project Site. The Project Site is located entirely within this landscape unit. The Lassen National Forest is located southeast of the Project Site while the Shasta-Trinity National Forest is to the north. Other surrounding lands are privately owned. Many are used for timber harvesting purposes. The Project Site is located near the private recreational facility of Moose Camp in which approximately 75 members use 50 cabin residences year-round. Because Moose Camp and the leasehold area in which the Project Site is located are privately owned, publicly accessible views are not available from these areas. Most of the project vicinity is densely forested with pine, mixed conifer, fir forests, montane chaparral, and forest scrub which limits views of surrounding areas.

From the valley to the Cascade Range to the east, the mountains become larger, the vegetation transitions to mixed conifer forests, and the topography transitions to a mix of steep ridges, buttes, and peaks separated by small valleys. Small, rural communities such as Round Mountain, Montgomery Creek, and Burney are located intermittently along SR 299. SR 299 winds through these communities and offers intermittent views of the mountains and valleys. The densely vegetated areas of the forest are interrupted by burn scars from fires, timber clearcuts, and nearby rural communities. Depending on the location of the viewer, views range from enclosed due to the topography and vegetation to expansive views of rolling vegetated mountains in the foreground to snowcapped peaks in in distance. Views from publicly accessible locations near the Project Site contain ridgelines and slopes of varying grades with partial to complete coverage of evergreen trees. Dispersed residences are visible between communities and managed timberlands and lumber manufacturing facilities and associated infrastructure and roads are visible between towns. The existing Hatchet Ridge turbines are visible along the ridgelines from various vantage points throughout this landscape unit (see Figure 3.2-3, *Character Views 1 and 2*). Sources of nighttime lighting include surrounding rural development, traffic along SR 299, and the safety lighting on the existing Hatchet Ridge turbines.

Within the Mountain Communities landscape type, the visual character is defined by ridgeline forms visible above and beyond vivid evergreen trees. Human elements such as linear roadways, utility poles, transmission corridors, timber operations and the wind turbines also shape the visual character and introduce an element of contrast with the otherwise natural environment. Typical viewers within this landscape unit include tourists who may be seeking out vista views or traveling to recreational destinations as well as commuters, workers, and residents within the region. Views in this landscape unit would primarily be brief and intermittent as travelers drive through the landscape along SR 299. The designated Fountain Fire Overlook (KOP 1) provides sustained, contemplative views. Additionally, informal pullouts along SR 299 and other community resources such as schools and community centers may provide sustained views.

KOP 1 through KOP 5 are located within this landscape unit. KOP 1, the Fountain Fire Overlook, is a designated viewpoint commemorating the 1992 Fountain Fire which burned approximately 64,000 acres in the area. The majority of the land visible from this KOP is privately owned and there is active logging in the area. The types of development visible to viewers from this KOP include managed timberland and associated roads and infrastructure comprise the majority of development between towns and communities.

KOP 2 in Montgomery Creek and KOP 3 in Round Mountain are representative of views to the east from the western slopes. These locations provide intermittent views of the nearby ridgelines and developed communities. Certain portions of SR 299 are located in areas where more expansive views are available as shown in KOP 4. However, most views along SR 299 in this region are enclosed by trees and structures. The views shown in KOP 5, located in Burney, demonstrates the presence of intervening elements from an urbanized environment.

Hat Creek and Pit River Character

This landscape unit includes the portion of the study area east of SR 89. The visual character of this landscape unit is characterized by the contrast between the Hat Creek Valley and the peaks

and buttes located to the east and west, see **Figure 3.2-4**, *Character Views 3 and 4*. Within the Valley, Hat Creek flows to the north through the flatlands and into the Pit River. Approximately 11 miles from the Project Site, views to the west are blocked by Burney Mountain and other ridgelines. Higher elevations within the valley provide broader views to the west, represented by KOP 6, an informal lookout along Haney Mountain approximately 19 miles from the Project Site. The varied topography of the region is visible within views from KOP 6. The Hatchet Ridge turbines are discernable along the ridgeline in the distance. An electrical transmission corridor extends into the background. Sources of nighttime lighting in the landscape unit include traffic along SR 299 and SR 89 and rural development.

Within this landscape unit, travelers, residents, commuters, recreationists and workers are common typical viewers. Popular recreational locations near this landscape unit include Hat Creek and Pit River, the Volcanic Legacy Scenic Byway, the Pacific Crest National Scenic Trail between McArthur-Burney Falls Memorial State Park and Lassen Volcanic National Park. Views within this landscape unit would primarily be brief as viewers travel along SR 299. Longer, more sustained views would be available from pullouts along SR 299 and SR 89.

3.2.2.3 Regulatory Setting

Federal

Federal Aviation Administration Regulations on Objects Affecting Navigable Airspace

The Federal Aviation Administration (FAA) is the federal agency that identifies potential impacts related to air traffic and related safety hazards. The FAA's Federal Aviation Regulations (FAR) at 14 CFR Part 77 establish standards and notification requirements for objects affecting navigable airspace. This notification serves as the basis for evaluating the effect of the proposed construction or alteration on operating procedures; determining the potential hazardous effect of the proposed construction on air navigation; identifying mitigating measures to enhance safe air navigation; and charting of new objects. FAA standards and Advisory Circular 70/7460-1L (FAA, 2018) govern the marking and lighting of obstructions that have been deemed to be a hazard to air navigation. In general, any temporary or permanent structure, including appurtenances, that exceeds an overall height of 200 feet (61 m) above ground level (AGL) meets the requirements to be marked and/or lighted. This would include the proposed meteorological evaluation towers (METs) and wind turbines. The lighting and marking standards in Advisory Circular 70/7460-1L were developed specifically to reduce potential impacts on migratory bird populations (FAA, 2018).

State

California State Scenic Highway Program

In 1963, the California Legislature created the Scenic Highway Program to protect scenic highway corridors from changes that would diminish the aesthetic value of lands adjacent to the highways. A highway may be designated as "scenic" depending on how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent to which development intrudes upon the travelers' enjoyment of the view. The Scenic Highway System includes highways that are either eligible for designation or have been designated as such. There

Character View 3: View from Cassel Road facing southwest, east of SR 89 and Hat Creek, one of few locations with unobstructed views to the west. Burney Mountain is visible in the left side of the view. The Project would be approximately 12 miles away from this location. The row of trees beyond the Hat Creek sign are typical of view obstructing vegetation along SR 89.

Character View 4: View from Big Valley Point Summit facing southwest, east of Fall River Mills. Burney Mountain is approximately 27 miles away and is visible in the left of the view. Saddle Mountain and Haney Mountain are approximately 13 miles away and are visible in the right of the view, appearing above the Fall River Valley.

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SOURCE: Stantec

Fountain Wind

Figure 3.2-4
Character Views 3 and 4

is only one designated state scenic highway in Shasta County: a 3.3-mile segment of SR 151 extending south from Shasta Dam which is located 28 miles from the western edge of the Project Site. Eligible State Scenic Highways include SR 89 from the Siskiyou County border to its intersection with SR 44 (at its closest approximately 11 miles from the Project Site), SR 299 west of I-5, and east of SR 89 (runs through the Project Site), and SR 44 from I-5 to its intersection with SR 89 (Caltrans, 2019).

Local

Shasta County General Plan

The Scenic Highways element of the Shasta County General Plan is intended to establish and protect state or county roads with scenic value. The element defines the term "scenic highway" as any freeway, highway, road, street, or boulevard which traverses an area of unusual scenic quality. The element also defines the area that is easily visible from a scenic highway or road as a "scenic corridor." The scenic highways element also defines unique features which define the visual quality of scenic corridors:

- **Focal points** – prominent natural or man-made features which immediately catch the eye.
- **Transition areas** – locations where the visual environment changes dramatically.
- **Gateways** – locations which mark the entrance to a community or geographic area

Figure SH-1 in the Scenic Highways element identifies such scenic highways and features. It shows Hatchet Ridge Summit on SR 299 as designated a "gateway." Additionally, SR 299 from Bella Vista east to the Hatchet Ridge Summit gateway and SR 44 from Old Station to Millville each is considered a "corridor in which the natural environment is dominant." SR 299 from the Hatchet Ridge Summit gateway to Burney is considered a "corridor in which natural and manmade environment contrast." I-5 from the City of Shasta Lake north to the County border is considered a "corridor in which the natural environment is dominant" (Shasta County, 2004).

Shasta County has developed the following objectives and policies to protect the visual quality of scenic highways and corridors within the County.

> **Objective SH-1:** Protection of the natural scenery along the official scenic highways of Shasta County from new development which would diminish the aesthetic value of the scenic corridor.
>
> **Objective SH-2:** New development along scenic corridors of the official scenic highway should be designed to relate to the dominant character of the corridor (natural or natural and man-made contrast) or of a particular segment of the corridor. Relationships shall be achieved in part through regulations concerning building form, site location, and density of new development.
>
> **Objective SH-3:** Recognition that the management practices of agriculture, timber, and other resource-based industries which may cause some degradation of the visual quality of the scenic corridor are inevitable but their impacts are temporary.
>
> > ***Policy SH-a*:** To protect the value of the natural and scenic character of the official scenic highway corridors and the County gateways dominated by the natural environment, the

following provisions, along with the County development standards, shall govern new development:

- setback requirements
- regulations of building form, material, and color
- landscaping with native vegetation, where possible
- minimizing grading and cut and fill activities
- requiring use of adequate erosion and sediment control programs
- siting of new structures to minimize visual impacts from highway
- regulation of the type, size, and location of advertising signs
- utility lines shall be underground wherever possible; where undergrounding is not practical, lines should be sited in a manner which minimizes their visual intrusion.

***Policy SH-b*:** The type, size, design, and placement of signs within an official corridor shall be compatible with the visual character of the immediate surroundings. The County's sign regulations should be redrafted for the following locations:

- timberlands and forest areas
- croplands and grazing lands
- rural community centers
- urban and town centers
- recreational uses

***Policy SH-c*:** Official scenic highways should include vista sites, turnouts, restrooms, picnic grounds, travel information, and other related facilities/services.

Shasta County Zoning Ordinance

Section 17.84.050 of the Shasta County Zoning Ordinance outlines requirements for outdoor lighting as follows: "All lighting, exterior and interior, shall be designed and located so as to confine direct lighting to the premises. A light source shall not shine upon or illuminate directly on any surface other than the area required to be lighted. No lighting shall be of the type or in a location such that constitutes a hazard to vehicular traffic, either on private property or on abutting streets."

3.2.3 Significance Criteria

A project would have a significant impact to Aesthetics if it would:

a) Have a substantial adverse effect on a scenic vista or substantially degrade the existing visual character or quality of public views of the site and its surroundings from publicly accessible vantage point.

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;

c) Create a new source of substantial light or glare which would adversely affect daytime or nighttime views in the area.

CEQA Guidelines Appendix G Section I suggests, "In non-urbanized areas," a project would have a significant effect on the environment if it would "substantially degrade the existing visual character or quality of public views of the site and its surroundings." Public views are defined for purposes of this inquiry as "those that are experienced from publicly accessible vantage point." A different consideration is suggested if a project would be located in an urbanized area. The Project is not proposed to be located in an area that meets the CEQA definition of "urbanized" (Pub. Res. Code §21071); therefore, the analysis below focuses on the potential for the Project or an alternative to substantially degrade the existing visual character or quality of public views. Because the analysis of visual character and quality informs adverse effects on scenic vistas and vice versa, the analysis for CEQA Guidelines Appendix G Section I checklist criteria a) and c) are considered together in this analysis.

The degree of visual impact depends on how noticeable the adverse change is in conjunction with the visual sensitivity of the site. An adverse visual impact may occur when: (1) an action perceptibly changes the existing physical features of the landscape that are characteristic of the region or locale; (2) an action introduces new features to the physical landscape that are perceptibly uncharacteristic of the region or locale, or become visually dominant in the viewshed; or (3) an action blocks or totally obscures valued aesthetic features of the landscape. The noticeability of a visual impact is a function of the Project features, context, and viewing conditions (angle of view, distance, and primary viewing directions). The key factors in determining the degree of visual change are visual contrast, project dominance, and view blockage.

Visual Contrast. Visual contrast is a measure of the degree of change in line, form, color, and texture that a project would create, when compared to the existing landscape. Visual contrast ranges from "none" to "strong," and may be defined as:

- None –The element contrast is not visible or perceived;
- Weak –The element contrast can be seen but does not attract attention;
- Moderate –The element contrast begins to attract attention and begins to dominate the characteristic landscape; or
- Strong – The element contrast demands the viewer's attention and cannot be overlooked.

Project Dominance. Visual dominance is a measure of a project feature's apparent size relative to other visible landscape features in the viewshed.

View Blockage or Impairment. View blockage or impairment is a measure of the degree to which a project's features would obstruct or block views of aesthetic features due to the project's position and/or scale.

Overall Adverse Visual Impact. Overall adverse visual impact is determined by the change in visual quality that would be introduced by a project. While generally a greater change in the visual quality of landscape would result in a greater visual impact, the degree of visual impact is also affected by the viewer type and sensitivity. Viewers types that are more sensitive to visual change may experience a greater visual impact from a given change in visual quality.

3.2.4 Direct and Indirect Effects

3.2.4.1 Methodology

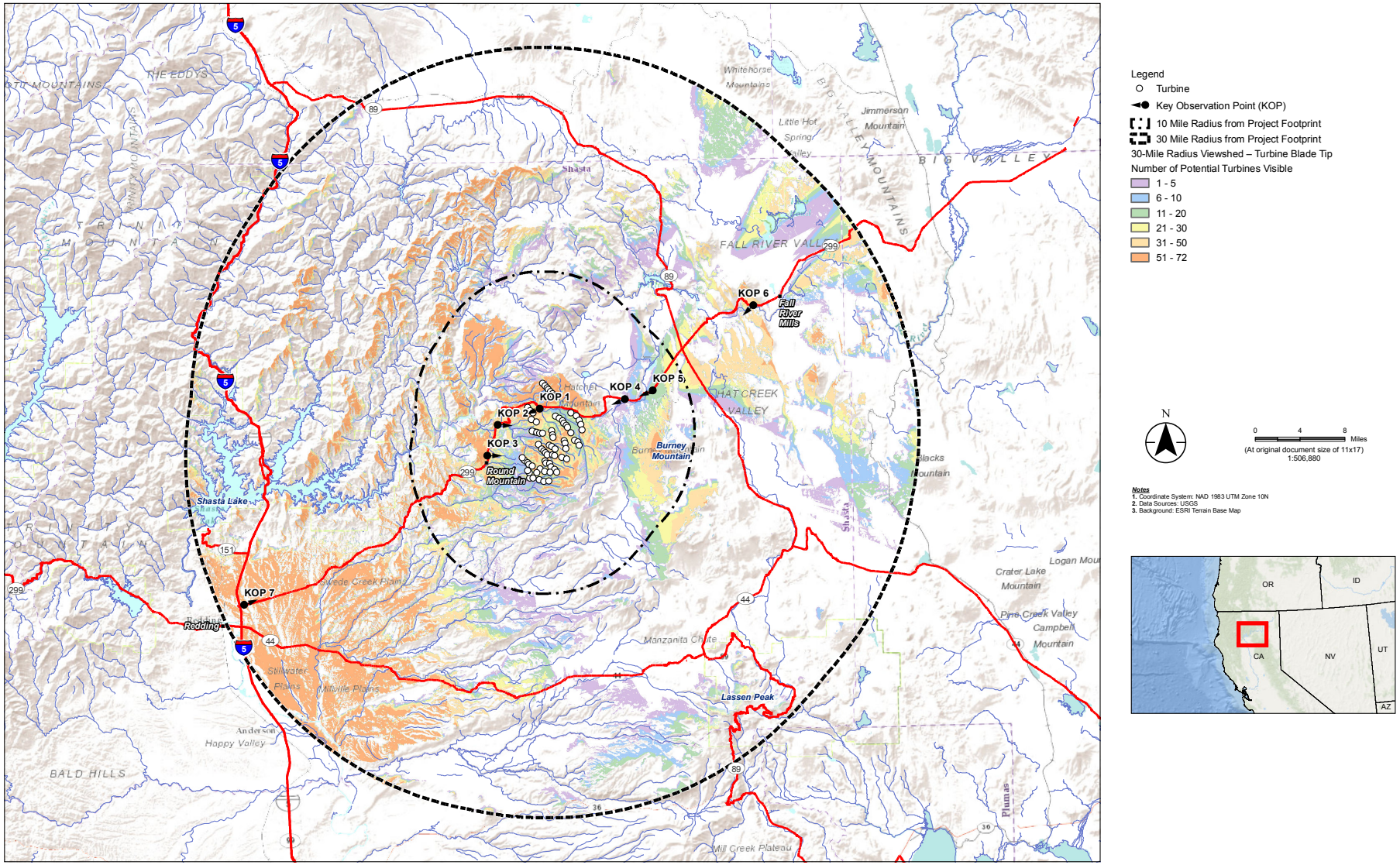
Visual Resources Technical Report

This section summarizes the methodology used in the Visual Resources Technical Report (Appendix A) to analyze the Project's impacts to visual quality. The viewshed analysis used to select representative views and KOPs is described in Section 3.2.2.3, *Environmental Setting*. Appendix A provides additional discussion of the methodology used.

The Visual Resources Technical Report conducted a viewshed analysis using geographic information system (GIS) mapping to identify the visibility of the Project based on the height of proposed components and the surrounding topography. A viewshed analysis was conducted for the study area (i.e., within a 30-mile radius of the Project Site) as well as a 10-mile radius in order to define where the turbines would be visible at a scale not allowed by the 30-mile zone. This analysis was performed to determine from what locations the tip blades of turbines would be visible (see **Figure 3.2-5**, *30-Mile Radius Viewshed Turbine Blade Tip*) and from what locations the turbine hubs would be visible (see **Figure 3.2-6**, *30-Mile Radius Viewshed Hub Height*).

Visual simulations were created for each of the seven KOPs by placing a photo-realistic model of the Project into existing photographs. These simulations serve as the basis for evaluating the contrast between existing conditions and the conditions introduced by the Project. The Project is proposed entirely within forested lands that are actively managed for timber production. Additional parts of the Project (such as ancillary structures and overhead electrical collector lines and corridors) would be located within privately owned parcels and set back from publicly accessible locations. These components generally would be obscured by the surrounding forest and the topography in views toward the Project Site from outside viewing locations and, as analyzed below, would not substantially alter existing views. For these reasons, the analysis in the Technical Report focused on the visual effects of the proposed turbines. The analysis of Project operations in this section also focuses on the visual impacts of proposed turbines. The only Project component that would be visible from the viewing locations selected is the turbines; therefore, the simulations include only the proposed turbines. Long distance views also were included in the simulations to reflect the visibility of the Project from I-5 and Redding. More information about how these long-distance simulations were created can be found in Appendix A.

These simulations as well as on-site observations provided the basis for the evaluation of changes in visual quality for each KOP. The assessment of potential effects to visual resources relies on the methodology established by the Federal Highway Administration (FHWA) Visual Impact Assessment (VIA) for Highway Projects. The assessment relied on the FHWA worksheets which evaluates the natural harmony, cultural order, overall coherence, and landscape composition and vividness for each view. This assessment assigns a visual quality rating from "very low" to "very high" for each view for existing conditions and for simulated images showing existing conditions with the Project in place. The change in the visual quality rating for each view between existing and proposed conditions indicates the degree of contrast and visual change that would be introduced by the Project.



SOURCE: Stantec

Fountain Wind

Figure 3.2-5
30-Mile Radius Viewshed Turbine Blade Tip

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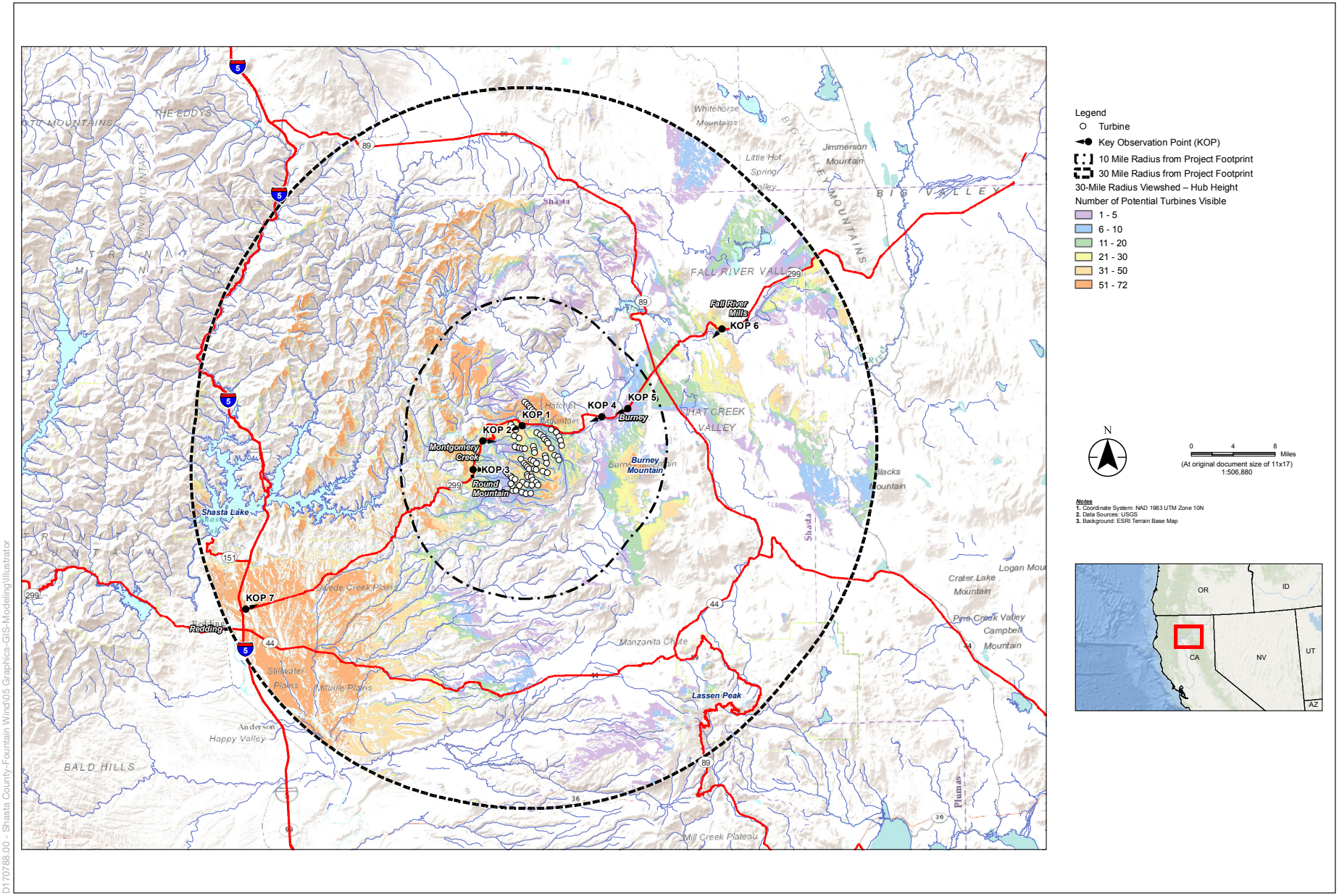

SOURCE: Stantec

Fountain Wind

Figure 3.2-6
30-Mile Radius Viewshed Hub Height

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Visual Impact Analysis

This visual impact assessment identifies and assesses any potential short- or long-term adverse visual impacts on Aesthetics and visual resources that could result from implementation of the Project The visual impact assessment included the following steps:

- Identifying Project components that could affect representative views in the study area in terms of visual quality, character, and levels of light and glare, as informed by plans, descriptions, and simulations provided by the Applicant;
- Visiting the Project Site. EIR Preparers visited the Project Site and surrounding area in June 2018, January 2019, and February 2019. Experience from these visits informed the understanding of baseline visual conditions as well as the County's independent review of the technical report provided by the Applicant.
- Assessing the Project's impacts to identified views by evaluating potential Project-caused change in the affected area's baseline visual quality, character, scenic vistas, designated scenic highways, and sources of light and glare using the visual simulations and analysis provided in the technical report. In addition to analyzing the impacts to individual viewpoints, this analysis evaluates the visual impacts of the Project as a whole.

3.2.4.2 Direct and Indirect Effects of the Project

a) Whether the Project would have a substantial adverse effect on a scenic vista or substantially degrade the character or visual quality of views from publicly accessible vantage points.

Impact 3.2-1: The Project would, unless mitigated, have a substantial adverse effect on a scenic vista or substantially degrade the character or visual quality of views from publicly accessible vantage points. (*Significant and Unavoidable*)

The Project would be located in unincorporated Shasta County. The General Plan does not identify specific scenic vistas. Therefore, the Project would have no impact on scenic vistas designated in planning documents. However, while there are no designated scenic vistas within Shasta County, there are numerous formal and informal areas from which public views of the surrounding areas are accessible. Therefore, consideration of this potential impact focuses on the potential impact that the Project would have on these public vistas and visual character and quality. Nighttime lighting is discussed in this section as it relates to impacts on scenic vistas and general degradation of visual character and quality. However, a more detailed discussion of the impacts of glare and nighttime lighting is discussed under significance criterion c).

Project construction would require grading, vegetation and timber clearing, the operation of equipment, and the delivery and staging of equipment and turbine components. Decommissioning would require the operation of heavy equipment, the dismantling of turbine structures, and restoration of the Project Site. Equipment and vehicles traveling to the Project Site would be visible from SR 299 and locations such as KOP 1, similar to existing traffic from timber hauling trucks and traffic along SR 299 is visible from these locations. The deliveries and vehicles associated with Project construction and decommissioning may result in a short-term increase in the frequency of large delivery trucks along SR 299; however, this increase would not create a long-term substantial change in existing visual conditions as Project construction is expected occur over 18–24 months

and the Project would result in a 25 percent increase in traffic volume on SR 299 during peak am and pm hours, see Section 3.14, *Transportation*, for more information.

Unlike the turbines, which would extend above the tree line and be visible from surrounding vantage points, the majority of construction and decommissioning activities would not be visible from publicly accessible locations. The majority of construction and decommissioning activities would occur within the privately owned leasehold area, as discussed in Section 3.2.4.1, *Methodology.* Construction and decommissioning activities, each lasting approximately 24 months, that would be set back approximately 800 feet from SR 299 and screened by forested areas adjacent to SR 299. While activities during these periods would result in temporary adverse visual impacts due to the short-term increase in traffic and large delivery trucks along SR 299, as well as the potential for increased presence of dust in and around the Project Site (see Section 3.3, *Air Quality*). The impacts would be of short duration and would not represent a substantial change from existing conditions. Therefore, aesthetic impacts from construction and decommissioning would be less than significant.

To analyze potential impacts during the operation and maintenance period, the technical report uses the FHWA methodology to evaluate potential Project-caused changes relative to specified publicly accessible locations throughout the landscape units. The seven selected KOPs represent areas of potential Project visibility and visual sensitivity and were chosen as viewpoints which would be representative of the visual change that would be experienced from publicly accessible locations where the Project is visible. Visual simulations were created and analyzed to compare the view vividness, intactness, and unity to existing conditions without the Project to assess the change in visual quality that would be introduced by the Project.

Before and simulated after views from each KOP are provided in the figures that follow. All Project components would be located within privately owned parcels, set back a minimum of 800 feet from publicly accessible locations, and generally obscured by the forest and topography from views toward the Project from outside the Project Site. Therefore, this analysis focuses on the proposed turbines, which would extend above the forested areas and be visible from publicly accessible locations. Vegetation clearance would be required for the overhead electrical lines and access road improvements. Vegetation clearance could result in the creation of linear, man-made features within forested hills that could be visible from some locations. This vegetation clearance would create a level of visual contrast compared to existing conditions. However, due to the presence of existing cleared transmission line rights of way associated with Hatchet Ridge and other electrical lines as well as areas cleared for timber harvests, the introduction of linear vegetation clearance associated with the Project would not create a substantial amount of visual contrast when compared to existing conditions.

The following discussion summarizes the overall visual change that would be introduced by the Project. The KOP-level analysis describes the visual change at each representative viewpoint, but does not make CEQA conclusions. A discussion of the overall CEQA impact to scenic vistas follows the KOP level discussion. A detailed discussion of potential effects on vistas, visual character and visual quality for each KOP also is discussed. From KOP 1, 2 and 3, turbines are not visible in existing (baseline) views. Therefore, the introduction of Project turbines could

create a substantial source of visual contrast due to the strong, vertical/angular forms, light smooth texture of the turbines, and the motion of turbines. The features would create contrast with existing skylines which currently appear undeveloped aside from built features such as transmission towers in some views. The impact of the turbine towers to visual quality would depend on the proximity of the viewer. For example, from KOP 1, just two turbines would be visible, but the proximity of the viewer to the turbines would result in the turbines being a dominant feature from KOP 1. In certain views, such as from KOP 4 and KOP 5, the Hatchet Ridge Wind Project turbines would be visible; therefore, the proposed turbines would reinforce an existing element of the landscape character as they would similar in form, color, and texture to the existing turbines.

KOP 1: Fountain Fire Overlook

KOP 1 is representative of views experienced by tourists traveling through the area on SR 299 and is intended to represent views of nearby residents traveling along Moose Camp Road. This vista point has signage and parking. Typical viewers at this location (tourists and residents) are assumed to have a moderately high to high sensitivity to visual change. While travelers or tourists passing by this location on SR 299 would experience this view briefly, more sustained views would be experienced by tourists, recreationists, or residents who stop at the Fountain Fire Overlook.

As described in Section 3.2.2.3, *Environmental Setting*, the visual character of KOP 1 is defined by distinct, flat, uninterrupted ridgeline and homogenous forested vegetation. The existing visual quality at the Fountain Fire Overlook is moderately high. The uniformity of the forest landscape creates a high degree of natural harmony, coherence, and landscape composition and vividness (see **Figure 3.2-7**, *KOP 1, Fountain Fire Overlook*). As shown, two Project turbines would be visible from KOP 1, creating straight, vertical white structures (turbine towers, hubs, and blades would be visible) along an otherwise uninterrupted ridgeline. The proximity of the viewer to the turbines would make the turbines dominant within views from KOP 1. The turbines would have an adverse impact on the visual character of the site by interrupting the straight line and dominant form of the ridgeline with vertical forms and introducing smooth white colors which contrast with the evergreen colors dominant in existing views.

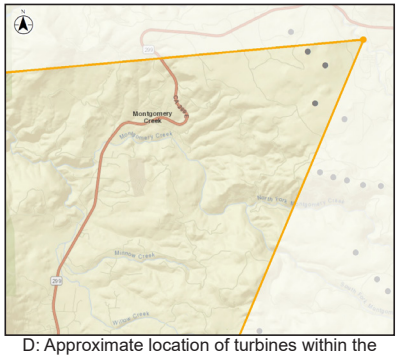
The purpose of the Fountain Fire Overlook is to create an accessible area for viewers to learn about and contemplate the Fountain Fire and associated reforestation efforts. The dominance of the turbines would become the view's most memorable component, detracting from the intended purpose of the vista point. Therefore, the Project would have an adverse effect on the Fountain Fire Scenic Vista. In this view, the turbines would dominate views and attract the focus of viewers, detracting from the natural harmony of the existing views. The turbines do not relate to any other existing structures within the view and; therefore, would reduce the overall coherence of the view and the landscape composition and vividness.

Additionally, although vegetation would partially screen nighttime views, nighttime lighting on turbines would be highly visible from this KOP. Although views from this KOP would primarily be experienced during daytime hours, views of turbine lighting would be unavoidable and would be enhanced by the proximity of the turbines to the KOP. The Project's reduction in the view's harmony, coherence, cultural order, and vividness would reduce visual quality at KOP 1 from

A: View to the west-southwest from the Fountain Fire Overlook, located along Moose Camp Road, just south of SR 299. A temporary meteorological tower is visible in the right side of the view.

B: View from KOP 1 with Project simulated. Proposed turbines would be visible just under one mile away, in the center of the view.

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.

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 Proposed Turbines: 2

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SOURCE: Stantec

Fountain Wind

Figure 3.2-7
KOP 1: Fountain Fire Overlook

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moderately high to moderately low. In summary, the Project would have an adverse impact to scenic vistas from KOP 1, the visual character, and visual quality of KOP 1. KOP 1 is representative of views from scenic vista points where the proposed turbines would be in close proximity and would impose on an otherwise uninterrupted skyline.

KOP 2: Montgomery Creek

KOP 2 is located near the entrance of the Montgomery Creek School and is intended to be representative of views in the Montgomery Creek area. Viewers from this KOP would include Montgomery Creek residents, who would have relatively static or sustained views from the community, and tourists who would have brief views while traveling eastward along SR 299. Both viewer types would have moderately high to high sensitivity to visual change. Commuters and workers (assumed to have a moderate sensitivity to visual change) also would briefly see this KOP while traveling along SR 299. Views from KOP 2 are not considered scenic vistas because there is no designated signage or place intended for the public to experience a scenic vista and the view as seen from KOP 2 is typical of built mountain communities. Therefore, the following analysis focuses primarily on the Project's potential to degrade the character or visual quality of views from KOP 2 as a publicly accessible vantage point.

Existing visual character visible from KOP 2 is defined by an undeveloped ridgeline in the background and a hill which extends from the middle to the right side of the view. Built features such as the paved entry way to the elementary school, structures and vehicles associated with the elementary school, and a transmission line and light pole introduce elements of development into the KOP. As shown in **Figure 3.2-8**, *KOP 2, Montgomery Creek*, views from KOP 2 show overlapping ridges, in the middleground and the background. Linear man-made features such as roads, light poles, and power lines are present in the middleground. Views from KOP 2 have a moderate level of natural harmony and cultural order and show a representative mix of ridgelines and development typical of the area. The overall coherence and landscape composition and vividness of views from KOP 2 is low due to the contrast of built features in the foothills. The overall visual quality of views from KOP 2 under existing conditions is moderate and representative of views along the highway with undeveloped hills and mountains in the background interrupted by transmission or distribution facilities.

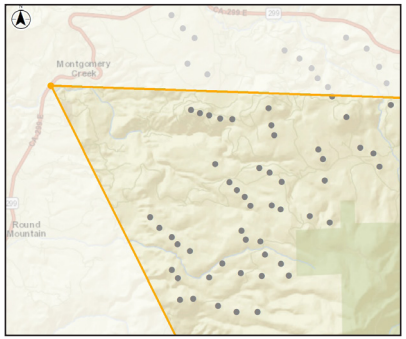
As shown in Figure 3.2-8, six of the proposed turbines would be visible along the furthest ridgeline. Turbines would appear at varying heights behind the ridgeline and turbine towers, hubs, and blades would be visible above the ridgeline. The visible turbines would introduce straight, vertical forms, white, smooth colors, and motion into an otherwise undeveloped ridgeline introducing new colors and forms into existing views. While the turbines would alter the visual character in views from KOP 2, the change in visual character would be somewhat consistent with the pattern of existing development in views from KOP 2.

The Project would not alter the level of natural harmony in views from KOP 2. With regard to cultural order, the Project turbines would be visible, but there would be no discernible pattern to the turbines visible from KOP 2 resulting in a decrease in the cultural order of views. The addition of the turbines would be somewhat consistent with existing presence of transmission towers and would balance out the presence of the transmission towers. However, the turbines

A: View to the east from the entrance to Montgomery Creek Elementary School off of SR 299.

B: View from KOP 2 with project simulated. Turbines would be most visible in the left side of the view, between 3 and 5 miles away.

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.

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 Proposed Turbines: 10

SOURCE: Stantec

Fountain Wind

Figure 3.2-8
KOP 2: Montgomery Creek

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would create new unique, moving forms along the ridgeline and would draw the attention of viewers. The overall visual quality of views from KOP 2 would be reduced from moderate to moderately low. Safety lighting on the turbines would be visible along the ridgeline and would introduce nighttime lighting where no nighttime lighting currently is visible. In summary, the views from KOP 2 are not considered to be scenic vistas; therefore, there would be no impact to scenic vistas at KOP 2. The turbines visible from KOP 2, however, would have an adverse impact on visual character and would reduce the visual quality from moderate to moderately low.

KOP 3: Round Mountain

KOP 3 is located in and is representative of views from the community of Round Mountain. Typical viewers at this KOP would include residents of Round Mountain and tourists (assumed to have a moderately high sensitivity to visual change) and commuters and workers (assumed to have a moderate sensitivity to visual change). The Hill Country Clinic and Community Center is near this KOP. The duration of views for tourists or commuters at this KOP would be short, but not momentary or intermittent. The duration of views for Round Mountain residents would be sustained. Views from KOP 3 are not considered scenic as there is no designated signage or place intended for the public to experience a scenic vista and because the view is representative of the existing community. Therefore, the following analysis focuses primarily on the potential for the Project to degrade the character or visual quality of views from KOP 3 as a publicly accessible vantage point.

As shown in **Figure 3.2-9**, *KOP 3, Round Mountain*, views from KOP 3 are similar to views from KOP 2. Under existing conditions, visual character at KOP 3 is defined by an extended, rounded and articulate ridgeline in the background and rural development in a narrow valley the middleground. Under existing conditions, no structures interrupt the skyline. Built features such as power lines, transmission towers, power lines, fence lines, and roads introduce linear, man–made features which traverse the view, partially blocking the ridgeline in the background. The visual character; therefore, is defined by the form of the forested ridgeline in the background and the infrastructure and development in the foreground.

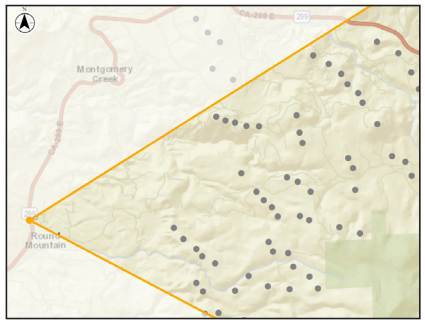
Similar to the views from KOP 2, existing visual quality of the view from KOP 3 is moderate. Under baseline conditions, the natural harmony of views is moderate due to the strong, defined ridgeline in the background which is interrupted by transmission towers. The collection of transmission towers and rural residences reduces the cultural order of views to a moderately low level. Similarly, the contrast between the ridgeline and the transmission towers and houses result in a moderately low level of coherence and a moderate level of landscape composition and vividness. As a result, the overall visual quality of views from KOP 3 is moderate.

The Project would introduce a number of turbines atop the ridgeline. The turbines would be visible at various heights resulting in varying visibility of turbine towers, nacelles, and blades. Project turbines would extend above the ridgeline, interrupting the currently undisturbed skyline. The Project would result in changes to the visual character of views at KOP 3. While the turbines would add an element of visual interest to views from KOP 3, they would also extend the components of linear development in existing conditions above the ridgelines. Grey and white colors and vertical forms would attract the focus of viewers and diminish the visual character of the existing ridgeline.

A: View to the east from the Round Mountain Post Office, just south of the Hill Country Community Clinic.

B: View from KOP 3 with project simulated. Project turbines would be visible between 3 and 6 miles away.

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.

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 Proposed Turbines: 13

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SOURCE: Stantec

Fountain Wind

Figure 3.2-9
KOP 3: Round Mountain

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While the Project would introduce white, vertical structures which would result in an interruption in the skyline, the Project would not reduce the level of natural harmony or cultural order, as it would create consistency with existing infrastructure in views. The addition of turbines to views from KOP 3 would result in electrical infrastructure being a dominant part of the view. This would reduce the overall coherence and landscape composition and vividness. The Project would reduce the overall visual quality from KOP 3 from moderate to moderately low. Due to the amount of mature vegetation and the location of the highway within the mountain valley, views of Project infrastructure would be intermittent, but would draw the attention of viewers. Additionally, due to the height of the turbines above the ridgeline, nighttime safety lighting would be visible and unobstructed in views from KOP 3. In summary, while the Project would not impact a scenic vista from KOP 3, the visual character of views from KOP 3 would be adversely affected. Additionally, the visual quality of views from KOP 3 would be reduced from moderate to moderately low.

KOP 4: SR 299 at Tamarack Road

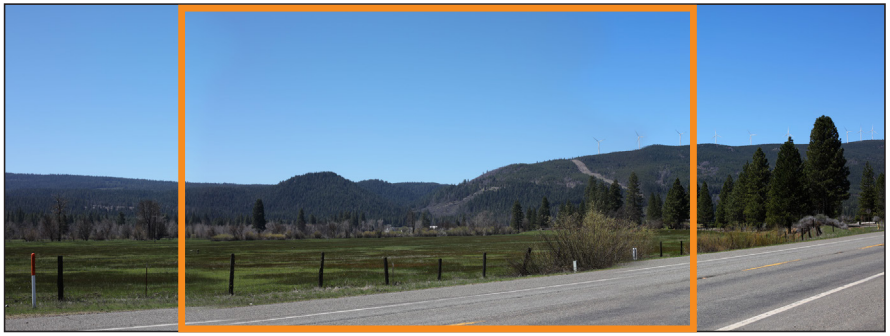
KOP 4 is located along SR 299 east of the Project Site and is representative of views east of Hatchet Ridge and west of Burney. Viewers would include moderately high to highly sensitive tourists and commuters and workers who would be less sensitive to visual change. As shown in **Figure 3.2-10**, *KOP 4, SR 299 at Tamarack Road*, Views from KOP 4 would be relatively long due to the extended, straight stretch of SR 299 in the open valley. Views from KOP 4 are not considered a scenic vista because there is no designated signage or place intended for the public to experience a scenic vista. Therefore, the following analysis focuses primarily on the potential for the Project to degrade the character or visual quality of views from KOP 4 as a publicly accessible vantage point.

The existing visual character of views from KOP 4 is defined by a defined, forested ridgeline in the background and broad open meadow in the foreground and middleground. Partially screened rural development and mature trees are visible in the middleground. Linear features such as the road and fence lines are visible in the foreground. A linear, cleared transmission right-of-way (ROW) extends from the right side of the valley, up the hillside toward the middle of the ridgeline. Atop the ridgeline, the towers, nacelles, and blades of the existing Hatchet Ridge turbines are visible. The existing visual quality of views from KOP 4 is moderate. Under existing conditions, views from KOP 4 have a moderately high level of natural harmony due to the densely vegetated hillsides which lead to the valley floor. The various man-made features visible from KOP do not have a coherent pattern. Therefore, views from KOP 4 have a low level of cultural order. The man-made components of views from KOP 4 detract from the overall coherence and landscape composition and vividness.

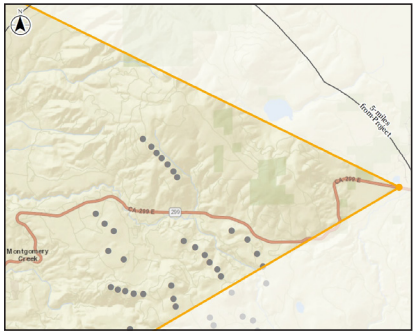
Two Project turbines would be partially visible in views, with just the turbine blades extending above the mountain ridgeline in the center of the view. These turbines would not be prominently visible to viewers at KOP 4 due to their low profile, although the motion of the blades above the ridgeline, could attract viewers' attention. Turbines of the Hatchet Ridge Wind Project would remain the most visible human-made feature in views from KOP 4. The visual character of views from KOP 4 would not change substantially. The additional turbine blades would be imperceptible to most viewers and would not substantially change the form, line, or color visible in existing views. The new turbines would not detract from the natural elements in daytime views and would not

A: View to the west-southwest from SR 299 at Tamarack Road, near Sierra Pacific Industries. Existing Hatchet Ridge turbines are visible less than 3 miles away.

B: View from KOP 4 with Project simulated. Two Project turbines would be visible between 4 and 6 miles away in the center of the view.



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.

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 Proposed Turbines: 2

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SOURCE: Stantec

Fountain Wind

Figure 3.2-10
KOP 4: SR 299 at Tamarack Road

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reduce the cultural order, coherence, or landscape composition and vividness of views. At night, turbine lighting would be partially visible from KOP 4; however, it would be consistent with the lighting for the existing turbines on Hatchet Ridge. Therefore, due to the low profile of turbines and the presence of the existing turbines on Hatchet Ridge, the Project would not substantially reduce the visual quality of views from KOP 4. In summary, at KOP 4, the Project would have no impact on scenic vistas and would not substantially reduce the visual character or quality of views.

KOP 5: Burney

KOP 5 is located in downtown Burney, the main population center east of the Project Site. Viewers from this KOP would include local residents who would have sustained views of the Project, tourists traveling to or through Burney who would have brief views of the Project. Commuters and workers also could have static or brief views of the Project depending on whether they are moving through the town or stopped in Burney for an extended period of time. Views from KOP 5 are not considered to be a scenic because they reflect views from the community generally and because they would be blocked in substantial respect by built features. While sustained views of the Project may be possible from downtown, there is no designated signage or place intended for the public to experience a scenic vista. Therefore, the following analysis focuses primarily on the potential for the Project to degrade the character or visual quality of views from KOP 5 as a publicly accessible vantage point.

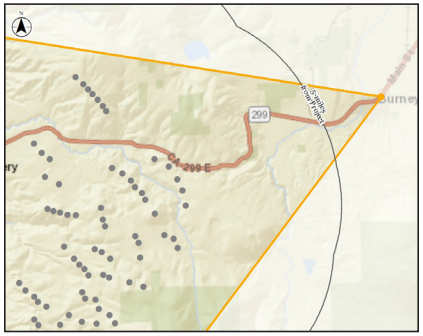
Existing visual character of views from KOP 5 is defined by features typical of suburban development including roads, structures, light poles, traffic lights, parking lots, and mature trees. The form of an extended forested ridgeline is visible in the background, which is interrupted by the structures and trees in the downtown area. A linear transmission line ROW is prominent on the ridgeline and the Hatchet Ridge turbines are visible atop the right side of the ridgeline, Existing visual quality of views from KOP 5 is moderate. Due to the contrast between the man-made features of the downtown area and the surrounding valley and ridgeline, natural harmony is considered moderately low. Similarly, none of the observable components of the view are particularly memorable, resulting a moderately low level of landscape composition and vividness. The cultural order and overall coherence of views are considered moderate.

As demonstrated in **Figure 3.2-11**, *KOP 5, Burney*, the Project would introduce turbines to the left of the existing Hatchet Ridge turbines and to the left of the transmission line corridor. Many of the Project turbines would be obscured by vegetation and intervening topography resulting in just their blades being visible above the ridgeline. The motion of the blades would be visible above the ridgeline. The additional turbines would not have an appreciable effect on the visual character of views from KOP 5. The turbines would add forms and colors similar to the existing turbines and would not substantially alter the existing visual character. From KOP 5, Project turbines would be seen as an extension of the existing Hatchet Ridge turbines. They would not appear as unique features and would result in a retained coherence and composition in views. Despite the increased size of the Project turbines compared to the existing turbines, the distance at which the Project turbines would be seen would result in the turbines appearing with a consistent height. Viewers in Burney would have intermittent views of the Project from the downtown area. At night, the existing lighting on the Hatchet Ridge turbines would appear extended along the ridgeline. Due to the

A: View to the west-southwest from downtown Burney. The existing Hatchet Ridge project is visible in the right portion of the view.

B: View from KOP 5 with Project simulated. Project turbines would be visible near the center of the view, to the left of existing Hatchet Ridge turbines, between 7 and 10 miles away.

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.

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 Proposed Turbines: 8

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SOURCE: Stantec

Fountain Wind

Figure 3.2-11
KOP 5: Burney

ESA

presence of the existing Hatchet Ridge Wind Project turbines and the combination of natural and manmade features visible from KOP 5, the Project would not reduce visual quality of views from KOP 5. In summary, the Project would not impact scenic vistas or reduce visual character or quality from KOP 5.

KOP 6: SR 299 at Pit River Overlook

KOP 6 is located along SR 299 at the Pit River Overlook. This KOP also is representative of views along SR 299 east of SR 89, which is a regional arterial. The Pit River Overlook provides an informal opportunity for travelers along SR 299 to stop and contemplate views of the Pit River, varied topography in the valley, and peaks in the distance. Typical viewers at this location would include recreationists and tourists, although commuters also may travel the route. Most viewers are expected to experience this view while in motion and have relatively brief views of the KOP; however, viewers who stop at the informal pullout could experience sustained landscape views. This KOP location also is used as a reference point to conceptualize views of the Project Site from Lassen Peak or Burney Peak as they would both have expansive but distant views toward the Project Site looking northwest. Lassen Peak is located further from the Project Site than KOP 6, so the turbines would likely be less visible and have less of an impact than from KOP 6. Burney Peak is located closer to the Project Site than KOP 6 is. Therefore, in views of the Project Site from Burney Peak, turbines would likely be closer and more prominent along the ridgeline due to the distance from the Project Site.

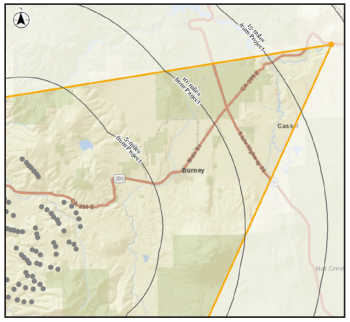
The existing visual character of views from KOP 6 are defined by the varied forms of the topography and the various shades of greens and browns which form the layers of topography and ridgelines. The Pit River creates a linear feature that winds through the landscape. The presence of the transmission line ROW bisects views from KOP 6 and Hatchet Ridge Wind Project turbines are visible along the right side of the ridgeline when atmospheric haze or clouds do not limit visibility. As shown in **Figure 3.2-12a**, *KOP 6, SR 299-Pit River Overlook*, visual quality of views from KOP 6 is high. The views of the mountains and river valley provide a high degree of natural harmony, overall coherence, and landscape composition and vividness.

As shown in **Figure 3.2-12b**, KOP 6a, *KOP 6, SR 299-Pit River Overlook (Simulation)*, Project turbines visible to the left of the existing turbines would extend slightly the portion of the skyline that currently is occupied by wind turbines. The additional turbines would add colors and forms along the skyline which are similar to existing views. Additionally, the proposed turbines would not block or diminish the existing skyline or other prominent forms in the view. Therefore, the visual character of views from KOP 6 would not be substantially reduced by the Project. The additional Project turbines would reinforce the cultural order in existing views and would not substantially reduce the natural harmony, overall coherence, or landscape composition and vividness. At night, turbine lighting would be visible to viewers alongside the lighting of the Hatchet Ridge turbines. The Project would not reduce the visual quality of views from KOP 6. Additionally, in existing views, the visual focus for viewers at KOP 6 is the Pit River and the distant snowy skyline, and the existing turbines are visible but are not prominent within views.

A: View to the southwest from SR 299, at an overlook en route to Fall River Mills. Hatchet Ridge turbines are detectable along the ridgeline in the right side of the view.

B: View from KOP 6 with Project simulated. The Project would be visible just under 19 miles away.

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.

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 Proposed Turbines: 36

D170788.00 - Shasta County-Fountain Wind\05 Graphics-GIS-Modeling\Illustrator

SOURCE: Stantec

Fountain Wind

Figure 3.2-12a
KOP 6: SR 299-Pit River Overlook

ESA

E: Enlarged image showing view from KOP 6 with Project simulated.

SOURCE: Stantec

Fountain Wind

Figure 3.2-12b
KOP 6: SR 299-Pit River Overlook (Simulation)

D170788.00 - Shasta County-Fountain Wind\05 Graphics-GIS-Modeling\Illustrator

KOP 7: Redding

KOP 7 is located on SR 299 near I-5 and is used as reference point to evaluate views from Redding and the general Sacramento Valley area. Viewers of this KOP would include residents and tourists with a moderately to high sensitivity to visual change and commuters and workers with more moderate sensitivities. The straight segment of highway would allow for sustained views for drivers along SR 299. Views from this KOP are also representative of views from eastern Redding where more static views would be available. No designated pullouts or signs are available for viewers at this KOP that would indicate a scenic vista; therefore, the following analysis focuses on the potential for the Project to degrade the character or visual quality of views from KOP 7 as a publicly accessible vantage point.

The existing visual character of views from KOP 7 is defined by the extensive Sacramento Valley and the defined uniform line and form of the mountain skyline east of Redding. The skyline is mostly uninterrupted and extensive panoramic views of the surrounding mountains are available. Built features such as roads, signage and the development associated with Redding are visible in the foreground and middleground. The existing visual quality of the view from KOP 7 is moderately high. As shown in **Figure 3.2-13a**, *KOP 7, Redding*, snowcapped peaks and forested ridgelines are visible in the background, built features such as the highway and nearby homes are visible in the foreground and middleground. The Hatchet Ridge Wind Project turbines are barely detectable on the left side of the view along the ridgeline when atmospheric conditions do not limit visibility.

As shown in **Figure 3.2-13b**, *KOP 7, Redding (Simulation)*, the Project's proposed turbines would be visible between the existing turbines and in the center of views. They would appear scattered with no orderly layout or pattern and would be larger when compared to the existing turbines. This would diminish the uniform line, color, and form of the ridgeline. The proposed turbines would encroach upon the skyline and could give the impression of development spilling down from the ridgeline resulting in an adverse impact to the visual character of views from the KOP. Due to the distance of the Project Site from KOP 7, the turbines would be barely visible in the distant background. However, the layout of the proposed turbines around the existing turbines would create an impression that an extended portion of the mountains is dedicated toward the development of wind energy. Nighttime lighting would be visible from this KOP and would increase the extent of turbine safety lighting on the hillside. Due to the scattered appearance of the turbines, the Project would reduce the level of cultural order, overall coherence, and landscape composition and vividness of views. The Project would reduce overall visual quality from moderately high to moderate.

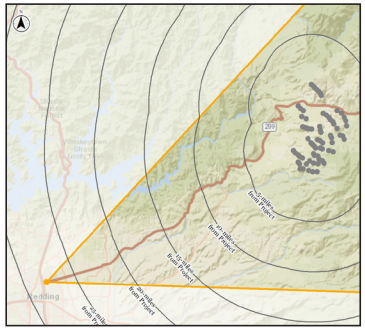
Impact Summary

As described in the KOP-specific analysis above, the Project's potential impact to visual resources would vary depending on existing visual elements in views from KOPs, the visibility of the Project, duration of views, and the visual sensitivity of viewers. Generally, the Project would result in long-term visual impacts due to the introduction of vertical elements and motion (when the rotor blades are in motion). In locations where no existing turbines are visible and where there are no other existing manmade features (such as power lines), the Project turbines would be a source of significant visual contrast. The amount of visual contrast created by the turbines would depend on the view from each KOP.

A: View to the east from eastbound SR 299, east of Redding near Shasta College and a local bike path. Existing Hatchet Ridge turbines are barely detectable along the ridgeline in the left side of the view.

B: View from KOP 7 with Project simulated. Project turbines would be visible just under 28 miles away.

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.

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 Proposed Turbines: 72

D170788.00 - Shasta County-Fountain Wind\05 Graphics-GIS-Modeling\Illustrator

SOURCE: Stantec

Fountain Wind

Figure 3.2-13a
KOP 7: Redding

ESA

E: Enlarged image showing view from KOP 7 with Project simulated.

SOURCE: Stantec

Fountain Wind

Figure 3.2-13b
KOP 7: Redding (Simulation)

D170788.00 - Shasta County-Fountain Wind\05 Graphics-GIS-Modeling\Illustrator

Mountain Communities

Within the Mountain Communities Landscape Unit, the Hatchet Ridge Wind Project turbines are intermittently visible from various locations due to intervening topography and dense forests along SR 299. From certain KOPs such as KOP 2 and 3, that project's turbines are not visible and the existing ridgelines are uninterrupted. For this Project, turbine towers, hubs, and blades would be visible. Due to existing man-made infrastructure, the lack of designated scenic vistas, moderate existing visual quality, and the brief duration of most views, the Project turbines would not result in a substantial impact to scenic vistas, visual character, or visual quality.

From locations such as KOP 4 and KOP 5, the Hatchet Ridge Wind Project turbines are prominent in existing views: the towers, hubs, and blades of multiple turbines are visible in existing views and are prominent along the ridgelines. With the Project, views from KOP 4 of the Project's turbines would be mostly obscured - just the blade tips of most turbines would be visible. From KOP 5, the proposed turbine towers, hubs, and blades would be visible. From both of these locations, the turbines would extend slightly the line of existing turbines and would not impact scenic vistas, visual character, or visual quality.

In contrast to the other locations, the Hatchet Ridge Wind Project turbines are not visible from some locations to the west such as KOP 1, and there is no other element of development or man-made structures that reduces visual character or quality. The existing visual quality of views from this KOP is moderately high and views would be sustained from the designated overlook. With the Project, two turbines would dominate views and turbine towers, hubs, and blades would be visible. At this KOP, the presence of the turbines would dominate views at the scenic vista and create a substantial amount of visual contrast resulting in an adverse impact to the scenic vista and would substantially degrade visual character and quality.

Hat Creek and Pit River

Within the Hat Creek and Pit River Landscape Unit, the existing Hatchet Ridge Wind Project turbines would be visible in the distance in views to the west from some elevated locations. From KOP 6, the existing turbines are visible from a scenic vista along SR 299, but while multiple entire turbine towers are visible, the turbines are not prominent along the ridgeline and do not dominate existing views from the scenic vista. The Project would introduce additional turbines along the ridgeline; however, the new turbines would blend in with the existing turbines, extending the existing line of turbines slightly and in an organized pattern. The Project's proposed turbines would not be prominent along the ridgeline, and would not contrast with existing conditions. Therefore, from this location, the Project would not result in a substantial impact to a scenic vista, visual character, or visual quality. KOP 6 also is used as a reference point to consider other publicly accessible views of the Project Site from mid-distance to distant locations such as Burney Mountain or Lassen Peak. This view is representative of the visual change that would occur south and east of the Project Site at other publicly accessible locations. From locations such as Lassen Peak, the turbines would appear more distant and less visible than depicted in Figure 3.2-12b. However, some locations, such as Burney Peak, are located closer to the turbines than KOP 6. Therefore, the turbines would likely appear larger and feature more prominently in views than depicted in Figure 3.2-12b.

Sacramento Valley

Within the Sacramento Valley landscape unit, the existing Hatchet Ridge Wind Project turbines are faintly visible atop the distant ridgeline. Visual quality is moderately high due to the extended form and line of the mountain skyline east of Redding and the high degree of natural harmony, cultural order, overall coherence, and landscape vividness and composition. The Project would result in a longer extension of the line of turbines along the ridgeline left to right. Additionally, the Project's proposed turbines would appear larger than the turbines on Hatchet Ridge and would descend down the mountains, creating an appearance of development and wind energy encroaching upon the mountains east of Redding and occupying a large portion of the mountain skyline. This would reduce the quality of scenic vistas represented by KOP 7 and would reduce the visual character and quality of views from KOP 7 and the views for which it is representative, including views from the Valley and views from southeastern slopes north or the Project. Due to the distance between viewers at this KOP and the turbines, the proposed turbines would be barely visible along the ridgeline. Therefore, while the proposed turbines would extend the visibility of wind development along the hillside and would reduce visual quality, the turbines would not dominate views from the KOP and would not result in a moderate reduction of existing visual character or quality. As shown in Figure 3.2-6, the entire extent of the Project would be visible from many locations in the Valley, on SR 299 traveling east, and from southeastern facing slopes located northwest of the Project.

The change in visual quality that would result from the Project is summarized in **Table 3.2-2**, *Summary of Visual Quality Findings*, below.

TABLE 3.2-2
SUMMARY OF VISUAL QUALITY FINDINGS

KOP Location	Overall Visual Quality
Mountain Communities	
KOP 1 - Fountain Fire Overlook	Moderately High
With Project	Moderately Low
KOP 2 - Montgomery Creek	Moderate
With Project	Moderately Low
KOP 3 - Round Mountain	Moderate
With Project	Moderately Low
KOP 4 - SR 299 at Tamarack Road	Moderate
With Project	Moderate
KOP 5 – Burney	Moderate
With Project	Moderate
Hat Creek and Pit River	
KOP 6 - SR 299 Pit River Overlook	High
With Project	High
Sacramento Valley	
KOP 7 – Redding	Moderately High
With Project	Moderate

SOURCE: Appendix A, *Aesthetics*

As shown in Table 3.2-2 the Project would not reduce visual quality at a number of representative KOPs. However, the Project would result in a substantial reduction to visual character, visual quality, and the quality of scenic vistas at KOP 1. Viewers at KOP 1 are expected to have a moderately high to high sensitivity to visual change and would have sustained views of the KOP at the designated scenic vista. Therefore, due to the significant change in visual character, visual quality, and the quality of scenic vistas at KOP 1, Project operation would have a significant impact under this criterion. With the implementation of **Mitigation Measure 3.2-1** (Project Design to Reduce Aesthetic Impacts at KOP 1), turbines would be sited in order to consider surrounding topography and avoid the visibility of turbines from sensitive scenic vistas at KOP 1. Through the implementation of Mitigation Measure 3.2-1, the two turbines visible at KOP 1 (D02 and D03) would be relocated so that they are removed from views from KOP 1 or relocated so that just the turbine blades are visible above the ridgeline, the turbines would no longer dominate views from the scenic vista and the adverse impact on the scenic vista would be reduced. Additionally, if the turbines were to be removed from views from KOP 1or relocated such that just the turbine blades were visible, then the turbines would no longer introduce dominant forms and colors along the ridgeline and would not reduce the natural harmony and overall coherence of the KOP as significantly. Therefore, with the implementation of Mitigation Measure 3.2-1, the dominance of the turbines in views from KOP 1 would be reduced and the impact of the Project to the scenic vista, visual character, and visual quality at KOP 1 would be reduced to a less-than-significant level.

As described throughout the KOP discussion above, the Project would introduce visual contrast but would not reduce visual quality significantly from locations where the Project would blend in and expand the existing visual impact of the Hatchet Ridge Project. From locations where wind turbines are not currently visible, however, the Project would introduce a greater level of visual change. In the case of KOP 1, this would result in a significant impact. If turbines were to be removed from views from KOP 1, then the visual impact of the Project at KOP 1 could be reduced to a less-than-significant level. However, given uncertainty about the feasibility of removing, or sufficiently moving, the turbines from views from KOP 1, impacts would remain significant and unavoidable even with the implementation of Mitigation Measure 3.2-1. Additionally, while the amount of visual change from most representative viewpoints is not considered significant, when considered as a whole, the Project would have a significant impact on the visual character and quality of views in the Project region. There is no feasible mitigation that could reduce the visual impact of the Project as a whole. Therefore, the impact of the Project on scenic vistas, visual character, and visual quality would be significant and unavoidable.

Mitigation Measure 3.2-1: Project Design to Reduce Aesthetic Impacts at KOP 1

When finalizing the design for the Project, the Applicant shall site turbines to avoid placing turbines within the viewshed of KOP 1, or to reduce the visibility of turbines from KOP 1. For example, if the turbines were to be moved further downslope they would be less visible from KOP 1. When submitting site plans to the County of Shasta to be approved, the Applicant shall demonstrate to the County that the impacts from KOP 1 have been avoided or reduced. The turbines shall be painted in accordance with manufacturer's and Federal Aviation Administration marking requirements. Commercial messages and symbols shall not be used on turbine structures. When the site plans are presented to the County for approval, the Applicant also shall present the type of turbine

selected to the County so that the County may ensure that no commercial messages are used on the turbines.

Significance after Mitigation: Impacts resulting from operation of the Project would remain significant and unavoidable with the implementation of Mitigation Measure 3.2-1.

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b) Whether the Project would substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway.

Impact 3.2-2: The Project could damage scenic resources within a state scenic highway. (*Less-than-Significant Impact*)

As described above, most construction and decommissioning activities would be screened from SR 299 and would not be visible from publicly accessible viewpoints. While traffic due to deliveries and other vehicle travel to and from the Project site would increase traffic and large delivery loads on SR 299, the increase would be temporary (lasting the approximately 18- to 24-month construction period) and would be an approximately 25 percent increase in traffic during peak delivery times when compared to the visual impact from existing traffic due to timber operations and other traffic along SR 299.

As described in Section 3.2.2.3, *Regulatory Setting*, the nearest designated state scenic highway to the Project Site is a 3.3-mile section of SR 151 located approximately 28 miles from the western edge of the Project Site. Eligible State Scenic Highways near the Project Site include SR 89 (approximately 11 miles away), SR 299 east of SR 89 (approximately 11 miles away), and SR 44 (approximately 17 miles away). Additionally, SR 299 and I-5 are considered a "corridors in which the natural environment is dominant." Impacts to these highways are discussed below.

The Project would not degrade any rock outcroppings, historic buildings, or trees along a designated scenic highway. As described in Section 3.2.2.2, *Environmental Setting*, the Project would be constructed on private timber lands, and so would not be constructed within a scenic resource that is integral to the character of a scenic highway. The Project may, however, be visible from certain portions of designated and eligible highways. As shown on Figure 3.2-5, the Project would be highly visible along SR 299. From more distant viewing locations along SR 299, the Project would be visible adjacent to the existing Hatchet Ridge turbines. As SR 299 passes through the Project Site, fewer turbines would be visible, but they would be more prominent and would appear larger due to their proximity. The Project would be partially visible from a portion of SR 89 in the Hat Creek Valley. The full extent of the Project also would be visible from the portion of I-5 that passes through Redding and from a short section of SR 151 located near I-5.

KOP 6 is located along SR 299 and is near the eligible section of SR 299 and the portion of SR 89 from which the Project would be visible (see Figure 3.2-5). KOP 7 is located near the intersection of I-5 and SR 299 and is representative of views available from SR 151. Therefore, in the following discussion, these viewpoints are used as reference points for views experienced by

motorists driving along scenic highways. Viewers along designated scenic highways are assumed to have a moderate to moderately high degree of visual sensitivity to visual changes.

As described under Impact 3.2-1, the Project would not reduce the visual quality of views from KOP 6 because it would not create contrast with existing visual conditions. The proposed turbines would blend in with existing Hatchet Ridge Wind Project turbines and would not detract from the scenic vista available from KOP 6. Visual quality of views from KOP 6 would remain high. As described under Impact 3.2-1, turbines would be visible in the distance along the ridgeline, near the existing Hatchet Ridge Wind Project turbines. The turbines would be visible in the distance above the view's natural elements and would not reduce the natural harmony of existing view. Additionally, the Project turbines would reinforce the cultural elements in existing views, reinforcing the cultural order and overall coherence of views. Therefore, the Project would not contrast with existing visual conditions and would blend in with and extend existing forms along the ridgeline. The Project would not damage any specific scenic resources visible from this KOP. As shown in Figure 3.2-5, smaller portions of the Project would be visible from SR 89 than as shown for KOP 6. Additionally, SR 89 is lined with mature trees that enclose views and significantly limit views to the west. Based on the location of SR 89, the Project would likely result in less visual contrast from SR 89 as compared to KOP 6. Therefore, the Project would have a less-than-significant impact on views from SR 299 east of SR 89 and SR 89.

KOP 7 is located near SR 299 and I-5 and is considered a reference point for views from the designated scenic highway. As described under Impact 3.2-1, in views from KOP 7, the Project would add additional turbines to the mountains visible in the background from views from the Sacramento Valley. The additional turbines would barely be visible along the ridgeline but would appear scattered and would increase the appearance of encroaching development in the foothills. As a result, the Project would reduce the cultural order and overall coherence of views from this location. Overall visual quality of views from this KOP would be reduced; however, the quality of views from this KOP would remain moderate and impacts would be less than significant. Therefore, the Project would not substantially damage scenic resources within a state scenic highway and impacts would be less than significant.

Mitigation: None required.

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c) Whether the Project would create a new source of substantial light or glare which would adversely affect daytime or nighttime views in the area

Impact 3.2-3: The Project could create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area. (*Less-than-Significant Impact*)

Potential impacts relating to shadow flicker are analyzed in Section 3.11, *Hazards and Hazardous Materials*, in the context of Impact 3.11-6. As described there, any shadow flicker that would be caused by the Project would not be substantial or adversely affect daytime views in the area. Shadow flicker does not occur at night.

As discussed in Section 2.4.5.5, *Construction Schedule and Workforce*, construction is expected to occur during daytime hours; nighttime construction is not anticipated. If unexpected nighttime construction or deliveries were to be required, Project construction and decommissioning could result in a temporary increase of traffic light along SR 299 due to vehicle travel to and from the Project Site. At peak am and pm hours, the Project is expected to increase traffic on SR 299 by approximately 25 percent. If nighttime construction is required, it is not likely to require the same number of vehicles and delivery. Therefore, the increase in light from traffic on SR 299 in the event of nighttime construction is likely to be less than a 25 percent increase compared to existing conditions. Therefore, impacts from increased light from traffic during construction would be less than significant. As described in Section 3.2.4.1, *Methodology*, the Project would be set back from SR 299 and would be screened by forested areas near SR 299. During construction, the construction laydown area would have security lighting. Additionally, in the event that nighttime construction is required, nighttime construction lighting may be required. Security lighting also would be installed and maintained through the operations phase at the O&M facility. Both security lighting and construction lighting would be separated from the road and would be screened by intervening forest. However, depending on the lighting configuration, lighting has the potential to project upward and illuminate construction equipment. Additionally, construction lighting could potentially be seen from elevated locations. However, due to the screening of intervening trees, construction lighting would not be visible from most publicly accessible locations. Impacts would be less than significant.

Wind project component surfaces typically are not reflective. For example, the proposed turbines would be painted an off-white with a matte finish in accordance with FAA requirements and the proposed overhead electrical collector system would be installed on wood poles, which do not cause glare. Up to four permanent, unguyed and freestanding METs also would be constructed on the Project Site at heights up to 394 feet tall. METs typically are manufactured with a galvanized finish that weathers to a dull, non-reflective patina and so would not result in a new source of glare resulting from introduction of these Project elements. A less-than-significant impact related to glare would result.

Regarding lighting, as described in Section 2.4.1, *Wind Turbine Generators*, Section 2.4.4.4, *Meteorological Equipment*, and Section 3.2.2.3, *Regulatory Setting*, safety lighting would be required pursuant to FAA standards and Advisory Circular 70/7460-1L to reduce potential hazards to aircraft from the proposed turbines and METs. Designated turbines (potentially including all turbines) and METs would have flashing red lights. Due to the height of the proposed turbines, it is expected that each turbine to be lit would require two lights, one on either side of the turbine nacelle, to mark it as a potential hazard to air navigation. The Applicant would submit an FAA-approved lighting plan to the County before turbine installation. The extent of safety lighting on turbines ultimately would be determined pursuant to FAA review.

Figure 3.2-1 and Figure 3.2-6, both of which depict the areas from which the turbine hubs would be visible, demonstrates where in the study area aircraft warning lights could be visible. The visibility of nighttime lighting and the impact of nighttime views would vary depending on the proximity of the KOP to the turbines, the extent of existing light pollution at the KOP, and the frequency of viewers during nighttime hours.

At KOP 1, which is representative of views near SR 299 and Moose Camp Road, as there is no designated camping or other area where nighttime use would be common, most users would be daytime viewers. Nighttime lighting would be highly visible from this location and would introduce such lighting where none currently exists. Vegetation would partially screen nighttime lighting in views from KOP 1; however, the proximity of viewers to turbines would increase the visual impact of nighttime lighting. Turbine lighting in views from KOP 1 would be highly visible and unavoidable in nighttime views from this location; however, due to the limited number of nighttime viewers at this location and viewing locations along this section of SR -299, the impact of lighting would not be substantial.

In views from KOP 2, which represents views from Montgomery Creek, there would be a limited number of nighttime viewers at publicly accessible locations such as the elementary school. Similarly, in views from KOP 3, which represents views from Round Mountain, limited nighttime viewers may view the Project from the nearby community center near the Project. The Project would result in nighttime lighting along the ridgelines in each of these KOPs where no lighting is currently present. Although other sources of nighttime lighting exist in the vicinity of these KOPs (such as surrounding development), the turbines would introduce a new form of nighttime lighting. The distance between viewers and the turbines would reduce the prominence of the nighttime lights. Additionally, few nighttime viewers would be expected at this location and views are expected to be brief as travelers move along SR 299.

From KOP 4, which is representative of views east of Hatchet Mountain and west of Burney, few nighttime viewers would be expected as it is not located within a community and there is no designated area for nighttime viewers to stop along SR 299. The lighting of a few Project turbines would barely be visible above the ridgeline. The lights of these few turbines would be located adjacent to the lights of the existing Hatchet Ridge turbines. Therefore, the nighttime lighting introduced by the Project would not create a significant new source of nighttime lighting.

From KOP 5, the number of nighttime viewers would be greater as Burney is the main population center east of the Project and tourists, recreationists, and residents could experience nighttime views from locations such as KOP 6. The safety lights on the Project turbines would be positioned at a similar height as the lights on the existing Hatchet Ridge Project and would appear in roughly an extended line from the existing lights along the Hatchet Ridge Project. The Project would extend nighttime lighting similar to the existing lights of the Hatchet Ridge Wind Project. However, it would not introduce a substantial new source of nighttime lighting that would create a substantial amount of contrast in nighttime views.

Viewers at KOP 6 would primarily visit the informal overlook during the daytime as it is an informal pullout along the highway that would not be likely to attract nighttime viewers. This KOP also is representative of views available while traveling along SR 299 east of SR 89, a regional arterial. These nighttime views could be experienced by communities east of the Project Site and travelers along SR 299. Additionally, the safety lights on the Project turbines would be at a similar height as the lights on the existing Hatchet Ridge Project and would appear in roughly an extended line from the existing lights along the Hatchet Ridge Project. Therefore, the nighttime lighting introduced by the Project would not create a substantial new source of nighttime lighting.

At KOP 7 the number of viewers would be higher due to nighttime traffic along SR 299. Project safety lighting would be visible alongside the safety lighting of the existing Hatchet Ridge turbines. Due to the scattered order of turbines at this location, the nighttime safety lighting would not appear in a line and would appear more scattered. While the safety lights associated with Hatchet Ridge are clustered along the ridgeline and distant, the Project would extend the nighttime lighting associated with the Project horizontally and vertically along the ridgeline.

From KOP locations 4 through 7, the additional nighttime lighting of the Project turbines would extend the nighttime lighting of the existing Hatchet Ridge Wind Project. If alternating blinking lighting between the Hatchet Ridge turbines and the proposed turbines were to occur the visual impact of the nighttime lighting would increase. However, at these locations, the Project would not introduce a significant new source of nighttime lighting that would contrast with existing nighttime lighting conditions. In views from KOP 1, 2, and 3, the Project turbines would introduce nighttime lighting where nighttime light pollution is currently limited to light associated with rural development. Viewer exposure to nighttime lighting at KOP 1 and along SR 299 west near Moose Camp road would be very limited and; therefore, the nighttime lighting introduced by the Project would not have a substantial impact on nighttime views. Viewer exposure within communities west of the Project Site would be slightly greater due to nearby community resources such as community centers and clinics. some of these locations would be low due to the limited number of viewers during nighttime hours. However, in these views, due to existing sources of lighting, the space between the viewer and the turbines, and the few turbines visible from each of the KOPs, the additional source of nighttime lighting would not have a substantial impact on nighttime views. Therefore, impacts under this criterion would be less than significant.

Mitigation: None required.

3.2.4.3 PG&E Interconnection Infrastructure

As described in Section 3.2.2.2, *Environmental Setting*, the Project Substation, Switching Station and associated PG&E interconnection facilities would be located within the Project Site, away from publicly accessible viewpoints. No mitigation would be required specific to the PG&E interconnection infrastructure. As part of the Project, construction, operation, maintenance and decommissioning of the PG&E interconnection infrastructure would result in a less-than-significant impact relating to the potential for a substantial adverse effect on a scenic vista, a substantial degradation of the character or visual quality of views from publicly accessible vantage points (i.e., any of the KOPs), or to substantially damage scenic resources within a state scenic highway. Similarly, because the four to six new transmission support structures and other infrastructure would not include substantial new sources of light or glare, the Project-proposed construction and modifications of PG&E infrastructure would have a less-than-significant impact.

3.2.4.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, the up to seven turbines north of SR 299 would not be constructed, resulting in incrementally fewer obstructions in the visual landscape and incrementally fewer safety lights. Depending on the specific viewing location or KOP, this alternative could reduce aesthetic impacts. However, from certain locations, clustering of turbines south of SR 299 could reduce the coherence between the Hatchet Ridge Project and the proposed Project, creating an appearance of multiple separate wind energy generation projects encroaching in the foothills. Any increase or decrease in the aesthetic impacts created by Alternative 1 would not be significant. Therefore, depending on the viewing location or KOP, Alternative 1 could either slightly increase or reduce aesthetic impacts. Impacts would remain less than significant relating to scenic vistas, publicly accessible vantage points (i.e., the KOPs), scenic resources within a state scenic highway, and new sources of light or glare.

Alternative 2: Increased Setbacks

Under Alternative 2, the setbacks required between turbines and residences and SR 299 would be increased. A setback of three times the turbine height would be required from residences and a setback of 1.5 times the turbine height would be required from SR 299 and from two private roads. The resulting spacing of the turbine strings could reduce from certain KOPs (e.g., KOPs 1, 2, and 3), the visibility and visual impact of turbines from SR 299 and regarding views from KOPs near SR 299. This alternative would slightly reduce the overall visual impact of the wind energy development compared to the Project. However, impacts to visual quality and character would remain significant and unavoidable.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind turbines and associated transformers, associated infrastructure, or ancillary facilities would be constructed, operated and maintained, or decommissioned on the Project Site, FAA-required safety lighting would not be installed. The proposed overhead and underground electrical collector system and communications lines would not be developed; and the onsite collector substation, switching station, and operation and maintenance facility would not be constructed. Laydown areas would not be cleared, no new access roads would be constructed, and no existing roads would be improved to achieve the widths needed to accommodate the delivery of turbine components. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to Aesthetics.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to

result in a significant adverse individual or cumulative effect to aesthetics. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.2.5 Cumulative Analysis

The geographic scope for cumulative effects is the 30-mile radius identified in Section 3.2.2.1, *Study Area*. That distance is about as far as the eye can distinguish features of the Project. Beyond that distance, a viewer would not easily be able to discern Project turbines in combination with another project or feature. The Project would have visual impacts during all phases of construction (short-term and temporary impacts during construction and decommissioning and long-term impacts during operation); therefore, the temporal scope for cumulative impacts spans from Project construction through decommissioning.

3.2.5.1 Scenic vistas and the Character or Visual Quality of Views from Publicly Accessible Vantage Points or from State Scenic Highways

As described above, the Project would have a potentially significant impact on views from scenic vistas and publicly accessible views unless recommended mitigation measures are implemented, and a significant unavoidable impact on the scenic vista, visual character and visual quality of views from KOP 1. If implemented, it is possible that Mitigation Measure 3.2-1 would reduce this impact to a less-than-significant level; however, given uncertainty in light of the measure's feasibility, the Project's incremental contribution to cumulative effects would be significant and unavoidable. While the Project would not create a substantial amount of contrast with the existing visual character or quality from most locations, taken together, the overall visual impact of the Project would be significant due to the number of publicly accessible viewpoints that would have views of the Project and the impact to visual quality across the region.

Within the study area, cumulative projects that would cause impacts that could combine with the impacts of the Project include the Hatchet Ridge Wind Project, ongoing commercial timber operations in the area, forest thinning Projects, the ongoing effects of climate change as it pertains to drought and wildfire, existing and proposed power lines and electrical infrastructure, active and reclaimed mining sites, and commercial development (see Section 3.1.2.1, *Cumulative Scenario*). These types of projects could combine with the impacts of the Project when viewed together in the same view or when viewed in succession along a travel route. Timber operations in the area have an ongoing adverse impact on visual character and quality by increasing the presence of clear cut areas, logging trucks, and equipment along SR 299, thereby reducing the natural harmony of views in the area. The Hatchet Ridge Wind Project has an ongoing, significant adverse effect on visual character and quality in the region by creating contrast between the natural environment and man-made features or interruptions to the landscape. The Hatchet Ridge Project, ongoing logging operations, and other cumulative projects combine to create a significant and adverse cumulative impact to aesthetic resources.

In views from certain KOP locations such as KOPs 4-7, the Project would be visible in the same view as the Hatchet Ridge Wind Project. From most of these viewing locations, the Project would be visible as an extension of the Hatchet Ridge Project (KOPs 4, 5, and 6), from other locations, the Project would appear scattered from Hatchet Ridge Wind Project components, creating an impression of increasing encroaching development in the foothills (KOP 7). In other viewing locations, such as from KOP 1, 2, and 3, the Project would not be visible alongside Hatchet Ridge Wind Project turbines, but would be viewed cumulatively as a viewer drives along SR 299. Therefore, the Project would contribute to the existing significant adverse cumulative impact to aesthetic resources as the Project would increase the amount of man-made development and contrast with the natural environment as viewed from certain locations and seen in succession driving along SR 299.

From most viewing locations where both Hatchet Ridge and the proposed Project would be visible, the Project would appear as an extension of Hatchet Ridge. The Project would result in a noticeable increase in the number of turbines visible from some locations resulting in an increase in the amount of contrast in views. In some views (as in from KOP 7), the Project would appear scattered and distinct from Hatchet Ridge, and would significantly increase the amount of contrast with the natural environment. Therefore, from vantage points where the Project turbines would be visible adjacent to existing turbines, the Project's contribution to the existing significant cumulative impact would be cumulatively considerable.

When viewed in succession, as when viewed driving along SR 299, the Project would intermittently be visible alone and in combination with the Hatchet Ridge Project. Under existing conditions, certain portions of SR 299 have no views of turbines and retain the visual quality of a route along which the natural environment is dominant. The proposed Project would increase the encroachment of development along this route and reduce the natural harmony of views along SR 299. The Project would extend the presence of wind development as visible from the Sacramento Valley, through the Project Site and in Hat Creek Valley. Due to increase in the number of turbines visible, the scattered nature of the turbines, and the scale of the turbines, as one drives along SR 299, the Project would result in an increasing dominance of wind turbines within the region. Therefore, the Project would cause a considerable contribution to an existing significant adverse cumulative impact. No reasonable, feasible mitigation measures are available to reduce the Project's incremental contribution to a level that it would not be cumulatively considerable.

3.2.5.2 Scenic Resources within a State Scenic Highway

As described above, the Project would have a less-than-significant impact to scenic resources within a state scenic highway. Projects included in the cumulative scenario which could have an impact on scenic resources within a state scenic highway include ongoing logging and timber operations and the Hatchet Ridge Wind Project. Views toward the Project area from the portion of SR 151 that is near I-5 and SR 89 represent long distance views where the Hatchet Ridge turbines and existing logging is not highly visible in views toward the Project Site. As described in the analysis above, mature trees line SR 89 and significantly enclose views. The Project would be only visible from only a few locations where there are open views to the west. In these instances, the turbines would appear very small along the ridgeline and would not significantly

increase visual contrast. Along SR 151, near the intersection with SR 299, the Hatchet Ridge Wind Project turbines are barely visible along the distant ridgeline. The proposed Project would elongate the extent of turbines slightly, but this change would be barely perceptible due to the distance between SR 151 and the Project site and intermittent buildings. Therefore, the Project would not result in an impact to visual quality from SR 151 that could be cumulatively considerable.

From SR 299, Hatchet Ridge Wind Project turbines are intermittently visible as one drives along SR 299, and dominant in certain views from SR 299 leading to a significant cumulative condition with regard to impacts to views from SR 299. As described above, the Project would increase the number of turbines visible from a given location, blending in with the existing Hatchet Ridge Wind Project turbines. In other views, the Project would be visible separately from the other project. For the reasons described above, the Project would not have a cumulatively considerable contribution to views available from SR 299; therefore, the Project would not have a cumulatively considerable impact to views from scenic highways.

3.2.5.3 Sources of Substantial Light or Glare

Within the study area, cumulative projects that could combine with the glare or lighting impacts of the Project including the Hatchet Ridge Wind Project, increased traffic along highways, and increased rural and commercial development. Due to the Hatchet Ridge Wind Project, there is an existing significant and adverse cumulative impact to the nighttime lighting environment. As described above, from certain locations, the lighting from the proposed turbines would be viewed as an extension of the lighting from the existing project. From certain locations, the number of turbines visible would double, resulting in a doubling of the lights visible across ridgelines. While the impact of the Project on existing conditions at these viewing locations would not be considered significant, the extension of turbine lighting across ridgelines would result in a cumulatively considerable contribution to an existing adverse cumulative condition. No reasonable, feasible mitigation measures are available to reduce the Project's incremental contribution to a level that it would not be cumulatively considerable.

From other locations, Project lighting would be visible cumulatively, as one drives along SR 299, decreasing the area along SR 299 where no turbine lighting is visible. As shown in views from KOP 1, 2, and 3 few turbines would be visible from SR 299. This would result in additional locations along SR 299 where a few safety lights would be visible. The Project would result in an extension of areas along SR 299 where turbine lighting is visible, resulting in turbine lighting in areas with very limited nighttime lighting. Therefore, the Project would have cumulative considerable contribution to an adverse cumulative condition. No reasonable, feasible mitigation measures are available to reduce the Project's incremental contribution to a level that it would not be cumulatively considerable.

3.2.6 References

California Department of Transportation (Caltrans), 2019. List of eligible and officially designated State Scenic Highways, August, 2019. Available online: https://dot.ca.gov/programs/design/lap-landscape-architectureand- community-livability/lap-liv-i-scenic-highways. Accessed February 20, 2020.

Federal Aviation Administration (FAA), 2018. Advisory Circular: Obstruction Marking and Lighting. AC No. 70/7460-1L, Change 2. August 17, 2018.

Federal Highway Administration (FHWA), 2015. Guidelines for the Visual Impact Assessment of Highway Projects. (FHWA-HEP-15-029.) January 2015.

Shasta County, 2004. Shasta County General Plan as Amended Through September 2004. September. Available online: https://www.co.shasta.ca.us/index/drm_index/planning_index/plng_general_plan.aspx. Accessed February 20, 2020.

3.3 Air Quality

This section identifies and evaluates issues related to Air Quality in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. The information and analysis presented are based in part on emissions calculations presented in **Appendix B**, *Air Quality and Greenhouse Gas Emissions*.

The Shasta County Air Quality Management District (AQMD), consistent with its role as a Responsible Agency, provided initial input for the County's environmental review process shortly after the CUP application was filed for the Project (AQMD, 2018). Later, in response to the issuance of the notice of intention to prepare this Draft EIR, the County received scoping input from the AQMD and others raising concerns about the proximity of residential receptors to Project emissions from construction material delivery vehicles (including wide or "super" loads for turbine components) originating outside the County, secondary impacts resulting from increased emissions from other vehicle delays resulting from traffic controls and lane closures required for material deliveries, emissions from construction worker commute trips and construction vehicles, on-site vehicle and equipment emissions for site preparation-related timber harvesting, and dust. All scoping input received, including that regarding air quality, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

3.3.1 Setting

3.3.1.1 Study Area

The Project Site is in Shasta County in the extreme northern end of the Sacramento Valley Air Basin (Air Basin), which is comprised of Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, and Yuba counties, the western portion of Placer County, and the eastern portion of Solano County. The geographic area of analysis for purposes of this section is the Air Basin and a small portion of San Joaquin Valley Air Basin (SJVAB). The vast majority of Project emissions would occur in Shasta County except for a portion of truck trips that would be required to deliver turbine components that would originate at the Port of Stockton, which is in the extreme northwestern end of SJVAB.

3.3.1.2 Environmental Setting

Geography and Climate

Air quality is affected by both the rate and location of pollutant emissions and by meteorological conditions, which influence movement and dispersal of pollutants. Atmospheric conditions such as wind speed, wind direction, and air temperature gradients, along with local topography, provide the link between air pollutant emissions and air quality.

The Air Basin is surrounded by the Klamath and Coastal Mountains to the northwest and the Cascade Mountains to the northeast and east. When winds are calm with fairly stable atmospheric conditions, the potential for substantial air pollution in the Air Basin is considered high (Shasta County, 2004).

The low elevation areas of Shasta County generally experience moderate to very poor capability to disperse pollutants nearly 80 percent of the time. This is primarily due to the relatively stable atmosphere that acts to suppress vertical air movement. Extremely stable atmospheric conditions referred to as "inversions" act as barriers to pollutants. Elevations within the Project Site range from 3,000 to 6,000 feet above sea level. In valley locations under 1,000 feet elevation, such as the Redding Metropolitan area approximately 30 miles to the southwest of the Project Site, create a "lid" under which pollutants become trapped. Dust and other pollutants can be trapped within these inversion layers and will not disperse until atmospheric conditions become more unstable. This situation creates concentrations of pollutants at or near the ground surface that can pose significant health risks for plants, animals, and people (Shasta County, 2004).

The climate in the vicinity of the Project Site provides average maximum and minimum winter (i.e., January) temperatures of 44 degrees Fahrenheit (ºF) and 19 ºF, respectively, while average summer (i.e., July) maximum and minimum temperatures are 88 ºF and 44 ºF, respectively (WRCC, 2020a). Rainfall averages approximately 67 inches per year and snowfall averages 79 inches per year, with an average winter snow depth of 2 inches (WRCC, 2020b). Average annual wind speeds in the vicinity of Round Mountain are approximately 19 miles per hour (mph), with average monthly peak wind speed at approximately 29 mph during October, and average monthly minimum average wind speed at 11 mph in June (USA, 2020). A scoping comment noted south-west prevailing summer winds. See Letter P117, provided in Appendix H of the Scoping Report included as Appendix J to this Draft EIR.

Criteria Air Pollutants

The U.S. Environmental Protection Agency (USEPA) has identified criteria air pollutants and has set National Ambient Air Quality Standards (NAAQS) for widespread pollutants from numerous and diverse sources that are a threat to public health and welfare. The USEPA has set NAAQS for the following seven principal pollutants, which are called “criteria” pollutants:

- Carbon monoxide (CO);
- Lead;
- Nitrogen dioxide (NO_2);
- Ozone;
- Particulate matter less than or equal to 10 microns in diameter (PM_{10});
- Particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$); and
- Sulfur dioxide (SO_2).

The State of California has established California Ambient Air Quality Standards (CAAQS) for these criteria pollutants, as well as ambient air quality standards for sulfates, hydrogen sulfide (H_2S), and vinyl chloride. NAAQS and CAAQS are summarized in Table 3.3-2, *NAAQS/CAAQS*

and Attainment Status for Shasta County. Criteria pollutants that would be generated by the Project are described below.

Ozone

Ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections and that can cause substantial damage to vegetation and other materials. Ozone is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and nitrogen oxides (NO_x). ROG and NO_x are known as precursor compounds for ozone. Significant ozone production generally requires ozone precursors to be present in a stable atmosphere with strong sunlight for approximately 3 hours.

Ozone is a regional air pollutant because it is not emitted directly by sources, but is formed downwind of sources of ROG and NO_x under the influence of wind and sunlight. Ozone concentrations tend to be higher in the late spring, summer, and fall, when conditions, such as long sunny days and regional subsidence inversions, are conducive to the formation and accumulation of secondary photochemical compounds.

According to the USEPA, ozone can cause the muscles in the airways to constrict potentially leading to wheezing and shortness of breath (USEPA, 2019). Ozone can make it more difficult to breathe deeply and vigorously; cause shortness of breath and pain when taking a deep breath; cause coughing and sore or scratchy throat; inflame and damage the airways; aggravate lung diseases such as asthma, emphysema and chronic bronchitis; increase the frequency of asthma attacks; make the lungs more susceptible to infection; continue to damage the lungs even when the symptoms have disappeared; and cause chronic obstructive pulmonary disease (USEPA, 2019). Long-term exposure to ozone is linked to aggravation of asthma, and is likely to be one of many causes of asthma development and long-term exposures to higher concentrations of ozone may also be linked to permanent lung damage, such as abnormal lung development in children (USEPA, 2019).

Inhalation of ozone causes inflammation and irritation of the tissues lining human airways, causing and worsening a variety of symptoms and exposure to ozone can reduce the volume of air that the lungs breathe in and cause shortness of breath (CARB, 2019a). People most at risk from breathing air containing ozone include people with asthma, children, older adults, and people who are active outdoors, especially outdoor workers (USEPA, 2019). Children are at greatest risk from exposure to ozone because their lungs are still developing and they are more likely to be active outdoors when ozone levels are high, which increases their exposure (USEPA, 2019). Studies show that children are no more or less likely to suffer harmful effects than adults; however, children and teens may be more susceptible to ozone and other pollutants because they spend nearly twice as much time outdoors and engaged in vigorous activities compared to adults (CARB, 2019a). Children breathe more rapidly than adults and inhale more pollution per pound of their body weight than adults and are less likely than adults to notice their own symptoms and avoid harmful exposures (CARB, 2019a).

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is an air quality pollutant of concern because it acts as a respiratory irritant. NO_2 is a major component of the group of gaseous nitrogen compounds commonly referred to as oxides of nitrogen (NO_x). A precursor to ozone formation, NO_x is produced by fuel combustion in motor vehicles, industrial stationary sources (such as industrial activities), ships, aircraft, and rail transit. Typically, NO_x emitted from fuel combustion is in the form of nitric oxide (NO) and NO_2. NO is converted to NO_2 when it reacts with ozone or undergoes photochemical reactions in the atmosphere. NO_2 can potentially irritate airways in the human respiratory system (USEPA, 2016). Short-term exposures can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to emergency rooms and longer exposures to elevated concentrations of NO_2 may contribute to the development of asthma and potentially increase susceptibility to respiratory infections.

Carbon Monoxide

Carbon monoxide (CO) is a non-reactive pollutant that is a product of incomplete combustion and is mostly associated with motor vehicle traffic. High CO concentrations develop primarily during winter when periods of light winds combine with the formation of ground level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease, or anemia.

Particulate Matter

Particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) represent fractions of particulate matter that can be inhaled into air passages and the lungs and can cause adverse health effects. Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, fuel combustion, and atmospheric photochemical reactions. Some sources of particulate matter, such as demolition and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. Particulates can damage materials and reduce visibility. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly, or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. According to a study by the California Air Resources Board (CARB), the estimated number of annual $PM_{2.5}$-related premature deaths in California is 9,200 (CARB, 2010). A large body of scientific evidence indicates that both long-term and short-term exposure to $PM_{2.5}$ can cause a wide range of health effects (e.g., aggravating asthma and bronchitis, causing visits to the hospital for respiratory and cardiovascular symptoms, and contributing to heart attacks and deaths) (CARB, 2020a).

Sulfur Dioxide

Sulfur dioxide (SO_2) is a colorless acid gas with a pungent odor. It has potential to damage materials and it can have health effects at high concentrations. It is produced by the combustion

of sulfur-containing fuels, such as oil, coal, and diesel. SO_2 can irritate lung tissue and increase the risk of acute and chronic respiratory disease.

Toxic Air Contaminants

Toxic air contaminants (TACs) are airborne substances that are capable of causing short-term (acute) and/or long-term (chronic or carcinogenic, i.e., cancer-causing) adverse human health effects (i.e., injury or illness). TACs include both organic and inorganic chemical substances. They may be emitted from a variety of common sources including gasoline stations, automobiles, dry cleaners, industrial operations, and painting operations. The current California list of TACs includes nearly 200 compounds, including Diesel Particulate Matter (DPM) emissions from diesel-fueled engines (CARB, 2011).

Existing Air Quality

The AQMD is the local air district responsible for air quality within Shasta County. The AQMD maintains a regional monitoring network that measures the ambient concentrations of criteria pollutants in the County. Ambient air quality measurements from air monitoring stations maintained by the AQMD help to determine the level of air quality in the local area. The closest air quality monitoring stations to the Project Site are the Shasta Lake monitoring station, located approximately 27 miles west-southwest of the southwestern Project Site boundary, and the Redding monitoring station, located approximately 30 miles southwest of the southern Project Site boundary. **Table 3.3-1** shows a 5-year (2014 through 2018) summary of ozone and PM_{10}, data collected at the Shasta Lake monitoring station, and $PM_{2.5}$ data collected at the Redding monitoring station. The data are compared to the CAAQS and NAAQS.

TABLE 3.3-1
AIR QUALITY DATA SUMMARY (2014–2018) FOR THE STUDY AREA

Pollutant	Standard	Monitoring Data by Year				
		2014	2015	2016	2017	2018
Ozone – Shasta Lake						
Highest 1 Hour Average (ppm)		0.067	0.091	0.093	0.096	0.111
Days over State Standard	0.09	0	0	0	1	1
Highest 8 Hour Average (ppm)		0.062	0.082	0.082	0.088	0.088
Days over National Standard*	0.070	0	12	13	13	11
Particulate Matter (PM_{10}) – Shasta Lake						
Highest 24 Hour Average (µg/m^3)		77	84	32	84	142
Measured Days over State Standard	50	1	1	0	1	8
State Annual Average (µg/m^3)	20	*	14	12	*	*
Particulate Matter ($PM_{2.5}$) - Redding						
Highest 24 Hour Average (µg/m^3)		22	65	13	67	131
Measured Days over National Standard	35	0	1	0	1	5
State Annual Average (µg/m^3)	12	5	*	*	8	*

NOTES: ppm = parts per million; µg/m^3 = micrograms per cubic meter; * = insufficient data.

SOURCE: CARB, 2020b

As shown in Table 3.3-1, measured ozone levels exceeded the State 1-hour ozone standard once per year during 2017 and 2018. The national 8-hour ozone standard was not exceeded in 2014, but exceeded between 11 and 13 times per year during the rest of the 5-year period. PM_{10} was measured to exceed the 24-hour State PM_{10} standard once per year during 2014, 2015, and 2017, but was measured to exceed the standard eight times in 2018. $PM_{2.5}$ was measured to exceed the national 24-hour $PM_{2.5}$ standard once per year in 2015 and 2017, and was measured to exceed the standard five times in 2018. The relatively high PM_{10} and $PM_{2.5}$ measurements in 2018 are likely attributed to the Camp Fire that occurred in Paradise, approximately 75 miles south-southeast of Shasta Lake. The Camp Fire impacted regional air quality in the late Fall of 2018, throughout northern and central California (Quartz, 2018).

Sensitive Receptors

Some receptors are considered more sensitive than others to air pollutants. The reasons for greater than average sensitivity include pre-existing health problems, proximity to emissions sources, or duration of exposure to air pollutants. Schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because children, elderly people, and the infirm are more susceptible to respiratory distress and other air quality-related health problems than the general public. Residential areas are considered sensitive to poor air quality because people usually stay home for extended periods of time, with greater associated exposure to ambient air quality. Recreational uses are also considered sensitive due to the greater exposure to ambient air quality conditions because vigorous exercise associated with recreation places a high demand on the human respiratory system. The AQMD considers sensitive receptors to be facilities that house or attract children, the elderly, people with illnesses, or others who are especially sensitive to the effects of air pollutants (AQMD, 2003a).

The closest sensitive receptors to the Project Site are residences. The nearest residence to any of the work areas on the Project Site are off Sycamore Road, approximately 1,900 feet to a construction staging area. The closest residence to any of the access roads on the Project Site are along Moose Avenue, at a distance of approximately 400 feet.

3.3.1.3 Regulatory Setting

Air quality within the Air Basin is addressed through the efforts of various federal, State, and local government agencies. These agencies work jointly, as well as individually, to improve air quality through legislation, regulations, planning, policy-making, education, and a variety of programs. The air pollutants of concern and agencies primarily responsible for improving the air quality within the Air Basin and the pertinent regulations are discussed below.

Criteria Air Pollutants

Regulation of air pollution is achieved through both CAAQS and NAAQS as well as emission limits for individual sources of air pollutants. As required by the federal Clean Air Act (CAA), the USEPA has identified criteria pollutants and has established NAAQS to protect public health and welfare. NAAQS have been established for ozone, CO, NO_2, PM_{10}, $PM_{2.5}$, and lead. These pollutants are called "criteria" air pollutants because standards have been established for each of them to meet specific public health and welfare criteria.

To protect human health and the environment, the USEPA has set "primary" and "secondary" maximum ambient thresholds for all six criteria pollutants. Primary thresholds were set to protect human health, particularly sensitive receptors such as children, the elderly, and individuals that suffer from chronic lung conditions such as asthma and emphysema. Secondary standards were set to protect the natural environment and prevent further deterioration of animals, crops, vegetation, and buildings.

The NAAQS are defined as the maximum acceptable concentration that may be reached, but not exceeded, more than once per year. California has adopted more stringent ambient air quality standards (i.e., CAAQS) for most of the criteria air pollutants, which also are designed to protect human health. Emission levels above the NAAQS and/or CAAQS are levels that could create adverse effects on human health.

Table 3.3-2 presents both sets of ambient air quality standards (i.e., national and State) and provides the attainment status in Shasta County for each. California also has established State ambient air quality standards for sulfates, hydrogen sulfide, and vinyl chloride; however, air emissions of these pollutants are not expected under the Project or alternatives and are not further discussed in this EIR.

Shasta County is classified as a non-attainment area for the State 1-hour and 8-hour ozone standards. For all other criteria pollutants, the County is classified as either unclassified or as attainment with respect to State and federal standards; however, the rest of the Air Basin is classified as non-attainment of the State PM_{10} standards (CARB, 2016). The NAAQS and CAAQS are applicable to this analysis because the Project could impact the attainment status of ozone or PM_{10} in the Air Basin.

Federal

The USEPA is responsible for implementing programs established under the federal Clean Air Act (CAA), such as establishing and reviewing the NAAQS and judging the adequacy of State Implementation Plans (SIPs), but has delegated the authority to implement many of the federal programs to the states while retaining an oversight role to ensure that the programs continue to be implemented.

State

CARB is responsible for establishing and reviewing the State standards, compiling the California SIP and securing approval of that plan from USEPA, conducting research and planning, and identifying TACs. CARB also regulates mobile sources of emissions in California, such as construction equipment, trucks, and automobiles, and oversees the activities of California's air quality districts, which are organized at the county or regional level. County or regional air quality management districts are primarily responsible for regulating stationary sources at industrial and commercial facilities within their geographic areas and for preparing the air quality plans that are required under the federal CAA and California CAA.

TABLE 3.3-2
NAAQS/CAAQS AND ATTAINMENT STATUS FOR SHASTA COUNTY

Criteria Pollutant	Averaging Time	State Standard	Shasta County Attainment Status for California Standard	Federal Primary Standard	Shasta County Attainment Status for Federal Standard
Ozone	8 Hour	0.070 ppm	Non-Attainment	0.070 ppm	Attainment
	1 Hour	0.09 ppm	Non-Attainment	---	---
Carbon Monoxide	8 Hour	9.0 ppm	Unclassified	9 ppm	Attainment
	1 Hour	20 ppm	Unclassified	35 ppm	Attainment
Nitrogen Dioxide	Annual Average	0.030 ppm	Attainment	0.053 ppm	Attainment
	1 Hour	0.18 ppm	Attainment	0.100 ppm	Attainment
Sulfur Dioxide	Annual Average	---	---	0.030 ppm	Attainment
	24 Hour	---	---	0.14 ppm	Attainment
	1 Hour	---	---	0.075 ppm	Attainment
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 mg/m^3	Attainment*	---	---
	24 Hour	50 mg/m^3	Attainment*	150 mg/m^3	Attainment
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 mg/m^3	Attainment	12.0 mg/m^3	Attainment
	24 Hour	---	---	35 mg/m^3	Attainment
Lead	3-Month Rolling Average	---	---	0.15 mg/m^3	Attainment
Hydrogen Sulfide	1 Hour	0.03 ppm/ 42 $\mu g/m^3$	Unclassified	---	---
Sulfates	24 Hour	25 mg/m^3	Attainment	---	---
Vinyl Chloride	24 Hour	0.01 ppm/ 26 $\mu g/m^3$	Attainment	---	---

NOTES:

* Although Shasta County is in attainment of State PM_{10} standards, the rest of the Air Basin in non-attainment of State PM_{10} standards; ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter; mg/m^3 = milligrams per cubic meter; --- = no applicable standard; PM_{10} = particulates of 10 microns or less; $PM_{2.5}$ = particulates of 2.5 microns or less.

SOURCES: CARB, 2016, 2019b; USEPA, 2020.

California's Diesel Risk Reduction Plan / Diesel Fuel Regulations

As part of California's Diesel Risk Reduction Plan, CARB has passed numerous regulations to reduce diesel emissions from vehicles and equipment that are already in use. Combining these retrofit regulations with new engine standards for diesel fueled vehicles and equipment, CARB intends to reduce DPM emissions by 85 percent from year 2000 levels by 2020. California Diesel Fuel Regulations (13 Cal. Code Regs. §§2281–2285; 17 Cal. Code Regs. §93114) provide standards for diesel motor vehicle fuel and non-vehicular diesel fuel.

CARB also has adopted regulations for on road vehicles with a gross vehicular weight rating of 10,000 pounds or greater shall not idle for longer than 5 minutes at any location (13 Cal. Code Regs. §2485). This restriction does not apply when vehicles remain motionless during traffic or

when vehicles are queuing. Off-road equipment regulations adopted by CARB require that all engines shall not idle for longer than 5 minutes (13 Cal. Code Regs. §2449[d][3]). Exceptions to this rule include: idling when queuing; idling to verify that the vehicle is in safe operating condition; idling for testing, servicing, repairing, or diagnostic purposes; idling necessary to accomplish work for which the vehicle was designed (such as operating a crane); and idling required to bring the machine to operating temperature as specified by the manufacturer. The Diesel Risk Reduction Plan and diesel fuel regulations are applicable because the Project would generate diesel fuel exhaust emissions during construction.

Local

Northern Sacramento Valley Planning Area 2018 Triennial Air Quality Attainment Plan

The air districts for the counties of Shasta, Tehama, Butte, Glenn, Colusa, Sutter, and Yuba have established the Northern Sacramento Valley Planning Area (NSVPA). The NSVPA air districts were designated as non-attainment for the ozone CAAQS and have jointly prepared an air quality attainment plan to attain the ozone CAAQS standard by the earliest practicable date. The NSVPA air districts jointly prepared the original 1991 Air Quality Attainment Plan, and have since prepared triennial updates to the plan. The latest update is referred to as the 2018 Triennial Air Quality Attainment Plan (2018 Plan). The 2018 Plan includes an assessment of progress towards achieving the control measure commitments in the previous plan, a summary of ozone data, emission reductions for measures committed to in the previous plan, updated control measure commitments, and updated growth rates. The NSVPA air districts also administer several grant programs that achieve emission reductions in addition to stationary and area-wide control measures. These incentive programs are voluntary and often target mobile sources, of which comprise the majority of the NO_x emission inventory, yet the districts have no regulatory authority over. There are no control measures or grant programs that would be directly applicable to the Project (SVAQEEP, 2018).

Shasta County General Plan

The Air Quality Element of the Shasta County General Plan includes the following policies designed to reduce air pollutant emissions in the County (Shasta County, 2004):

> **Policy AQ-1e:** The County shall require new air pollution point sources such as, but not limited to, industrial, manufacturing, and processing facilities to be located an adequate distance from residential areas and other sensitive receptors.
>
> **Policy AQ-2a:** The County will cooperate with the AQMD, CARB, and the Regional Transportation Planning Agency in implementing programs designed to comply with provisions of Federal and State Clean Air Acts and the County's Air Quality Attainment Plan.
>
> **Policy AQ-2b:** The County will work to accurately determine and fairly mitigate the local and regional air quality impacts of projects proposed in the unincorporated portions of Shasta County.
>
> **Policy AQ-2c:** Land use decisions, where feasible, should contribute to the improvement of air quality. New projects shall be required to reduce their respective air quality impacts to below levels of significance, or proceed as indicated in Policy AQ-2e.

Policy AQ-2d: Shasta County shall ensure that air quality impacts identified during CEQA review are: (1) consistently and fairly mitigated, and (2) mitigation measures are feasible.

Policy AQ-2e: Shasta County will cooperate with the AQMD in assuring that new projects with stationary sources of emissions of non-attainment pollutants or their precursors that exceed 25 tons per year shall provide appropriate emission offsets. A comparable program which offsets indirect emissions of these pollutants exceeding 25 tons per year from development projects shall also be utilized to mitigate air pollution impacts. An Environmental Impact Report will be required for all projects that have unmitigated emissions of non-attainment pollutants exceeding 25 tons per year.

Policy AQ-2f: Shasta County shall require appropriate Standard Mitigation Measures and Best Available Mitigation Measures on all discretionary land use applications as recommended by the AQMD in order to mitigate both direct and indirect emissions of non-attainment pollutants.

Policy AQ-2g: Significance thresholds as proposed by the AQMD for emissions shall be utilized when appropriate for: (1) ROG and NO_x, both of which are precursors of ozone, and (2) PM_{10} in determining mitigation of air quality impacts.

Policy AQ-2h: Shasta County shall evaluate AQMD data annually to determine if the air quality impacts of development projects that may be insignificant by themselves are cumulatively significant.

Policy AQ-4b: The County's development standards shall require the paving of roads as a part of new development permits to the extent necessary to meet access and air quality objectives. These requirements shall be designed to help mitigate potentially significant adverse air quality impacts created by particulate emissions on both an individual and cumulative basis.

Shasta County AQMD Rules

The Shasta County AQMD enforces the following rules that may be applicable to the Project to limit the generation of air pollutants in Shasta County:

Rule 3:2: Specific Air Contaminants. This rule establishes limits to the amount of pollutants that may be discharged into the atmosphere.

Rule 3:16: Fugitive, Indirect, or Non-Traditional Sources. This rule established conditions upon any source, including sources of construction-related fugitive dust, to mitigate the emissions from such sources to below a level of significance or to a point that such emissions no longer constitute a violation of the California Health & Safety Code Section 41700 and/or Section 41701.

Rule 3:28: Stationary Internal Combustion Engines: The provisions of this rule apply to any gaseous, diesel, or any other liquid-fueled stationary internal combustion engine within the boundaries of the AQMD. The emissions limits identified by this rule are not applicable to emergency standby engines as approved by the Air Pollution Control Officer (APCO); however, the rule does require that testing and maintenance for emergency generators be limited to no more than 100 hours per year.

Rule 3:31: Architectural Coatings. This rule limits the quantity of volatile organic compounds (VOCs)[1] in architectural coatings supplied, sold, offered for sale, applied, solicited for application, or manufactured for use within Shasta County.

Rule 3:32: Adhesives and Sealants. This rule limits the emission of VOCs from adhesives and sealants and associated primers, and from related surface preparation solvents, cleanup solvents, and strippers.

3.3.2 Significance Criteria

CEQA Guidelines Appendix G Section III identifies considerations relating to air quality. See Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area*, as it relates to the County's analysis of the potential impacts of this Project to some of the air quality considerations suggested in CEQA Guidelines Appendix G. Otherwise, for purposes of this analysis, a project would result in a significant impact to air quality if it would:

a) Conflict with or obstruct implementation of the applicable air quality plan;

b) Result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable federal or state ambient air quality standard;

c) Expose sensitive receptors to substantial pollutant concentrations; or

d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

The CEQA Guidelines Appendix G Checklist (Section III, *Air Quality*) states that the significance criteria established by the applicable air quality management district or air pollution control district may be relied on to make the determinations for the above criteria. The AQMD has established air pollution emissions criteria for determining the significance of an impact during project construction and operation, and these thresholds have been used to evaluate the impacts of the Project on air quality. The AQMD requests that lead agencies apply standard mitigation measures and best available mitigation measures to the project as listed in the General Plan Air Quality Element. The standard mitigation measures are applied to all projects, while the list of best available mitigation measures are reviewed by the planning agency staff for consideration of a specific project. The County General Plan does not include construction-related air quality mitigation measures; however, the AQMD has recommended standard mitigation measures for the Project (AQMD, 2018). As described in **Table 3.3-3**, Shasta County has two levels of emission thresholds that are used to determine the appropriate level of required best available mitigation measures.

If the Project's emissions are greater than the Level A thresholds but less than Level B thresholds, appropriate mitigation should be implemented and the impact would be less than significant. If emissions exceed the Level B thresholds after the application of mitigation measures, then the Project would be considered to have a significant air quality impact.

[1] For the purposes of this analysis, volatile organic gases (VOCs) and reactive organic gases (ROG) are equivalent.

TABLE 3.3-3
SHASTA COUNTY EMISSIONS THRESHOLDS (POUNDS/DAY)

Significance Threshold Levels		NO_x	PM_{10}
A	25	25	80
B	137	137	137

NOTES:
ROG = reactive organic gases; NO_x = nitrogen oxides; PM_{10} = Particulate matter less than or equal to 10 microns in diameter.

SOURCE: AQMD, 2003a

3.3.3 Direct and Indirect Effects

3.3.3.1 Approach to Analysis

Shasta County is classified as a non-attainment area for the State ozone standards; and although the County is in attainment of State PM_{10} standards, the rest of the Air Basin in non-attainment of State PM_{10} standards. Therefore, the AQMD has adopted CEQA thresholds of significance for ROG, NO_x, and PM_{10} for both short-term construction and long-term project operations as identified in Table 4.3-3, above. The AQMD has determined that an exceedance of the Level B threshold for either NO_x or ROG or both of these precursors indicates that a project would cumulatively jeopardize attainment of ozone standards and that an exceedance of the Level B threshold for PM_{10} indicates that a project would cumulatively jeopardize attainment of PM_{10} standards. An exceedance of the ozone and/or PM_{10} standards would result in a significant adverse impact on air quality.

Criteria pollutant emissions from construction equipment, vehicle, and helicopter exhaust and generation of particulate matter in the form of fugitive dust are the primary concerns in evaluating the short-term (i.e., construction, decommissioning, and site reclamation) air quality impacts of the Project. Short-term Project activities that would result in air quality impacts include: timber removal and grubbing, grading and access road work; concrete batch plant activities; turbine, transformer, substation, and O&M building foundation work; turbine and transformer installation; substation and O&M building installation; installation of the underground and overhead collector systems; connection with PG&E infrastructure; and installation of the substation aggregate and security fencing. While long-term impacts associated with criteria pollutants were also evaluated, these would not be significant since emission-related activities associated with Project operations and maintenance would be limited to commuting workers trips, crane-related maintenance activities, and periodic emergency generator testing.

Exhaust pollutants would be emitted during construction, decommissioning, and site reclamation activities from a variety of construction and earth-moving equipment, including motor-driven construction equipment, a helicopter, construction vehicles, and workers' vehicles. Fugitive dust would be generated by ground disturbing activities (e.g., site grading and foundation excavation), as well as from heavy truck travel on paved and unpaved roads, concrete batch plant activities, and helicopter landings and takeoffs.

3.3.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would conflict with or obstruct implementation of the applicable air quality plan.

Impact 3.3-1: Construction, decommissioning, and site reclamation activities would generate pollutant emissions that could conflict or obstruct implementation of the applicable air quality plan. (*Less than Significant with Mitigation Incorporated*)

The Project would be under the jurisdiction of the AQMD. The AQMD has partnered with air districts from other counties, including Tehama, Butte, Glenn, Colusa, Sutter, and Yuba to form the NSVPA. The NSVPA's most recently prepared air quality attainment plan is the 2018 Plan to attain the ozone CAAQS standards. Construction, decommission, and site reclamation activities of the Project would be short-term and conducted in compliance with applicable federal, state, and local requirements. Project construction, decommissioning, and site reclamation activities have the potential to generate temporary ozone precursor emissions through the use of heavy-duty construction equipment, such as excavators and graders, through the use of a helicopter, and through vehicle trips generated from worker trips and haul trucks traveling to and from the Project Site. Construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of construction activity, and prevailing weather conditions. The assessment of construction, decommissioning, and site reclamation air quality impacts considers each of these potential sources (see Impact 3.3-2).

To determine if a project would conflict with or obstruct implementation of the applicable air quality plan, lead agencies must demonstrate that a project would not directly obstruct implementation of an applicable air quality plan and that a project be consistent with the assumptions (typically land-use related) upon which the air quality plan is based. The Project would result in an increase in short-term employment compared to existing conditions. Being relatively small in number (approximately 400 workers per day) and temporary in nature, construction jobs under the Project construction, decommissioning, and site reclamation phases would not conflict with the long-term employment projections upon which the 2018 Plan is based. There are no control measures or grant programs that would be directly applicable to the Project; however, as described under Impact 3.3-2, the Project would result in a significant impact associated with construction, decommissioning, and site reclamation emissions of NO_x, a precursor to ozone. Therefore, although the Project would not directly conflict with implementation of the 2018 Plan measures or grant programs, it could result in a violation of an ozone air quality standard, which would not be consistent with the intent of the 2018 Plan. With implementation of Mitigation Measures 3.3-1a (Tier 4 Final Emission Standards for Off-road Construction Equipment) and 3.3-1b (Idling Restrictions and Fuel Use), NO_x emissions would be reduced to less than the applicable Level B significance threshold and would not have a substantial effect on the regional and localized air quality in the Air Basin, and it would not conflict or obstruct implementation of the 2018 Plan. This impact would be reduced to **less than significant**.

Long-term operation of the Project would result in insignificant ozone precursor emissions from worker automobile trips, maintenance with cranes, and emergency generator testing. Exhaust emissions from these trips, cranes, and testing would be less than significant (see Impact 3.3-3).

Furthermore, operations of the Project would be consistent with the applicable growth projections and control strategies used in the development of the 2018 Plan and would not jeopardize attainment of the air quality levels identified in the 2018 Plan because it would not be considered growth inducing (see Section 3.1.4.11, *Population and Housing, Growth Inducing*). For these reasons, long-term operations of the Project would not conflict with or obstruct the implementation of the 2018 Plan. No impact would result from the proposed operation and maintenance activities.

Mitigation Measure 3.3-1a: Tier 4 Final Emission Standards for Off-road Construction Equipment.

The Applicant (and/or its construction contractor[s]) shall require that all diesel-fueled off-road construction equipment of more than 50 horsepower used at the Project Site during construction, decommissioning, and/or reclamation activities meet USEPA Tier 4 Final emission standards. A compliance log shall be maintained by the Applicant and made available to the Shasta County Department of Resource Management upon request.

Mitigation Measure 3.3-1b: Idling Restrictions and Fuel Use.

To ensure that idling time for on road vehicles with a gross vehicular weight rating of 10,000 pounds or greater does not exceed the five-minute limit established in Section 2485 of Title 13 California Code of Regulations, and that idling time for off-road engines does not exceed the five-minute limit established in Title 13 California Code of Regulations Section 2449(d)(3), the Applicant and/or its construction contractor(s) shall prepare and implement a written idling policy and distribute it to all equipment operators. Clear signage of these requirements shall be provided for construction workers at all access points to construction areas.

The Applicant shall use CARB-certified alternative fueled (compressed natural gas [CNG], liquid propane gas [LPG], electric motors, or other CARB certified off-road technologies) engines in construction equipment where feasible.

Significance after Mitigation: Less than significant.

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b) Whether the Project would result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard.

Construction of the Project would generate emissions of criteria air pollutants over a construction period of up to 21 months (two years with no construction in January through March); however, during this period there would be no construction during January through March due to winter conditions. Exhaust emissions would result from construction equipment and machinery, a helicopter, as well as from vehicular traffic generated by construction activities. Fugitive dust emissions would result from entrained particulates that become airborne from vehicles traveling on unpaved roadway surfaces at the site and paved roadway surfaces off-site, concrete batch plant activities, helicopter landings and takeoffs, and earthwork activities, including site grading and foundation excavation. Emission levels for the various construction activities would vary with the type of equipment, duration of use, operation schedules, and size of the construction labor force.

As part of the County's Use Permit application process, the Applicant provided equipment assumptions for the construction phases that would occur during each of the 2 years of construction, including the types of construction equipment that would be required, the amounts of each type, overall duration of equipment operator daily work hours, workdays per week, and total number of workdays. Based on the overall duration of equipment operator daily work hours (i.e., 10 hours), it is estimated that each piece of equipment, including the helicopter, would operate up to 8 hours per workday, to account for breaks, lunch hour, refueling, etc., with the exception of for cranes and boom lifts, which are assumed to operate up to 4 hours per day.

In addition, the Applicant prepared a traffic study (**Appendix H**, *Transportation*) that the County independently reviewed and determined to be suitable for reliance in combination with other sources of data to inform this analysis. The traffic study identifies total construction-related vehicle miles travelled (VMT) that would be associated with commuting workers as well as haul truck trips that would be required to deliver equipment and materials to the Project Site (Westwood, 2020). The trip lengths were estimated based on origins from Port of Stockton (270 miles), Redding (50 miles), Burney (20 miles), and the small towns east of the Project Site (10 miles). Subsequent to the preparation of the traffic study, the Applicant provided additional trips data for the proposed timber removal and grubbing activities. The VMT values identified in the traffic study and provided by the Applicant were doubled to reflect one-way trips, and then were used to generate worker and haul truck trip and mileage rates for each of the construction phases during the 2 years of construction.

As shown in Section 3.14, *Transportation*, Table 3.14-5, all roadway segments along Highway 299 in the vicinity of the Project Site entrances would continue to operate at an acceptable level of service (LOS) according to California Department of Transportation and Shasta County standards (LOS C or better) with the addition of Project construction traffic; therefore, secondary impacts from increased vehicle emissions due to delays resulting from traffic controls and lane closures would not be expected.

It should be noted that the trips from the Port of Stockton for the turbine-related deliveries would pass through seven air district jurisdictions, including the AQMD, Tehama County Air Pollution Control District (TCAPCD), Glenn County Air Pollution Control District (GCAPCD), Colusa County Air Pollution Control District (CCAPCD), Yolo-Solano Air Quality Management District (YSAQMD), Sacramento Metropolitan Air Quality Management District (SMAQMD), and San Joaquin Valley Air Pollution Control District (SJVAPCD). The pollutant emissions associated with these trips were allocated according to the relevant air districts, and compared to the applicable jurisdiction's significance criteria.

The Project emissions were estimated by the EIR preparers (identified in Chapter 5, *Report Preparation*) using the California Emissions Estimator Model (CalEEMod) version 2013.3.2. This version of CalEEMod calculates the construction equipment exhaust emissions based on CARB's OFFROAD2011 model emission and load factors, and calculates fugitive dust, including from ground disturbance and paved and unpaved road vehicle travel, using factors from USEPA's AP-42, *Compilation of Air Emission Factors*, and other sources. To estimate on-road mobile exhaust emissions, CalEEMod version 2013.3.2 uses vehicle emission factors from an outdated

version of CARB's Emfac model (2014); therefore, the CalEEMod "off-site" vehicle emissions estimates were not used in this analysis, and the Project on-road vehicle exhaust emissions were estimated outside of CalEEMod using emissions factors obtained from the latest version of the Emfac model, released in 2017. Helicopter emissions that would be associated with conductor stringing for the overhead collection system and transmission line connection were estimated manually using emissions factors obtained from the Swiss Federal Office of Civil Aviation (FOCA) (2015).[2] For all the air pollutant emissions assumptions and calculations, see Appendix B.

Construction-related fugitive dust emissions were estimated using the CalEEMod model. For the purposes of this analysis, it is assumed that all grading and access road work would occur over a period of 160 workdays during the first year of construction. These grading activities would disturb an estimated 1,384 acres. Excavation activities for installation of the turbine foundations are assumed to result in handling of 256,000 cubic yards of excavated material. These excavation activities would happen over a 70-day period and would also occur during the first year of construction, partially overlapping with the grading activities. With regard to vehicle travel on unpaved roads, it is assumed that workers would park at the O&M building site or at one of the various laydown/staging areas at the site. The O&M building site is approximately 0.5 mile from the paved highway and the various laydown/staging areas are estimated to average 6 miles from the highway, which represents the approximate center of the Project Site. Assuming equal amounts of workers would park at the O&M building site and at the various laydown/staging sites, it is assumed that each worker trip would result in an average of 3.25 miles of unpaved road travel. For haul truck trips that would be required for timber removal and grubbing (80 workdays during first year of construction), grading and access work (160 workdays during first year of construction), concrete deliveries (70 workdays during first year of construction), turbine and transformer installation (100 workdays during second year of construction), substation and O&M building installation (160 workdays during second year of construction), and aggregate and the security fence installation (15 workdays during second year of construction), it is assumed that each trip would require an average of 6 miles of unpaved road travel from the paved highway.

Two scenarios were used to estimate emissions that would be associated with the Project's use of approximately 37,000 cubic yards of concrete. One scenario assumed the concrete would be trucked to the site via 3,805 truck deliveries from Redding, and the other assumed that the concrete would be batched as part of the Project at several plants onsite. Fugitive dust emissions that would be associated with the concrete batch plants were estimated using emission factors from USEPA's AP-42, Section 11.12, *Concrete Batching* (USEPA, 2012), and the exhaust emissions that would be associated with equipment used to run the batch plants were estimated using the CalEEMod model. Although the onsite concrete batch plants would generate slightly higher exhaust emissions than trucking the concrete to the site, the fugitive dust emissions that would be associated with unpaved road travel from trucking the concrete to the site would be substantially greater than the fugitive dust emissions that would be associated with batching the

[2] FOCA emission factors are one of the main sources for helicopter emission factors used in CEQA reviews. The Federal Aviation Administration maintains the Aviation Environmental Design Tool (AEDT), which is used by the U.S. government to consider the interdependencies between aircraft-related fuel burn, noise, and emissions; however, the AEDT database is incomplete with regard to helicopter emission factors.

concrete onsite. Therefore, for a conservative analysis, it is assumed that the concrete would be trucked to the site from Redding.

According to the Applicant, the Project would be completed in the following phases: timber removal and grubbing, grading and access road work; concrete batch plant activities; turbine, transformer, substation, and O&M building foundations; turbine and transformer installation; substation and O&M building installation; underground collector system; overhead collection systems; the transmission line connection; and substation aggregate and security fencing. To estimate peak daily Project construction emissions, the construction phases that could overlap in schedule, i.e., occur simultaneously, were identified to estimate the combined total estimated peak daily emissions. Based on the Applicant's identified proposed construction phases, concurrent construction activities for each Project component that would emit the greatest amount of daily emissions during the first and second year of construction would be as follows.

First Year of Construction:

- *Timber Removal and Grubbing; and*
- *Grading and Access Road Work.*

Second Year of Construction:

- *Turbine and Transformer Installation*;
- *Substation and O&M Building Installation*;
- *Underground Collector System*; and
- *Overhead Collection Systems*.

Table 3.3-4, *Unmitigated Project Peak Daily Construction Emissions*, presents the estimated peak daily construction emissions that would be associated with the Project. These emissions would be dispersed throughout the study area at the various Project component sites. As shown in the table, the maximum peak daily construction emission would occur during the first year of construction, and would primarily be associated with grading and access road work for exhaust emissions and timber removal and grubbing for fugitive dust. For information on the types and amounts of construction equipment that would be used to construct the Project, refer to Table 2-2, *Construction Equipment List*, in Chapter 2. It is anticipated that the peak daily emissions that would be associated with decommissioning and site reclamation activities for the Project would be similar to the emissions estimated for the construction of the Project because similar construction equipment would likely be required for those activities. Therefore, this impact analysis is applicable to both Project construction, decommissioning, and site reclamation.

Turbine and transformer installation vehicle trip emissions presented in Table 3.3-4 represent only the portion of the trips that would occur within Shasta County AQMD's jurisdiction. The emissions associated with the portion of those trips that would be generated in the other six air district jurisdictions, including the TCAPCD, GCAPCD, CCAPCD, YSAQMD, SMAQMD, and SJVAPCD, have been evaluated and are presented in Table 3.3-6 (see the Impact 3.3-2d discussion, below).

TABLE 3.3-4
PROJECT PEAK DAILY CONSTRUCTION EMISSIONS WITHIN THE AQMD JURISDICTION

Phase	Source	ROG	NO_x	PM_{10}			$PM_{2.5}$		
				Exh.	Dust	Total	Exh.	Dust	Total
Peak Construction Emissions - First Year (pounds/day)									
Timber Removal and Grubbing	Equipment	7	62	2	0	2	2	0	2
	Vehicles	4	52	1	1,739	1,740	0	174	174
Grading and Access Road Work	Equipment	21	208	9	45	54	8	21	29
	Vehicles	4	43	2	1,062	1,064	1	107	108
Total		**35**	**365**	**14**	**2,846**	**2,860**	**12**	**302**	**313**
Peak Construction Emissions - Second Year (pounds/day									
Turbine and Transformer Installation	Equipment	6	67	3	0	3	3	0	3
	Vehicles**	1	39	1	527	528	1	55	55
Substation and O&M Building Installation	Equipment	1	10	0	0	0	0	0	0
	Vehicles	1	3	1	595	596	0	60	61
Underground Collector System	Equipment	3	32	2	6	8	2	3	5
	Vehicles	0	0	0	179	179	0	18	18
Overhead Collection System	Equipment	3	34	2	0	2	1	0	1
	Vehicles	0	0	0	179	179	0	18	18
	Helicopter	13	19	1	10	10	1	1	1
Total		**29**	**205**	**9**	**1,497**	**1,506**	**8**	**154**	**162**
Level A Significance Thresholds		**25**	**25**	**--**	**--**	**80**	**--**	**--**	**--**
Level B Significance Thresholds		**137**	**137**	**--**	**--**	**137**	**--**	**--**	**--**

NOTES: Emissions amounts may not add perfectly due to rounding error.

* For a conservative analysis, it is assumed that the concrete would be trucked to the site from Redding, therefore the emissions that would be associated with batching the concrete onsite (equipment row) have been netted out of the total emission values.

** Turbine and transformer installation vehicle emissions represent only the portion of the trips that would occur within Shasta County AQMD's jurisdiction.

SOURCE: Appendix B

Impact 3.3-2a: Construction, decommissioning, and site reclamation activities would generate ROG emissions that could result in a cumulatively considerable net increase of ozone, for which the Project region is non-attainment of State ambient air quality standards. (*Less-than-Significant Impact*)

The AQMD has two thresholds: Level A and Level B. An exceedance of the Level B threshold for either NOx or ROG (or both of these precursors) indicates that a project would cumulatively jeopardize attainment of ozone standards, and so result in a significant impact. An exceedance of the Level A threshold merits further consideration, but would not be considered to be a significant adverse CEQA impact. The estimated ROG emissions that would be generated within the AQMD (as presented in Table 3.3-4) show that the Project's mass emissions would not exceed the Level B threshold. Therefore, ROG emissions generated by the Project within the AQMD would not be expected to result in a cumulatively considerable net increase in regional ozone emissions. Construction, decommissioning, and site reclamation impacts associated with the generation of ROG emissions would therefore be **less than significant**.

The AQMD recommends that projects with emissions greater than the Level A thresholds, but less than Level B thresholds, include measures to further reduce impacts. As noted, the Project's ROG emissions would not result in a significant impact. Nonetheless, the implementation of Mitigation Measures 3.3-1a and 3.3-1b (which are recommended to reduce significant impacts associated with NO_x emissions pursuant to Impact 3.3-1, above), would also reduce peak ROG emissions to less than 25 pounds per day (see Appendix B).

Table 3.3-5, *Mitigated Project Peak Daily Construction Emissions*, presents the estimated peak daily construction emissions that would be associated with the Project with implementation of Mitigation Measures 3.3-1a, 3.3-1b, and 3.3-2c.

TABLE 3.3-5
MITIGATED PROJECT PEAK DAILY CONSTRUCTION EMISSIONS WITHIN THE AQMD JURISDICTION

Phase	Source	ROG	NO_x	PM_{10}			$PM_{2.5}$		
				Exh.	Dust	Total	Exh.	Dust	Total
Peak Construction Emissions - First Year (pounds/day)									
Timber Removal and Grubbing	Equipment	2	8	0	0	0	0	0	0
	Vehicles	4	52	1	280	281	0	28	29
Grading and Access Road Work	Equipment	4	17	1	20	21	1	9	10
	Vehicles	4	43	2	175	177	1	8	9
Total		**13**	**120**	**4**	**475**	**479**	**2**	**45**	**48**
Peak Construction Emissions - Second Year (pounds/day)									
Turbine and Transformer Installation	Equipment	1	6	0	0	0	0	0	0
	Vehicles**	2	39	1	61	62	1	8	9
Substation and O&M Building Installation	Equipment	0	3	0	0	0	0	0	0
	Vehicles	1	3	1	63	63	0	7	7
Underground Collector System	Equipment	1	7	0	3	3	0	1	2
	Vehicles	0	0	0	18	18	0	2	2
Overhead Collection System	Equipment	1	8	0	0	0	0	0	0
	Vehicles	0	0	0	18	18	0	2	2
	Helicopter	13	19	1	10	10	1	1	1
Total		**18**	**85**	**3**	**172**	**175**	**2**	**21**	**23**
Level A Significance Thresholds		**25**	**25**	**--**	**--**	**80**	**--**	**--**	**--**
Level B Significance Thresholds		**137**	**137**	**--**	**--**	**137**	**--**	**--**	**--**

NOTES: Emissions amounts may not add perfectly due to rounding error.

* For a conservative analysis, it is assumed that the concrete would be trucked to the site from Redding, therefore the emissions that would be associated with batching the concrete onsite (equipment row) have been netted out of the total emission values.

** Turbine and transformer installation vehicle emissions represent only the portion of the trips that would occur within Shasta County AQMD's jurisdiction.

SOURCE: Appendix B

Impact 3.3-2b: Construction, decommissioning, and site reclamation activities would generate NO_x emissions that could result in a cumulatively considerable net increase of ozone, for which the Project region is non-attainment of State ambient air quality standards. (*Less than Significant with Mitigation Incorporated*)

As shown in Table 3.3-4, total peak daily emissions of NOx would be as high as 292 pounds, which would exceed the Level B significance threshold, resulting in a significant impact. If all off-road construction equipment that would operate at the site were required to be Tier 4 compliant, the total peak daily construction emissions of NOx would be reduced to 120 pounds, less than the significance threshold (see Appendix B). As shown in Table 3.3-5, implementation of Mitigation Measures 3.3-1a (Tier 4 Final Emission Standards for Off-road Construction Equipment) and 3.3-1b (Idling Restrictions and Fuel Use) would reduce maximum construction-, decommissioning-, and site reclamation-related emissions of NOx to less than the 137 pounds-per-day significance threshold. The maximum daily emission would be reduced as a result of the Applicant/construction contractor(s) using off-road construction equipment that would meet USEPA's most stringent emissions standards for NOx (i.e., Tier 4). Therefore, the impact associated with the generation of NOx emissions to result in a cumulatively considerable net increase in regional ozone emissions would be less than significant with mitigation incorporated.

> **Mitigation:** Implement Mitigation Measures 3.3-1a (Tier 4 Final Emission Standards for Off-road Construction Equipment) and 3.3-1b (Idling Restrictions and Fuel Use)
>
> **Significance after Mitigation:** Less than significant.

Impact 3.3-2c: Construction, decommissioning, and site reclamation activities would generate PM_{10} emissions that would result in a cumulatively considerable net increase of PM_{10}, which the Project region is non-attainment of State ambient air quality standards. (*Significant and Unavoidable*)

As shown in Table 3.3-4, total emissions of PM_{10} would exceed the Level B significance threshold, resulting in a significant impact. Mitigation Measure 3.3-2c (Fugitive Dust Controls; see below), would require the Applicant to implement feasible fugitive dust controls. Implementation of Mitigation Measure 3.3-2c would reduce fugitive dust emissions associated with travel on unpaved surfaces by 84 percent and associated with ground disturbance by 55 percent (South Coast AQMD, 2007), but as shown in Table 3.3-5, peak daily emissions would continue to exceed the significance threshold at 479 pounds (see Appendix B); hence, the impact relative to the potential for the Project to generate emissions that would result in a cumulatively considerable net increase in regional PM_{10} emissions would be **significant and unavoidable**.

> **Mitigation Measure 3.3-2c: Fugitive Dust Controls.**
>
> The following AQMD Standard Mitigation Measures for fugitive dust shall be implemented during the construction, decommissioning, and reclamation phases by the Applicant and/or its contractor(s):
>
> - Options to open burning of vegetative material on the Project Site shall be used by the Applicant unless otherwise deemed infeasible by the AQMD. Examples of suitable options are chipping, mulching, and conversion to biomass fuel.

- The Applicant shall be responsible for ensuring that all adequate dust control measures are implemented in a timely and effective manner during all phases of Project development and construction.
- All material excavated, stockpiled, or graded should be sufficiently watered to prevent fugitive dust from leaving property boundaries and causing a public nuisance or a violation of an ambient air standard. Watering should occur at least twice daily with complete site coverage, preferably in the mid-morning and after work is completed each day.
- All areas (including unpaved roads) with vehicle traffic should be watered periodically or have dust palliatives applied for stabilization of dust emissions.
- All onsite vehicles should be limited to a speed of 15 miles per hour on unpaved roads.
- All land clearing, grading, earth moving, and excavation activities on the Project Site shall be suspended when winds are expected to exceed 20 miles per hour.
- All inactive portions of the development site should be seeded and watered until suitable grass cover is established.
- The Applicant shall be responsible for applying (according to manufacturer 's specifications) nontoxic soil stabilizers to all inactive construction areas (previously graded areas that remain inactive for 96 hours) in accordance with the Shasta County Grading Ordinance.
- All trucks hauling dirt, sand, soil, or other loose material should be covered or should maintain at least 2 feet of freeboard (i.e., minimum vertical distance between top of the load and top of the trailer) in accordance with the requirements of California Vehicle Code Section 23114. This provision shall be enforced by local law enforcement agencies.
- All material transported off site shall be either sufficiently watered or securely covered to prevent a public nuisance.
- During initial grading, earth moving, or site preparation, the Applicant shall be required to construct a paved (or dust palliative-treated) apron, at least 100 feet in length, onto the Project Site from the adjacent paved Highway 299.
- Paved streets adjacent to the development site should be swept or washed at the end of each day to remove excessive accumulations of silt and/or mud that may have accumulated as a result of activities on the development site.
- Adjacent paved streets shall be swept at the end of each day if substantial volumes of soil materials have been carried onto adjacent public paved roads from the Project Site.
- Wheel washers shall be installed where project vehicles and/or equipment enter and/or exit onto paved streets from unpaved roads. Vehicles and/or equipment shall be washed prior to each trip.
- Prior to final occupancy, the applicant shall reestablish ground cover on the construction site through seeding and watering in accordance with the Shasta County Grading Ordinance.

Significance after Mitigation: Significant and unavoidable.

Impact 3.3-2d: Construction, decommissioning, and site reclamation activities would not result in cumulatively considerable net increases of criteria pollutants in other air district jurisdictions. (*Less-than-Significant Impact*)

As discussed previously, haul trips required from the Port of Stockton for the turbine-related deliveries to the Project Site would pass through six other air district jurisdictions in addition to the AQMD, including TCAPCD, GCAPCD, CCAPCD, YSAQMD, SMAQMD, and SJVAPCD. The estimated pollutant emissions associated with those trips that would be generated within each of air district jurisdictions are presented in **Table 3.3-6** and are compared to the jurisdiction's significance criteria, where criteria have been adopted. As shown in the table, the emissions would exceed none of the significance thresholds. Therefore, emissions generated by the Project in the other air district jurisdictions would not result in a cumulatively considerable net increase in regional emissions. Construction, decommissioning, and site reclamation impacts associated with net increases in criteria pollutant emissions in other air district jurisdictions would therefore be **less than significant**.

TABLE 3.3-6
PROJECT PEAK DAILY CONSTRUCTION EMISSIONS WITHIN OTHER AIR DISTRICT JURISDICTIONS

Air District	Source	ROG	NO_x	PM_{10}	$PM_{2.5}$
TCAPCD	Vehicles	1	22	1	<1
	Significance Thresholds[1]	25	25	80	--
GCAPCD	Vehicles	1	16	<1	<1
	Significance Thresholds	--	--	--	--
CCAPCD	Vehicles	1	18	1	<1
	Significance Thresholds	--	--	--	--
YSAQMD	Vehicles	2	42	1	1
	Significance Thresholds[2]	-	-	80	--
SMAQMD	Vehicles	<1	8	<1	<1
	Significance Thresholds	-	85	80	82
SJVAPCD	Vehicles	<1	2	<1	<1
	Significance Thresholds[3]	-	-	-	-
Significant Impacts?		**No**	**No**	**No**	**No**

NOTES: GCAPMD and CCAPCD do not have posted adopted significance thresholds.

1 Represents Level A thresholds, same as those applicable to the AQMD.

2 YSAQMD significance thresholds for ROG and NO_x are 10 tons per year. On an annual basis, Project-related ROG and NO_x emissions that would be generated in the YSAQMD jurisdiction would be less than 1 ton per year and 2 tons per year, respectively, which would be less than significant.

3 SJVAPCD significance thresholds for ROG and NO_x are 10 tons per year and for PM_{10} and $PM_{2.5}$ are 15 tons per year. On an annual basis, Project-related ROG, NO_x, PM_{10}, and $PM_{2.5}$ emissions that would be generated in the SJVAPCD jurisdiction would be less than 0.1 ton per year, which would be less than significant.

SOURCES: YSAQMD, 2007; SMAQMD, 2015; SJVAPCD, 2015

Impact 3.3-3: Operation of the Project would generate pollutant emissions that would not result in a cumulatively considerable net increase of criteria pollutants, which the Project region is non-attainment of State ambient air quality standards. (*Less Than Significant Impact*)

Long-term operation and maintenance of the Project would result in air pollutant emissions from 24 daily 50-mile worker automobile trips, two cranes operating up to 4 hours per day and two mowers operating 4 hours per day for maintenance work, a propane heater at the O&M building, and periodic testing and maintenance of a 268 horsepower emergency generator for up to 2 hours per day and 100 hours per year. The worker automobile trip exhaust emissions were estimated using 2023 emissions factors obtained from the Emfac2017 model, and worker trip dust emissions from unpaved road travel and the crane and emergency generator emissions were estimated using the CalEEMod version 2013.3.2 model. CalEEMod is not able to estimate propane heater emissions, but those emissions would not be considerable. **Table 3.3-7** presents the estimated daily operation and maintenance emissions that would be associated with the Project (see Appendix B for the emission calculations).

TABLE 3.3-7
PROJECT PEAK DAILY OPERATION AND MAINTENANCE EMISSIONS

	Daily Operation and Maintenance Emissions (pounds)							
			PM_{10}			$PM_{2.5}$		
Project Component	**ROG**	**NO_x**	**Exh.**	**Dust**	**Total**	**Exh.**	**Dust**	**Total**
Worker Vehicle Emissions	0.14	0.23	0.12	54.48	54.60	0.03	5.58	5.63
Maintenance Work with Cranes and Mowers	0.53	5.51	0.27	0.00	0.27	0.25	0.00	0.25
Emergency Generator Testing and Maintenance	0.88	2.46	0.13	0.00	0.13	0.13	0.00	0.13
Total (pounds per day)	**1.55**	**8.19**	**0.52**	**54.48**	**55.00**	**0.43**	**5.58**	**6.01**
Level A Threshold (pounds per day)	25	25		--	80	--	--	--
Threshold Exceeded?	No	No	--	--	No	--	--	--

SOURCE: Appendix B

These operation and maintenance emissions would not exceed the AQMD Level A significance thresholds. Therefore, emissions generated by operation and maintenance the Project would not be expected to result in a cumulatively considerable net increase in pollutant emissions. Operation and maintenance impacts associated with the generation of criteria pollutant and precursor emissions would therefore be **less than significant**.

Project Contribution to Cumulative Health Effects

No single project by itself would be sufficient in size to result in regional non-attainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulative adverse air quality impacts, and while its emissions may be individually limited, it could be cumulatively considerable when taken in combination with past, present, and future development projects. The project-level thresholds for criteria air pollutants are based on levels at

which new sources are not anticipated to contribute to an air quality violation or result in a considerable net increase in criteria air pollutants. Therefore, if a project leads to a significant impact individually, the project would also be considered to contribute significantly to the cumulative impact.

A CEQA air quality analysis of criteria air pollutants is based on significance thresholds that were set at emission levels tied to the region's attainment status (SJVAPCD, 2014). The CEQA significance thresholds are emission levels above which stationary air pollutant sources permitted by the AQMD (typically, industrial facilities, refineries, and the like) must offset their emissions through purchase of emissions "offsets" from other facilities that have reduced emissions, either through installation of emissions controls or removal of an emissions source. Such offset levels allow for regional development while keeping the cumulative effects of new sources at a level that would not impede attainment of the NAAQS. Therefore, a CEQA air quality analysis of criteria air pollutants is essentially an analysis of regional, cumulative air quality impacts and a given project's contribution to those impacts.

The health effects that are associated with emissions of criteria pollutants are described in the *Criteria Air Pollutants* discussion in Section 3.3.1.2, *Environmental Setting*. As described in the *Criteria Air Pollutants* discussion in Section 3.3.1.3, *Regulatory Setting*, compliance with the ambient air quality standards indicates that regional air quality can be considered protective of public health. The ambient air quality standards are expressed in terms of the concentrations of individual pollutants within the air. With certain exceptions, given current air quality modeling tools, calculating an individual project's effect on ambient pollutant concentrations does not yield information that is accurate enough to be useful. In addition, for projects that produce emissions for two years or less, this analysis is not meaningful because quantities of emissions are too small to have a statistically significant effect on health outcomes. Exceptions include CO, which is directly emitted from tailpipes and the concentration of which can be calculated proximate to locations such as high-volume intersections, where CO concentrations are typically highest. However, CO emissions and concentrations have decreased dramatically in urban areas of California in the nearly 45 years since introduction of the catalytic converter. Accordingly, modeling of CO concentrations is seldom required. Another exception is fine particulate matter. Concentrations of $PM_{2.5}$ exhaust can be used as a proxy for diesel particulate matter in a health risk assessment, which is a separate type of air quality analysis from the criteria pollutants discussed herein (see Impact 3.3-4).

Ozone, however, is a regional pollutant for which project-specific concentration modeling is not reliable given current modeling limitations. Because of the complexity of ozone formation and the non-linear relationship of ozone concentration with its precursor gases, and given the state of environmental science modeling in use at this time, it is infeasible to convert specific mass emissions levels (i.e., weight) of NO_x or ROGs emitted in a particular area (or by a particular project) to a particular concentration of ozone in that area (SJVAPCD, 2014). Meteorology, the presence of sunlight, seasonal impacts, and other complex chemical factors all combine to determine the ultimate concentration and location of ozone (South Coast AQMD, 2014; SJVAPCD, 2014). Furthermore, available models are designed to determine regional, population-wide health impacts, from long-term emission sources and cannot accurately quantify ozone-

related health impacts caused by NO_x or ROG emissions from the local level, and in particular not at the level of an individual project's construction emissions that last for less than 2 years.

As a result, project-level mass (weight) emission thresholds have been established for ozone precursors (NO_x and ROG) and PM_{10} precisely because it is not possible to readily convert mass emissions at the project-level to regional pollutant concentrations. The AQMD's thresholds for ROG, NO_x, and PM_{10} are tied to the offset requirements for ozone precursors based on the fact that the Air Basin is not in attainment with the State ozone and PM_{10} standards and therefore such an approach is appropriate to identify potential to cause further deterioration of ambient air quality, which would be a regionally cumulative significant impact. As explained above, attainment can be considered protective of public health, thus providing a strong link between a mass emission threshold and avoidance of health effects. These thresholds provide a connection between a mass emission threshold and avoidance of health effects.

As discussed above, the Project would not exceed the project-level Level B significance thresholds for construction, decommissioning, or site reclamation ROG or NO_x emissions, with the implementation of mitigation (Tier 4 engines) to reduce the construction emissions impact of NO_x to less than significant, and the Project would not exceed the Level A significance thresholds for operations. Therefore, the contribution of the Project to the cumulative, regional air quality impacts related to ozone precursors would not be considerable, and the Project's contribution to any cumulative air quality impacts would not be significant. As explained above, because the significance thresholds are linked to the avoidance of health effects, the Project would not be anticipated to result in an adverse health effect with respect to emissions of ozone precursors.

With respect to construction emissions of PM_{10} and $PM_{2.5}$, the vast majority (i.e., 99 percent PM_{10} and 94 percent $PM_{2.5}$) of the emissions that would be generated by construction of the Project would be in the form of fugitive dust due to vehicle travel on unpaved surfaces and ground disturbing activities on the Project Site. The scientific evidence of health effects from particulate matter suggest that combustion-derived components of particulate matter are the strongest drivers for adverse health effects, and that particulate matter from combustion sources are the greatest contributors to particulate matter-related mortality (SMAQMD, 2020). $PM_{2.5}$ has a greater effect on health compared to PM_{10} because these particles are small enough to be able to penetrate to the deepest parts of the lungs.

Although Shasta County does not have mass significance thresholds for $PM_{2.5}$, Project construction emissions would exceed the Shasta County AQMD Level B significance threshold for PM_{10} even with implementation of mitigation, resulting in a significant cumulative impact to regional air quality, which may result in adverse health effects from particulate matter, such as aggravating asthma and bronchitis, on local sensitive receptors in the vicinity of the Project Site and haul routes.

A quantitative health impact assessment (HIA) has not been prepared because the results of an HIA would be unlikely to reasonably inform decision-makers or members of the public of any causal link between changes in ozone and $PM_{2.5}$ concentrations associated with the Project and any specific individual health impact. While recent studies suggest a correlation between $PM_{2.5}$

concentrations and human health effects, substantial scientific uncertainty remains regarding a clear link between cause and effect. In fact, no studies have validated direct cause and effect from relatively small changes in concentration in localized vicinities. Uncertainty stems from the limitations of epidemiological studies, including inadequate exposure estimates, difficulty in identifying root health cause and effect, and the inability to control for many factors (including lifestyle factors like smoking or exposures to other air pollutants) that could explain the association between $PM_{2.5}$ and adverse health impacts. Further, for both the $PM_{2.5}$ and ozone health effects calculated in an HIA, each of the pollutants may amplify the health impact of the others. Due to these uncertainties, there is a high likelihood that modeled health effects, identified in an HIA, would not be reliably predictive of the actual future health effects of the Project. Thus, while it would be possible to rely on modeling software like BenMAP-CE, AERMOD, and other models, to calculate potential outcomes, the County has not done so based on a determination that the results would not be reasonably informative about the impacts of Project emissions.

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c) Whether the Project would expose sensitive receptors to substantial pollutant concentrations.

Impact 3.3-4: Project activities would generate emissions of toxic air contaminants, potentially exposing sensitive receptors to harmful pollutant concentrations. (*Less Than Significant Impact*)

Diesel particulate matter (DPM) was identified as a TAC by CARB in 1998. DPM is only TAC that would be generated by the Project. Construction of the Project would result in temporary generation of DPM emissions during an up-to 21-month period (two years with no construction in January through March) caused by the use of off-road diesel equipment and from construction material and equipment deliveries and debris hauling using on-road heavy-duty trucks. Long-term sources of DPM emissions associated with the Project would be insignificant and limited to 12 worker vehicle trips per day, operation of two cranes and two mowers for maintenance activities up to 4 hours per day, and periodic testing of the emergency generator during an approximately 40-year period that would commence with issuance of the requested use permit.

The dose to which receptors are exposed is the primary factor affecting health risk from TACs. Dose is a function of the concentration of a substance or substances in the environment and the duration of exposure to the substance. According to the Office of Environmental Health Hazard Assessment (OEHHA), health risk assessments, which determine the exposure of sensitive receptors to TAC emissions, should be based on 9-, 30-, and/or 70-year exposure periods when assessing TACs (such as DPM) that have only cancer or chronic non-cancer health effects. However, such health risk assessments should be limited to the duration of the emission-producing activities associated with the project, unless the activities occur for less than six months. Activities that would last more than 2 months, but less than 6 months, are recommended to be evaluated as if they would last for 6 months. The OEHHA does not recommend assessing cancer risk for projects lasting less than 2 months at the maximum exposed individual resident (MEIR) (OEHHA, 2015). In addition, the AQMD approval of permits requires certain evaluation and notification requirements for facilities that would have the potential to emit hazardous air pollutants that would be located

within 1,000 feet of a school (AQMD, 2003b). There are no schools in the vicinity of the Project Site; however, this distance is used here as a screening threshold for nearby residences as to whether a quantitative health risk assessment should be prepared for the Project.

The Project would take up to 21 months to construct. However, the closest residence to any of the work areas on the Project Site are off Sycamore Road, approximately 1,900 feet to a Project Site construction staging area. The closest residence to any of the access roads on the Project Site are along Moose Avenue, at distances as close as approximately 400 feet. It is anticipated that any construction improvements to this section of the access road would take less than 2 months to complete and the associated health risk impact of those improvements would not be adverse because the duration of DPM exposure would be low. Therefore, the health risk from the short-term DPM emissions that would be associated with construction, decommissioning, and site reclamation of the Project would be expected to result in a maximum cancer risk at the nearest residences that would not exceed the maximum individual cancer risk threshold of 10 in one million. This represents a less-than-significant impact relative to exposure of sensitive receptors to substantial pollutant concentrations.

Mitigation: None required.

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d) Whether the Project would result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

Impact 3.3-5: Project construction, decommissioning, site reclamation, and operation would not create objectionable odors adversely affecting a substantial number of people. (*Less than Significant Impact*)

Project construction, decommissioning, and site reclamation activities would include sources, such as diesel equipment, which could result in the creation of objectionable odors. These activities would be temporary or periodic, and spatially dispersed, and any associated odors would dissipate quickly from the sources. Further, 50 cabin residences are used year-round in the private recreational facility of Moose Camp. Estimating the population of Moose Camp based on the average household size in nearby Burney (i.e., 2.45 people per household as reported by City Data [2020]), any Project odors could impact no more than 123 people. Given relative distances between odor-causing Project elements and the cabins (i.e., as close as approximately 400 feet to Moose Avenue, which would be used as an access route for the Project) and the more than 180,000 people who live in Shasta County (U.S. Census Bureau, 2019), this is a conservative estimate of the potentially affected population. Accordingly, these activities would not affect a substantial number of people that reside in Shasta County. Additionally, odor emissions would be episodic and short-term. Therefore, impacts from odors generated by construction, decommissioning, and site reclamation of the Project would be less than significant.

Mitigation: None required.

3.3.3.3 PG&E Interconnection Infrastructure

As noted in Section 2.4.3, *Project Substation, Switching Station, and Interconnection Facilities*, minor modifications or upgrades to the existing 230 kV line may be required to facilitate the Project's interconnection. Upgrades to PG&E facilities are anticipated to include construction and/or reconfiguration of utility line structures and transmission line circuits involving four to six new transmission poles. If required, these new poles would be located adjacent to the proposed substation and switching station. Daily construction emissions that would be associated with these improvements are expected to occur during the second year of construction and are not anticipated to contribute to the peak daily construction emissions that year since the power line connection phase of the Project is expected to be constructed subsequent to the peak construction period. For emission estimates associated with off-road equipment use, helicopter use, and vehicle trips related to these improvements, refer to the "transmission line connection" emissions described in Appendix B. Operation of the power line connection would not result in the generation of emissions and maintenance of the power line connection would result in negligible emissions associated with periodic inspections. In and of themselves, these improvements would result in less than significant impacts to air quality.

3.3.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Alternative 1 would implement the Project exclusively in that portion of the Project Site located south of SR 299; none of the up to seven turbines proposed to the north of SR 299 (turbine numbers A01 through A07) or related infrastructure would be developed. Under Alternative 1, construction activities, including timber harvesting, would generate fewer vehicle trip and equipment emissions than the number estimated for the Project because up to seven fewer turbines and their related infrastructure would not be constructed. Similarly, the decommissioning and site reclamation phase would also generate fewer vehicle trip and equipment emissions than the amounts estimated for the Project, as the number of turbines and their related infrastructure to be developed and size of the area to be reclaimed would be less than what was identified for the Project. However, due to the high levels of peak emissions that would be associated with the Project disclosed in Table 3.3-4, the construction, decommissioning, and site reclamation emissions that would be associated with Alternative 1 also would result in a significant air quality impact with implementation of Mitigation Measures 3.3-1a through 3.3-1b. Operation of Alternative 1 would result in the same less-than-significant air quality impacts as identified for the Project because no reduction in employee trips to or from the Project Site, crane and mower use, propane heater use, or emergency generator testing are anticipated. In sum, although the impacts of Alternative 1 to air quality would be slightly reduced relative to the Project, the impact conclusions would be the same as identified for the Project.

Alternative 2: Increased Setbacks

Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within three times the height of the turbine (i.e., within 2,037 feet) of a residential property line and within 1.5 times the height of the turbine (i.e., within 1,018.5 feet) of State Route 299, any other publicly-maintained public highway or street, and of Supan Road or

Terry Mill Road. Under Alternative 2, construction activities, including timber harvesting, would generate fewer vehicle trip and equipment emissions than the number estimated for the Project because up to four fewer turbines and their related infrastructure would not be constructed. Similarly, the decommissioning and site reclamation phase would also generate fewer vehicle trip and equipment emissions than the amounts estimated for the Project, as the number of turbines and their related infrastructure to be developed and size of the area to be reclaimed would be less than what was identified for the Project. However, due to the high levels of peak emissions that would be associated with the Project disclosed in Table 3.3-4, the construction, decommissioning, and site reclamation emissions that would be associated with Alternative 2 would also result in a significant air quality impact with implementation of Mitigation Measures 3.3-1a and 3.3-1b. Operation of Alternative 2 would result in the same less-than-significant air quality impacts as identified for the Project because no reduction in employee trips to or from the Project Site, crane and mower use, propane heater use, or emergency generator testing are anticipated. In sum, the impacts of Alternative 2 on air quality would be slightly less than the Project, but the impact conclusions would be the same.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind project infrastructure would be delivered to the Project Site or constructed, operated and maintained, or decommissioned there. No construction, equipment, or additional vehicle trips would be made to, from, or within the site relative to baseline conditions. Ground clearance would not occur for laydown areas; utility line rights-of-way; roads; or the collector substation, switching station, or O&M facility. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to air quality.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts, including to air quality.

3.3.4 Cumulative Analysis

The geographic scope considered for cumulative impacts to air quality is the Sacramento Valley Air Basin and San Joaquin Valley Air Basin.

In developing mass emissions thresholds of significance for criteria air pollutants and ozone precursors, air districts consider the emission levels for which a project's individual emissions

would be cumulatively considerable. Therefore, if a project would exceed the identified construction or operational significance thresholds, its emissions would be cumulatively considerable, and if a project would not exceed the construction or operational significance thresholds, its emissions would not be cumulatively considerable.

The region is non-attainment of ozone and PM_{10} ambient air quality standards; which indicates an existing significant cumulative impact exists. As described in Section 3.3.3.2 (see Impacts 3.3-1, 3.3-1b), implementation of Mitigation Measures 3.3-1a and 3.3-1b would reduce significant ozone impacts of Project-related construction, decommissioning, and site reclamation activities to less than significant; however, implementation of Mitigation Measures 3.3-1a, 3.3-1b, and 3.3-2c would not reduce the significant PM_{10} impacts from construction, decommissioning, and site reclamation activities to a less-than-significant level. Therefore, construction of the Project would result in a cumulatively considerable net increase in PM_{10} and NO_x emissions pre-mitigation, and a cumulatively considerable net increase in PM_{10} emissions post-mitigation, the associated cumulative impact would be significant and unavoidable. All other criteria pollutant emissions, including those that would be generated within the SJVAB (see Impact 3.3.-2d), would be less than the respective significance thresholds and therefore would not be cumulatively considerable and would result in less-than-significant cumulative impacts.

With regard to impacts on sensitive receptors, the total DPM emissions from Project on-site construction equipment that would occur at the Project Site would result in less-than-significant impacts, and would not combine with emissions from other cumulative projects to the extent that a significant cumulative impact would occur because, as identified on Section 3.1.2.1, *Cumulative Scenario*, there are no cumulative projects close enough to the Project Site to interact with those of the Project. The cumulative impact that would be associated with construction, decommissioning, site reclamation, and operation of the Project would be less than significant.

Odor impacts that would be associated with the Project would be limited to combustion of diesel fuels. The impact would be less than significant because construction, decommissioning, and site reclamation activities would be intermittent and spatially dispersed, associated odors would dissipate quickly, and because the number of potentially affected people would be small. There is no existing adverse cumulative condition related to odors to which the Project could contribute. Given the proximity of cumulative projects to the Project Site and the expected duration of sensitive receptor exposure to Project-related diesel fumes, projects in the cumulative scenario would not cause diesel-related odors that would intermingle with those of the Project and, thereby, cause a significant cumulative effect. The cumulative impact would be less than significant.

Long-term operation and maintenance of the Project would not cause emissions that would exceed the operational significance thresholds (see Impact 3.3-3). Therefore, the cumulative impact would be less than significant.

The cumulative impacts of the alternatives would be substantially similar to those of the Project.

3.3.5 References

California Air Resources Board (CARB), 2010. Estimate of Premature Deaths Associated with Fine Particle Pollution (PM2.5) in California Using a U.S. Environmental Protection Agency Methodology, August 31, 2010. Available online at: http://www.arb.ca.gov/research/health/pm-mort/pm-report_2010.pdf. Accessed on February 29, 2020.

CARB, 2011. Toxic Air Contaminant Identification List, July, 2011. Available online at: https://www.arb.ca.gov/toxics/id/taclist.htm. Accessed on February 29, 2020.

CARB, 2016. Ambient Air Quality Standards, last updated April 4, 2016. Available online at: https://ww3.arb.ca.gov/research/aaqs/aaqs2.pdf?_ga=2.92356505.585851994.1582991730-413928035.1511897072. Accessed February 29, 2020.

CARB, 2019a. Ozone & Health, Health Effects of Ozone. Available online at: https://ww2.arb.ca.gov/resources/ozone-and-health. Accessed December 20, 2019.

CARB, 2019b. Summaries of Historical Area Designations for State Standards. Available online at: https://ww2.arb.ca.gov/our-work/programs/state-and-federal-area-designations/state-area-designations/summary-tables. updated July 2019.

CARB, 2020a. Inhalable Particulate Matter and Health (PM2.5 and PM10). Available: https://www.arb.ca.gov/research/aaqs/common-pollutants/pm/pm.htm, Accessed July 16, 2020.

CARB, 2020b. iADAM: Air Quality Data Statistics webpage. Available online at: https://www.arb.ca.gov/adam. Accessed February 29, 2020.

City Data, 2020. Burney, California. Available online at: http://www.city-data.com/city/Burney-California.html. Accessed March 28, 2020.

Office of Environmental Health Hazard Assessment (OEHHA). 2015. *Air Toxics Hot Spots Program Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessments*, adopted February, 2015. Available online at: http://oehha.ca.gov/air/hot_spots/hotspots2015.html. Accessed on March 24, 2020.

Quartz, 2018. Marlboro Nights, In parts of California, breathing is like smoking half a pack of cigarettes a day, by Zoë Schlanger, Environment reporter November 9, 2018. Accessed online: https://qz.com/1458615/the-camp-fire-is-making-california-air-quality-as-bad-as-smoking-half-a-pack-of-cigarettes-a-day/. March 29, 2020.

Sacramento Metropolitan Air Quality Management District (SMAQMD), 2015. SMAQMD Thresholds of Significance Table. May 2015.

SMAQMD, 2020. Guidance to Address the Friant Ranch Ruling for CEQA Projects in the SAC Metro Air District. Prepared by Ramboll US Corporation, June 2020.

Sacramento Valley Air Quality Engineering and Enforcement Professionals (SVAQEEP), 2018. Northern Sacramento Valley Planning Area 2018 Triennial Air Quality Attainment Plan. July 26, 2018.

San Joaquin Valley Air Pollution Control District (SJVAPCD), 2014. Application for Leave to File Brief of Amicus Curiae Brief of San Joaquin Valley Unified Air Pollution Control District in Support of Defendant and Respondent, County of Fresno and Real Party In Interest and Respondent, Friant Ranch, L.P. In the Supreme Court of California. Sierra Club, Revive the San Joaquin, and League of Women Voters of Fresno v. County of Fresno.

SJVAPCD, 2015. Air Quality Thresholds of Significance – Criteria Pollutants. March 19, 2015.

Shasta County, 2004. Shasta County General Plan, as Amended through September 2004.

Shasta County Air Quality Management District (AQMD), 2003a. Environmental Review Guidelines, Procedures for Implementation the California Environmental Quality Act. November 2003.

AQMD, 2003b. Protocol for Review Land Use Permitting Activities, Procedures for Implementing the California Environmental Quality Act. November 2003.

AQMD, 2018. Letter of John Waldrop to Bill Walker. January 16, 2018.

South Coast Air Quality Management District (South Coast AQMD), 2007. Table XI-D, Mitigation Measure Examples: Fugitive Dust from Unpaved Roads. revised April 2007.

South Coast AQMD, 2014. Application of the South Coast Air Quality Management District for Leave to File Brief of Amicus Curiae in Support of Neither Party and Brief of Amicus Curiae. In the Supreme Court of California. Sierra Club, Revive the San Joaquin, and League of Women Voters of Fresno v. County of Fresno.

Swiss Federal Office of Civil Aviation (FOCA), 2015. FOCA Guidance on Determination of Helicopter Emissions, Edition 2. December 2015.

USA (USA.com), 2020. Historical Weather data for Round Mountain, Ca. Available online at: http://www.usa.com/round-mountain-ca-weather.htm. Accessed on June 15, 2020.

U.S. Census Bureau, 2019. QuickFacts Shasta County, California. Available online at: https://www.census.gov/quickfacts/shastacountycalifornia. July 1, 2019.

U.S. Environmental Protection Agency (USEPA), 2012. AP-42, Section 11.12, *Concrete Batching.*

USEPA, 2016. Nitrogen Dioxide (NO_2) Pollution. Available online at: https://www.epa.gov/no2-pollution/basic-information-about-no2, last updated September 8, 2016. Accessed March 27, 2020.

USEPA, 2019. Health Effects of Ozone Pollution. Available online at: https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution, last updated July 30, 2019. Accessed March 27, 2020.

USEPA, 2020. Nonattainment Areas for Criteria Pollutants (Green Book) Available online at: https://www.epa.gov/green-book. updated February 29, 2020.

Western Regional Climate Center (WRCC), 2020a. Burney, California (041214), Period of Record Monthly Climate Summary, Period of Record: July 1, 1948 to September 17, 2015. Available online at: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca1214. Accessed on March 2, 2020.

WRCC, 2020b. Buckhorn, California (041149), Period of Record Monthly Climate Summary, Period of Record: July 1, 1948 to May 31, 2016. Available online at: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca1149. Accessed on March 2, 2020.

Yolo-Solano Air Quality Management District (YSAQMD), 2007. Handbook for Assessing and Mitigating Air Quality Impacts. Adopted July 11, 2007.

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3.4 Biological Resources

This section identifies and evaluates issues related to vegetation, wildlife and other Biological Resources in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. The information and analysis presented in this section are based in part on the following site-specific or species-specific technical reports. A copy of each is provided in **Appendix C**, *Biological Resources*.

1. Appendix C1: Western EcoSystems Technology (WEST), Inc., 2017. Site Characterization Study Report, Fountain Wind Project, Shasta County, California. January.
2. Appendix C2: Stantec, 2019. Fountain Wind Energy Project Aquatic Resources Survey Report. December 23.
3. Appendix C3:
    a. WEST Inc., 2018. Rare Plant Surveys and Natural Vegetation Community Mapping. Fountain Wind Project, Shasta County, CA. October 17.
    b. WEST, Inc., 2019. Rare Plant Surveys and Natural Vegetation Community Mapping. Fountain Wind Project, Shasta County, California. December 20.
4. Appendix C4:
    a. WEST, Inc., 2018. Year 1 Avian Use Study Report and Risk Assessment for the Fountain Wind Project, Shasta County, California. November 5.
    b. WEST, Inc., 2019. Results of the Year 2 Avian Use Study at the Fountain Wind Project – Addendum to the Year 1 Avian Use Study Report and Risk Assessment. Memorandum to ConnectGen Operating LLC. September 5.
5. Appendix C5: WEST, Inc., 2018. Great Gray Owl Habitat Assessment, Fountain Wind Project, CA. Memorandum to Pacific Wind Development. October 24.
6. Appendix C6: WEST, Inc., 2018. Bat Acoustic Survey Report, Fountain Wind Project, Shasta County, CA. October 22.
7. Appendix C7: WEST, Inc., 2018. 2017 Raptor Nest Survey Report for the Fountain Wind Project, California. Memorandum to Pacific Wind Development. September 19.
8. Appendix C8: WEST, Inc., 2018. 2018 Northern Goshawk Nest Survey Results, Fountain Wind Project, CA. Memorandum to Pacific Wind Development. October 15.
9. Appendix C9: WEST, Inc., 2018. 2018 Eagle Nest Status Survey Report, Fountain Wind Project, California. Memorandum to Pacific Wind Development. September 19.
10. Appendix C10: WEST, Inc., 2018. Response to Informal Consultation Request for Use Permit 16-007, Fountain Wind Project, Shasta County. November 6.
11. Appendix C11: WEST, Inc., 2020. California Spotted Owl Risk Assessment for the Proposed Fountain Wind Project, Shasta County, California. February 24.

12. Appendix C12: WEST, Inc., 2018. 2018 Willow Flycatcher Survey Results, Fountain Wind Project, CA. Memorandum to Pacific Wind Development. October 17.
13. Appendix C13:
    a. WEST, Inc. 2019. 2018/2019 Foothill Yellow-legged Frog Assessment for the Fountain Wind Project, Shasta County, California. December 20.
    b. WEST, Inc., 2018. 2018 Foothill yellow-legged frog and Cascades frog habitat assessments and surveys, Fountain Wind Project, CA. Memorandum to Pacific Wind Development. October 22.

The County independently reviewed these and other materials prepared by or on behalf of the Applicant and determined them to be suitable for reliance on (in combination with other materials included in the formal record) in the preparation of this Draft EIR.

The California Department of Fish and Wildlife (CDFW), consistent with its role as a Responsible Agency, provided initial input for the County's environmental review process shortly after the CUP application was filed for the Project (CDFW, 2018). The Central Valley Regional Water Quality Control Board (RWQCB) also provided input consistent with its role as a Responsible Agency (RWQCB, 2018). Later, in response to the issuance of notice of intention to prepare this Draft EIR, the County received scoping input about all manner of flora and fauna from a variety of sources. All scoping input received, including regarding Biological Resources, is provided in Section 4.1 of the Scoping Report (Environmental Science Associates, 2019).

3.4.1 Setting

3.4.1.1 Study Area

For the purpose of this analysis of impacts on Biological Resources, the study area consists of the 4,464-acre Project Site. The Project Site is within an approximately 29,500-acre leasehold area (Leasehold Area) in Shasta County in northern California west of the community of Burney and northeast of the larger community of Redding (Figure 2-1, *Project Location*). The east-west running California State Route 299 (SR 299) bisects the northern portion of the Project Site. The Hatchet Ridge Wind Project, which has been in operation since 2010, is located approximately 1 mile to the east. Lassen National Forest is located to the southeast of the Project and Shasta-Trinity National Forest is located to the north and east.

3.4.1.2 Environmental Setting

Regional Ecology

The Project Site is located within the Cascades Ecological Region (ecoregion; Griffith et al. 2016), which is a Level III ecoregion primarily covering parts of Oregon and Washington but also including a discontinuous land area near Mt. Shasta in California. This ecoregion is characterized by underlying volcanic rock strata and a physiography defined by recurring periods of glaciation. With high plateaus and valleys that trend east, this ecoregion includes steep ridges as well as both

active and dormant volcanoes, and is marked by a generally mesic, temperate climate which supports productive coniferous forests and at higher elevations, subalpine meadows.

Leasehold Area Ecology

Topography within the study area is characterized by gently rolling hills that transition to relatively steep, low mountains, with elevations ranging from approximately 2,156 feet; 657 meters in the southwestern corner of the Leasehold Area to 6,814 feet (2,077 meters) near Snow Mountain in the southeast corner. Significant waterways within the Leasehold Area include the north and south forks of Montgomery Creek. The dominant vegetation community is Sierran mixed conifer forest; however, the structure and species composition of this community varies greatly with slope, aspect, elevation, and disturbance (e.g., fire and forest management). Dominant overstory species include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*).

The Leasehold Area drains to the north and west into the Pit River and Sacramento River watersheds. A number of permanent and intermittent streams run throughout the Leasehold Area, flowing primarily to the west and northwest. The primary drainages in the north are Hatchet Creek and Montgomery Creek (north and south forks), while Cedar Creek and Little Cow Creek drain the southern portions of the Leasehold Area. Riparian vegetation along these creeks includes various willow species (*Salix* spp.), thinleaf alder (*Alnus incana* ssp. *tenuifolia*), several species of maple (*Acer* spp.), mountain dogwood (*Cornus nuttallii*), and California hazel (*Corylus cornata* var. *californica*). Soils within the Leasehold Area are primarily composed of the Cohasset, Windy, McCarthy and Lyonsville-Jiggs series and range from stony to clay loams that have formed in residuum weathered from volcanic rock (USDA Natural Resources Conservation Service [NRCS], 2017).

The Leasehold Area consists exclusively of private property operated as managed forest timberlands. In August 1992, the Fountain Fire burned approximately 64,000 acres (100 square miles) in and around the Leasehold Area, including a portion of the Project Site. Post-fire management included salvage logging, site preparation, and planting in the year following the fire. Within 5 years of the fire, approximately 17 million seedlings were planted in areas previously supporting timber. Species planted included ponderosa pine, Douglas-fir, and white fir at 10-foot (3.0-meter) spacing, with incense cedar planted along stream buffers. To reduce competition for (tree) seedling establishment, growth regulator herbicides were applied in many areas that had been colonized by manzanita (*Arctostaphylos* spp.) and California-lilac (*Ceanothus* spp.; Appendix C1).

Vegetation Communities

In spring and summer of 2018 and 2019 Western Ecosystems Technology, Inc. (WEST) botanists conducted vegetation mapping and rare plant surveys within the Project Site, covering 4,373.1 acres (Appendix C3a, Appendix C3b). Eight vegetation communities were categorized to the alliance level, consistent with *A Manual of California Vegetation, 2nd Edition* (MCV) (Sawyer et al., 2009) and updated in the current online edition (CNPS, 2019). Eight natural vegetation

communities present within the Project Site are summarized in **Table 3.4-1**, *Natural Vegetation Communities Present and Area within Project Site and Alternatives* and shown on **Figure 3.4-1**.

TABLE 3.4-1
NATURAL VEGETATION COMMUNITIES PRESENT AND AREA WITHIN PROJECT SITE AND ALTERNATIVES

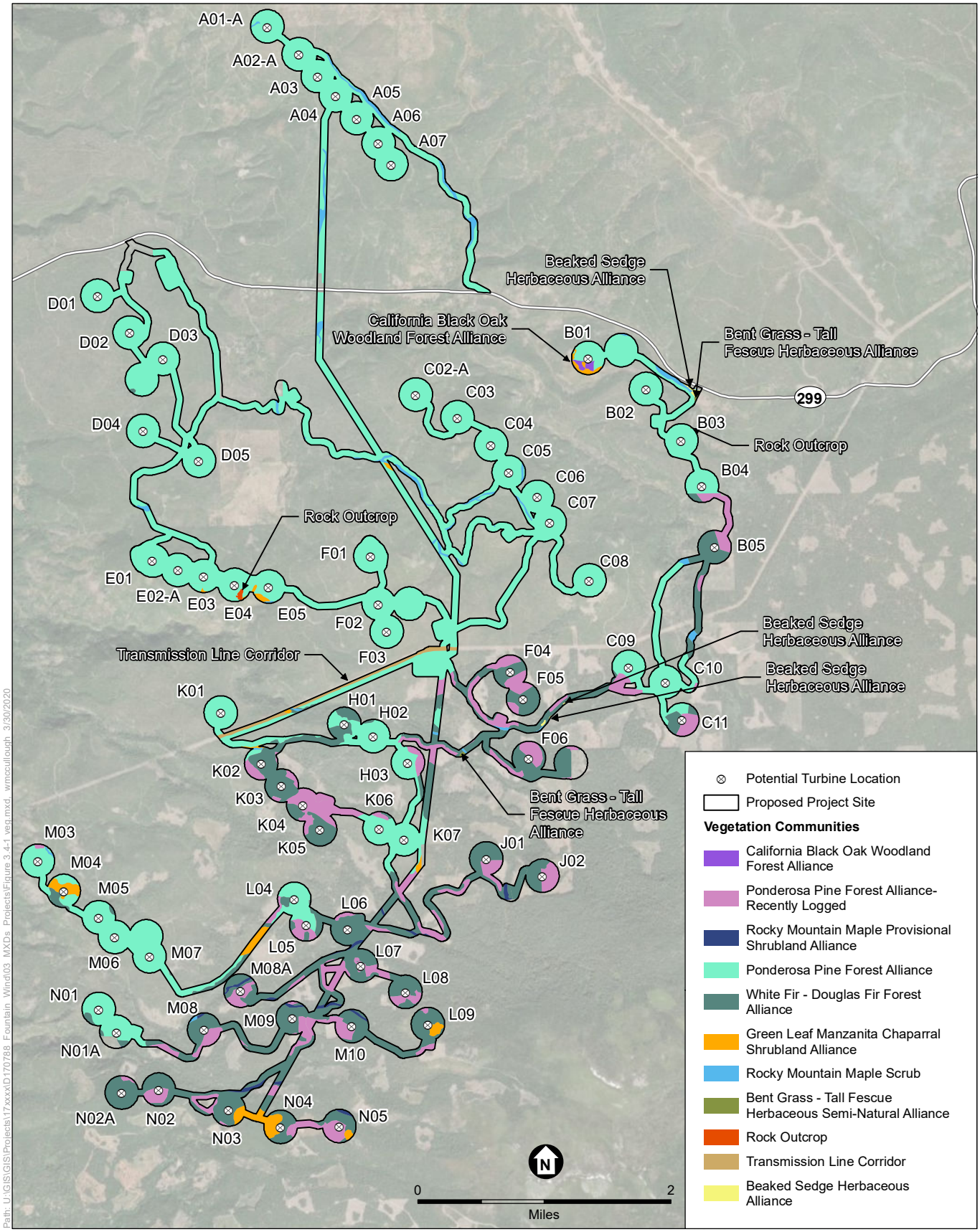
Vegetation Communities (*Scientific Name*)	State and Global Rarity Rank[1]	Project Site[2]	Alternative 1	Alternative 2
Upland				
Ponderosa Pine Forest (*Pinus ponderosa* Forest Alliance [FA])	G5/S4	2,668.8	2325.9	2568.2
Ponderosa Pine Forest – Recently Logged (*Pinus ponderosa* FA)	S4	485.4	485.4	475.4
White Fir - Douglas Fir Mixed Forest (*Abies concolor - Pseudotsuga menziesii* FA)	S4	1,028.5	1028.5	1016.1
California Black Oak Woodland (*Quercus kelloggii* FA)	S4	5.5	5.5	0.0
Green Leaf Manzanita Chaparral (*Arctostaphylos patula* Shrubland Alliance)	S4	76.2	76.2	69.2
Bent Grass - Tall Fescue Meadow (*Agrostis* [*gigantea, stolonifera*] - *Festuca arundinacea* Herbaceous Semi-Natural Alliance)	SNA	1.4	1.4	1.4
Riparian				
Rocky Mountain Maple Riparian Scrub (*Acer glabrum* Provisional Shrubland Alliance)[2]	S3?	107.2	76.0	105.6
Wetland				
Beaked Sedge Wet Meadow (*Carex utriculata* Herbaceous Alliance)	S4	3.4	3.4	3.4
Total		**4,373.1**	**4,002.3**	**4,239.3**

NOTES:

1 State Rank (CDFW 2019):
S3? Apparently Vulnerable – A question mark (?) denotes an inexact numeric rank because we know we have insufficient samples over the full expected range of the type, but existing information points to this rank (Sawyer et al. 2009).
S4 Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors.
SNA – Semi-Natural Alliance, not ranked because dominant species not all native.

2 The survey area (4,373.1 acres) was slightly different from the Project Site (4,464 acres) as surveys were performed prior to minor changes to the project layout; therefore, approximately 800 acres of the Project Site were not included in the 2019 Rare Plants Survey Area. If these areas were included in the final project footprint, pre-construction surveys will be performed (C-3; WEST 2019b).

SOURCE: WEST, 2019.



SOURCE: WEST Rare Plant & Natural Vegetation Communities Report; 2018/2019

Fountain Wind Project

Figure 3.4-1
Natural Vegetation Communities Found within the Project Site

Descriptions of the eight natural vegetation communities are presented below with the Forest Alliance (FA) name first followed by the more general (habitat description).

Ponderosa Pine Forest FA (Mixed Conifer Forest Burned)

The dominant vegetation community in the Project Site, the Ponderosa Pine FA, burned in the 1992 Fountain Fire. The area was subsequently replanted with conifer seedlings of ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*). Ponderosa pine is the dominant overstory species in the mixed conifer forest of even-aged trees (approximately 25 years old). Understory shrub and herbaceous vegetation is variable in species composition and cover, with mahala mat (*Ceanothus prostratus*), green leaf manzanita (*Arctostaphylos patula*), bracken fern (*Pteridium aquilinum*), and native squirrel tail grass (*Elymus elymoides*) most common.

Ponderosa Pine Forest FA – Recently Logged (Logged/Recently Logged)

This Ponderosa Pine FA has been logged within the past 10 to 15 years, through commercial timber harvest, with planted conifer saplings and seedlings, and small, remnant patches of mature trees. Ponderosa pine, and white fir less commonly, are the planted seedling species (Appendix C3). Understory in this FA is sparse, but dominated by invasive herbaceous species where present, including mullein (*Verbascum thapsus*), bull thistle (*Cirsium vulgare*), common St. Johnswort (*Hypericum perforatum*), and houndstongue (*Cynoglossum officinale*).

White Fir – Douglas Fir Forest FA (Mixed Conifer Forest – Burned)

The White Fir – Douglas Fir FA was found in a mosaic with the logged/recently logged areas and those areas not burned by the Fountain Fire (Appendix C3). The forest contains mature, even-aged, mixed conifer species, including white fir, Douglas fir, sugar pine (*Pinus lambertiana*), ponderosa pine, incense cedar (*Calocedrus decurrens*) and red fir (*Abies magnifica*). Forest openings often contain California black oak (*Quercus kelloggii*) and sparse understory due to a closed tree canopy.

California Black Oak Woodland FA (Black Oak Woodland)

The California black oak woodland was found in previously burned areas and lower elevations of the Project Site in a mosaic with patches of green leaf manzanita chaparral (Appendix C3). The deciduous California black oak trees have an open canopy and well-established understory of green leaf manzanita and grasses with Lemmon's needlegrass (*Stipa lemmonii*) most common.

Rocky Mountain Maple Provisional Shrubland Alliance (SA) (Mixed Montane Riparian Scrub/Mixed Montane Riparian Forest)

The Rocky Mountain Maple Provisional SA is a riparian vegetation community, located along ephemeral, intermittent and perennial streams and drainages throughout the Project Site. Rocky Mountain maple is the dominant species, with gray alder (*Alnus incana*) often codominant, particularly in the southern portion of the Project Site and is Mixed Montane Riparian Forest habitat. Understory vegetation is variable in the Project Site, with the southern area generally wetter, with blackfruit dogwood (*Cornus sessilis*), twinleaf honeysuckle (*Lonicera involucrata*), vine maple (*Acer circinatum*), and adjacent conifers providing canopy cover. In the northern, more xeric, riparian areas, riparian understory is dominated by Scouler's willow (*Salix*

scouleriana) along streambanks, with green leaf manzanita and ceanothus (*Ceanothus* spp.) in drier areas. These drier riparian areas in the north of the Project Site are considered Mixed Montane Riparian Scrub habitat.

Green Leaf Manzanita Chaparral SA (Mixed Montane Chaparral)

Green Manzanita Chaparral SA was found interspersed with most other vegetation communities in the Project Site, including rocky ridges and slopes, forest openings, recently burned and recently logged areas, as well as a transmission corridor where vegetation is managed (Appendix C3). The chaparral habitat contains dense green leaf manzanita with bush chinquapin (*Chrysolepis sempervirens*), mountain whitethorn (*Ceanothus cordulatus*), and deerbrush (*Ceanothus integerrimus*) as co-dominants, with little herbaceous understory.

Beaked Sedge Meadows Herbaceous Alliance (HA) (Wet Montane Meadow)

Beaked Sedge Meadows HA were mapped within seasonally or permanently saturated emergent wetland areas adjacent to streams and ponds in higher elevation areas of the Project Site. Composition of these wet meadows is dominated by a high diversity of grass, sedge, rush and forb species, which include beaked sedge (*Carex utriculata*), bluejoint reedgrass (*Calamagrostis canadensis*), marsh foxtail (*Alopecurus geniculatus*), Nebraska sedge (*Carex nebrascensis*), brown sedge (*Carex subfusca*), sword leaved rush *(Juncus ensifolius*), and others. Scattered shrubs occur in some of these wet meadows.

Bentgrass – Tall Fescue Herbaceous Semi-Natural Alliance (Montane Meadow)

The Bentgrass – Tall Fescue Herbaceous Semi-Natural Alliance meadows are found in forest openings and sometimes adjacent to beaked sedge wet meadows. As a semi-natural alliance, these montane meadows are non-native species dominant. Dominant plants include non-natives creeping bentgrass (*Agrostis stolonifera*), tall fescue (*Festuca arundinacea*), and the native species common yarrow (*Achillea millefolium*), and goldenrod (*Solidago* sp.).

Sensitive Vegetation Communities

CDFW designates vegetation communities as sensitive that have a State Rank of S1 to S3. The Rocky Mountain Maple (*Acer glabrum*) Provisional Shrubland Alliance has a State Rank of S3? (Table 3.4-1). A State Rank with a question mark (?), denotes an inexact rank due to insufficient data samples (CDFW, 2020). Within the Project Site, the Rocky Mountain Maple Provisional Shrubland Alliance covers 107.2 acres or 2.4 percent of the Project Site (Table 3.4-1), and is found in riparian areas along ephemeral, intermittent and perennial stream drainages (Appendix C3). Riparian communities, including the Rocky Mountain Maple Provisional Shrubland Alliance, are also considered sensitive, regardless of State Rank, under CEQA because of their rarity and biological importance.

Aquatic Resources

Stantec Consulting Services Inc. (Stantec) conducted a delineation of potential WOTUS, including wetlands and riparian areas (Appendix C2; Stantec, 2019) This survey was completed at the Project Site in 2019 by Stantec biologists. The survey focused on classifying aquatic habitats following *A*

Guide to Wildlife Habitats of California, an older and more general classification system (Mayer and Laudenslayer, 1988) during the aquatic resources delineation (Appendix C2). The WOTUS survey area encompassed a total of 6,118.06 acres. The WOTUS survey covered a 700-foot radius centered on proposed turbine locations, a 200- to 400-foot corridor centered on project roads, a 300-foot corridor centered on the electrical collection line, a 200-foot buffer around proposed project facilities, and a 100-foot buffer around proposed construction staging areas.

The survey area for the WOTUS survey includes numerous named and unnamed drainages with some evidence of surface waters. These drainages include tributary basins of the Whitmore and Pit Rivers, which contain but are not limited to: Richardson Creek, Little Hatchet Creek, Hatchet Creek, Carberry Creek, Goat Creek, North Fork Montgomery Creek, Indian Spring, South Fork Montgomery Creek, Cedar Creek, North Fork Little Cow Creek, Little Cow Creek, and Mill Creek. Hydrology for these features is provided by sheet flow, snow melt, seeps, springs, and groundwater.

Stantec personnel identified 206 wetlands and classified them as one of six "wetland types." A total of 52 acres of potential waters of the United States were mapped within the WOTUS survey area and include fresh emergent wetland (1.0 acre), riparian wetland (26.8 acres), seasonal wetland (0.1 acre), vegetated ditch (0.2 acre), wetland meadow (8.7 acres), wetland seep/spring (1.8 acres), ephemeral stream (0.6 acre), intermittent stream (2.9 acres), non-vegetated ditch (0.2 acres), perennial stream (9.5 acres), and pond (0.2 acre) (Appendix C2). The Project Site boundary was overlain onto the WOTUS survey results to identify the wetlands occurring within the Project Site. Results are presented in **Table 3.4-2**, *Summary of Potentially Jurisdictional Aquatic Resources occurring within the Project Site*). These acreages and linear feet represent all the aquatic resources in the Project Site (Appendix C2).

Non-native Invasive/Noxious Weeds

Surveys for non-native invasive plant species were conducted concurrently with rare plant surveys conducted in 2018 and 2019 (Appendices C3, C4). Roadsides within the Project Site and a subsample of recently logged areas were the focus of the invasive plant surveys, with road segments mapped where invasive plant species were found and the abundance of each invasive species noted. All invasive plant species designated by the California Invasive Plant Council (CAL-IPC) as High, Moderate or Limited were mapped.

The most common invasive, non-native plants observed on the Project Site were common mullein (*Verbascum thapsus*), bull thistle (*Cirsium vulgare*), common St. Johnswort (*Hypericum perforatum*), and houndstongue (*Cynoglossum officinale*). These four invasive plant species were common throughout roadsides, logged and recently logged lands and are abundant in the managed forest lands surrounding the Project Site. Four invasive plant species observed in the Project Site that ranked "high" by CAL-IPC, include Himalayan blackberry (*Rubus armeniacus*), yellow starthistle (*Centaurea solstitialis*), medusahead rye (*Elymus caput-medusae*) and cheatgrass (*Bromus tectorum*). A total of fifteen species of noxious weeds were documented in the Project Site (Appendix C3a, C3b). As noted above, the Project Site and surrounding area are operated as managed forest timberlands, which creates regular disturbances and traffic from timber harvest, resulting in widespread establishment of invasive plants. Active management of some invasive species is performed on logged sites to reduce competition for conifer seedling establishment.

TABLE 3.4-2
SUMMARY OF POTENTIALLY JURISDICTIONAL AQUATIC RESOURCES OCCURRING WITHIN THE PROJECT SITE

Feature Type	Acres	Linear Feet	Cowardin Code[1]
Wetlands			
Fresh Emergent Wetland	0.08	211[2]	PEM
Riparian Wetland	22.10	N/A	PSS, PFO
Seasonal Wetland	0.11	N/A	PEM
Vegetated Ditch	0.01	142	PEM
Wetland Meadow	3.89	N/A	PEM, PSS, PFO
Wetland Seep/Spring	1.16	N/A	PEM, PSS
Subtotal – Wetlands	***27.35***	***353***	-
Other Waters			
Ephemeral Stream	0.40	6,946	R4SB
Intermittent Stream	2.28	6,008	R4SB
Non-vegetated Ditch	0.17	3,535	R4
Perennial Stream	7.72	26,550	R3UB
Pond	0.04	N/A	PUB
Subtotal – Other Waters	***10.61***	***43,039***	-
Total Jurisdictional Area	**37.96**	**43,392**	-

NOTES:
1 PEM = palustrine emergent, PSS = palustrine scrub-shrub, PFO = palustrine forested, R4SB = riverine intermittent streambed, R4 = Riverine intermittent, R3UB = riverine upper perennial unconsolidated bottom, PUB = palustrine unconsolidated bottom. Codes based on Cowardin et al. 1979.
2 Linear distance for stream segments mapped as fresh emergent wetlands.

SOURCE: Stantec, 2019.

Wildlife

The Aquatic Resource Survey (Appendix C2) mapped 109 perennial stream segments within the study area, a total of approximately 7.7 acres and 26,500 linear feet within the Project Site. The widths of these perennial streams vary between 2 and 90 feet (Appendix C2). In addition to native fishes such as the Sacramento pikeminnow (*Ptychocheilus grandis*) and the special-status Pit roach, the streams may contain invasive species such as green sunfish (*Lepomis cyanellus*) and spotted bass (*Micropterus punctulatus*). **Table 3.4-3** identifies special-status species from the region and their potential to occur within the Project Site.

Amphibians may be present in wetland and stream areas of the Project Site, and in moist leaf litter of the forested areas. In addition to amphibians listed in Table 3.4-3, other common amphibians that may be present include ensatina (*Ensatina eschscholtzii*), rough-skinned newt (*Taricha granulose*), western toad (*Anaxyrus boreas*), Pacific tree frog (*Pseudacris regilla*), and bullfrog (*Lithobates catesbeianus*).

TABLE 3.4-3
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Species	Status	Habitat	Potential for Occurrence in the Project Site
Invertebrates			
Conservancy fairy shrimp *Branchinecta conservatio*	FE/--	Turbid, slightly alkaline, large, deep, vernal pools and winter lakes in California grassland areas	**None**. Suitable vernal pool habitat absent within Project Site
Shasta crayfish *Pacifastacus fortis*	FE/SE	Cool, spring-fed headwaters with clean, volcanic cobbles, over sand and gravel substrates	**Low.** Known only from the Fall River and Hat Creek subdrainages of the Pit River system
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT/--	Occurs only in the Central Valley of California, in association with blue elderberry (*Sambucus mexicana*)	**Low.** Known only to occur in locations west and south of Project Site in California's Central Valley
Vernal pool fairy shrimp *Branchinecta lynchi*	FT/--	Small, clear-water depression pools and grassed swales; endemic to grasslands of the Central Valley, central coast mountains, and south coast mountains	**None.** Known only from isolated locations in lower elevations of Shasta County; suitable vernal pool habitat absent from Project Site
Vernal pool tadpole shrimp *Lepidurus packardi*	FE/--	Vernal pools and swales in the Sacramento Valley containing clear to highly turbid water	**None.** Known only from isolated locations in lower elevations of Shasta County; suitable vernal pool habitat absent from Project Site
Fish			
Bull trout *Salvelinus confluentus*	FT/SE	Deep pools in cold rivers and large tributary streams, often in moderate to fast currents; also large coldwater lakes and reservoirs; historically found only in the McCloud River system	**None**. No suitable stream habitat present within Project Site; believed to be extinct in California
Chinook salmon *Oncorhynchus tshawytscha*	FT/ST (spring run) FE/SE (winter run)	Large freshwater streams and rivers and estuaries for spawning; require deep, cold, flowing water	**None**. No suitable stream habitat present within Project Site
Pit roach *Lavinia symmetricus mitrulus*	--/SSC	Inhabit deep pools and areas of low flow, moderate gradients, warm temperatures, and mats of vegetation.	**Low.** Limited suitable habitat present on the Project Site; one record of this species 2.7 miles north on Pit River.
Steelhead (Central Valley DPS) *Oncorhynchus mykiss irideus*	FT/--	Sacramento and San Joaquin rivers and their tributaries	**None**. Range lies to the west and south of the Project Site; no suitable stream habitat present within Project Site
Amphibians			
Southern long-toed salamander *Ambystoma macrodactylum sigillatum*	--/SSC	Found in moderate to high elevation (2,300-9,800 feet) meadows and lakes in Sierra Nevada, Klamath and Cascade Mountains.	**Moderate.** Suitable montane meadow habitat is present in burned and logged areas of the Project Site.
Coastal tailed frog *Ascaphus truei*	–/SSC	Cool perennial streams in conifer-dominated habitat including redwood, Douglas-fir, and ponderosa pine habitats in montane areas.	**High.** Known occurrences in the Project Site and suitable habitat present in the southern portion of the site.
Shasta salamander *Hydromantes shastae*	–/ST	Mixed conifer habitat near limestone caves at elevations from 1,000 to 3,000 feet, volcanic and other rock outcroppings; in rainy periods found under woody debris in mixed pine-hardwood stands.	**Low.** Recorded 5 miles west of Project Site, but outside of species' known distribution and elevational range.

TABLE 3.4-3 (CONTINUED)
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Species	Status	Habitat	Potential for Occurrence in the Project Site
Amphibians (cont.)			
California red-legged frog *Rana draytonii*	FT/SSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation	**Low**. Project Site on edge of this species' range; limited suitable habitat present within Project Site.
Foothill yellow-legged frog *Rana boylii*	–/SC, SSC	Creeks or rivers in woodland, forest, mixed chaparral, and wet meadow habitats with rock and gravel substrate and low overhanging vegetation along the edge; usually found near riffles with rocks and sunny banks nearby.	**Low.** Project Site on edge of this species' range; surveys, including eDNA sampling, did not identify occurrence of species on site.
Cascades frog *Rana cascadae*	–/CE, SSC	Ephemeral and permanent ponds and streams; oviposition habitat is open, shallow water in unshaded areas; overwinters underwater or in saturated ground.	**Low.** Known occurrence 1.2 miles southeast of the Leasehold Area; minimal and marginally suitable habitat in southern portion of Leasehold Area but no suitable habitat within the Project Site.
Reptiles			
Western pond turtle *Emys marmorata*	--/SSC	Aquatic species requiring ponds, marshes, rivers, streams, and irrigation ditches, usually with aquatic vegetation.	**Moderate.** Suitable aquatic habitat limited within the Project Site but may be present within pools of larger creeks or ponds; Species has been recorded near southwest corner of Project Site.
Birds			
Northern spotted owl *Strix occidentalis caurina*	FT/SSC	Mature forest, multi layered mixed conifers.	**None**. In Shasta County, northern subspecies occurs only north of the Pit River, which is outside of the Project Site.
California spotted owl	--/SSC	Nests in dense, old-growth, multi-layered mixed-conifer, redwood, and Douglas fir forests.	**Moderate.** Approximately 995 acres of suitable habitat is present in the southern portion of the Leasehold Area, outside the Project Site (Appendix C11). Historical records show occurrence onsite but suitable habitat no longer present within the Project Site. May nest in adjacent suitable habitat and forage within the Project Site.
Yellow-billed cuckoo *Coccyzus americanus*	FT/SE	Riparian forest along the broad, lower flood-bottoms of larger river systems; nests in riparian jungles of willow often mixed with cottonwoods.	**Low.** Rare breeder throughout California. Not known to occur near Project Site; suitable riparian habitat generally not present within the Project Site.
American peregrine falcon *Falco peregrinus anatum*	–/SE, FP	Permanent resident along North and South Coast ranges; Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large prey populations.	**Low.** May fly through Project Site during migration or movement between foraging areas.
Bald eagle *Haliaeetus leucocephalus*	–/SE, FP	Primarily nests and roosts in coniferous forests close to a lake, reservoir, stream, or bay.	**High.** Observed during surveys (Appendix C9); nesting habitat located on and near Project Site.

TABLE 3.4-3 (CONTINUED)
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Species	Status	Habitat	Potential for Occurrence in the Project Site
Birds (cont.)			
California horned lark *Eremophila alpestris actia*	–/SSC	Resident in a variety of open habitats, usually lacking large trees and shrubs; grasslands and deserts to dwarf shrub habitats above tree line.	**Moderate.** Not observed during surveys; suitable habitat is present in Project Site.
Cooper's hawk *Accipiter cooperii*	–/SSC	Nests in a wide variety of habitat types, from riparian woodlands and grey pine–oak woodlands through mixed conifer forests.	**High.** Suitable foraging habitat in Project Site; observed during Project surveys (Appendix C4).
Golden eagle *Aquila chrysaetos*	–/SSC, FP	Nest on cliffs and escarpments or in tall trees overlooking open country; forages in annual grasslands, chaparral, and oak woodlands with plentiful prey.	**High.** Observed during surveys (Appendix C9). Likely to pass through Project Site during migration.
Ferruginous hawk *Buteo regalis*	–/SSC	Open terrain in plains and foothills where ground squirrels and other prey are available.	**High.** Likely to pass through Project Site during migration.
Northern goshawk *Accipiter gentilis*	–/SSC	Nests and roosts in older stands of red fir, Jeffrey pine, ponderosa pine, lodgepole pine, Douglas-fir, and mixed conifer forests.	**Moderate.** Suitable foraging habitat in Project Site with limited nesting habitat. Hawks may fly through the site during movement between foraging areas.
Sharp-shinned hawk *Accipiter striatus*	–/SSC	Dense canopy ponderosa pine or mixed-conifer forest and riparian habitats.	**High.** Observed during Project surveys (Appendix C4); may fly through Project Site during migration or between foraging areas.
Vaux's swift *Chaetura vauxi*	–/SSC	Summer resident of northern California and common migrant throughout state, prefers redwood and Douglas fir forests, occasionally other conifers, where it nests and roosts in large hollow trees and snags, and prefers foraging over rivers and lakes.	**High**. Observed during Project surveys (Appendix C4); may fly through Project Site during migration or nest nearby.
Willow flycatcher *Empidonax traillii*	–/SE	Riparian areas and large wet meadows with abundant willows. Usually found in riparian habitats during migration.	**Low**. Known occurrences within 10-mile radius of the Project Site; not observed during Project surveys (Appendix C12); may fly through Project Site during migration; potential nesting habitat in Project vicinity.
Yellow warbler *Dendroica petechia brewsteri* (nesting)	–/SSC	Uncommon summer resident and common migrant throughout much of California; nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders or in mature chaparral; may also use oaks or conifers, with brushy understory.	**High.** Observed during Project surveys (Appendix C4); limited suitable nesting habitat in Project Site.
Greater sandhill crane *Grus canadensis tabida*	–/T, FP	Summers in open terrain near shallow lakes or freshwater marshes; winters in plains and valleys near bodies of fresh water.	**Moderate.** Known to pass through Project Site during migration but does not nest there.
Olive-sided flycatcher *Contopus cooperi*	-/BCC, SSC	Breeds in northern California, montane and coniferous forests, usually found in forest openings or edges and nests in prominent trees and snags.	**High.** Observed during Project surveys (Appendix C4); suitable forest edge nesting habitat is found in Project Site.

TABLE 3.4-3 (CONTINUED)
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Species	Status	Habitat	Potential for Occurrence in the Project Site
Birds (cont.)			
Cassin's finch *Haemorhous cassinii*	-/BCC	Open, coniferous forests of mountains, including ponderosa pine and Douglas fir, tend to be restricted to higher elevations in California.	**High.** Observed during Project surveys (Appendix C4); limited suitable nesting habitat found in Project Site.
Lewis' Woodpecker *Melanerpes lewis*	-/BCC	Open forests, riparian forests, burned pine forest, Breeds and winters in northern California.	**High.** Observed during Project surveys (Appendix C4); suitable open forest and burned forest habitat is found in Project Site.
Mammals			
Gray wolf *Canis lupus*	FE/SE	Habitat generalists, historically occupying diverse habitats including tundra, forests, grasslands, and deserts.	**Low.** Gray wolf has been documented in Shasta County (KRCRTV, 2020); natural recolonization of northern California is occurring from Oregon; suitable habitat is present within the Project Site.
Sierra Nevada mountain beaver *Aplodontia rufa californica*	--/SSC	Occurs in open brushy stages of most forest types as well as dense riparian-deciduous habitat. Requires friable soil for burrowing.	**Low.** Nearest detection more than 10 miles away; limited suitable habitat present on Project Site.
California wolverine *Gulo gulo*	--/ST	Higher elevation mixed conifer forests in northern Sierra Nevada; dens in dense forest and hunts in open areas adjacent to mixed conifer forests. Sensitive to disturbance.	**Low.** Occurrences east and northeast of the Project Site from approximately 50 years ago. Project Site contains suitable forest habitat but is frequently disturbed.
Oregon snowshoe hare *Lepus americanus klamathensis*	--/SSC	Found in vicinity of Mt. Shasta, Trinity and Warner mountains. Prefers riparian areas or other habitat with dense understory.	**Moderate.** The Project Site contains suitable habitat for this species.
Fisher *Pekania [=Martes] pennanti*	FC/SSC	Late successional coniferous forests and montane riparian habitats.	**High.** Known occurrences in vicinity; suitable habitat is present on Project Site.
American badger *Taxidea taxus*	–/SSC	Most abundant in drier, open stages of most shrub, forest, and herbaceous habitats with friable soils.	**Low.** Suitable habitat in Project Site is disturbed; not observed in Project surveys (Appendix C1).
Sierra Nevada red fox *Vulpes vulpes necator*	FC/ST	Historically ranged from southern Cascades to Sierra Nevada above 5,000 feet in subalpine forests of lodgepole pine and red fir. Chaparral and wet meadows may also be used.	**Low.** Project Site outside of known occupied range and nearest detection more than 10 miles away.
Pallid bat *Antrozous pallidus*	–/SSC	Occurs in a variety of habitats from desert to coniferous forest; most closely associated with oak, yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California; Relies heavily on trees for roosts.	**Moderate.** Suitable tree habitat present in Project Site; detections in acoustic surveys could not be confirmed (Appendix C6).
Townsend's big-eared bat *Corynorhinus townsendii*	–/SSC	Roosts in caves, tunnels, mines, and dark attics of abandoned buildings; very sensitive to disturbances.	**Low.** Minimal and marginal roosting and foraging habitat; uncommon colonial rooster; detections in acoustic surveys could not be confirmed (Appendix C6).

TABLE 3.4-3 (CONTINUED)
SPECIAL-STATUS WILDLIFE SPECIES WITH POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Species	Status	Habitat	Potential for Occurrence in the Project Site
Mammals (cont.)			
Spotted bat *Euderma maculatum*	--/SSC	Roosts in cracks, crevices and caves usually high above ground in rock cliffs and canyons or high elevation coniferous forests; forages in meadows, riparian areas, canyons and forests.	**Moderate.** Uncommon solitary bat; minimal and marginal roosting habitat on Project Site, but suitable foraging habitat; detected in acoustic surveys in low numbers (Appendix C6).
Western red bat *Lasiurus blossevillii*	--/SSC	Roosts in foliage in intact riparian habitat; day roosts in edge habitats near streams or fields; may feed around streetlights.	Moderate. Uncommon solitary bat; suitable habitat on Project Site; detections in acoustic surveys could not be confirmed (Appendix C6).
Western mastiff bat *Eumops perotis californicus*	–/SSC	Wide variety of habitats from desert scrub to montane conifer; roosts and breeds in deep, narrow rock crevices, may also use crevices in trees, buildings, and tunnels.	Moderate. Limited suitable roosting habitat present in Project Site; detected in acoustic surveys in low numbers (Appendix C6).

NOTES:
FE: federally-listed endangered species; FT: federally-listed threatened species; FC: federal candidate species for listing; SE: state-listed endangered species; ST: state-listed threatened species; SC: state-listed candidate species; FP: state fully protected species; SSC: state species of special concern. Species status from USFWS 2020a, CDFW 2020

Mixed conifer, scrub, and chaparral areas on the Project Site are suitable for reptiles such as western fence lizard (*Sceloporus occidentalis*), sagebrush lizard (*Sceloporus graciosus*), western skink (*Eumeces skiltonianus*), western whiptail (*Cnemidophorus tigris*), northern alligator lizard (*Gerhonotus coeruleus*), rubber boa (*Charina bottae*), sharp-tailed snake (*Contia tenuis*), gopher snake (*Pituophis melanoleucus*), common kingsnake (*Lampropeltis getulus*), western terrestrial garter snake (*Thamnophis elegans*), and western rattlesnake (*Crotalus viridis*).

The Project Site is located within the Pacific Flyway and numerous birds likely migrate through the region. The Project Site contains stopover habitat for songbirds, waterfowl, and shorebirds in the form of conifer forest, scrub-shrub, and riparian and wetland habitats. The Project Site is characterized by rolling mountain terrain that generally would not be expected to concentrate or funnel raptors during migration; however, potential exists for migrating raptors to use updrafts and thermals created by topography and to be attracted to riparian areas within the study area. Red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), and other common raptor species may be present as residents and/or migrants in the Project Site. In addition, turkey vulture (*Cathartes aura*), great horned owl (*Bubo virginianus*) and other species of owls may also occur in the Project Site. Nesting habitat for owls and forest-dependent raptor species is present throughout the Project Site and vicinity.

While not currently found in the Leasehold Area, California condors' reintroduction to northern coastal California could begin in 2020 (Appendix C1). If reintroduction efforts are successful, there is a possibility that condors could recolonize inland portions of northern California, including the Project Site, at some point in the future. However, the likelihood of this recolonization is currently unknown.

The Project Site has ample forest that could provide roosting habitat for bats and wetland and riparian habitat that may be important foraging habitat. Bat species including California myotis (*Myotis californicus*), small-footed myotis (*Myotis ciliolabrum*), little brown bat (*Myotis lucifugus*), silver-haired bat (*Lasionycteris noctivagans*), and hoary bat (Lasiurus cinereus) have the potential to occur within the Project Site (Appendix C6). The Project Site also has suitable habitat for mule deer (*Odocoileus hemionus*) fawning, and for numerous smaller mammal species. Mammals found in mixed conifer forest include mule deer, Roosevelt elk (*Cervus elaphus roosevelti*), black bear (*Ursus americanus*), and cougar (*Puma concolor*), as well as smaller carnivores such as American marten (*Martes americana*), spotted skunk (*Spilogale gracilis*), striped skunk (*Mephitis mephitis*), porcupine (*Erithrozion dorsatum*), and raccoon (*Procyon lotor*). Smaller mammals that may be present include western gray squirrel (*Sciurus griseus*), long-tailed weasel (*Mustela frenata*), dusky-footed woodrat (*Neotoma fuscipes*), western jumping mouse (*Zapus princes*), montane vole (*Microtus montanus*), western harvest mouse (*Reithrodontomys montanus*), and deer mouse (*Peromyscus maniculatus*).

Sensitive Biological Resources

Sensitive biological resources addressed in this analysis include special-status species and sensitive habitats that are afforded consideration or protection under CEQA, the California Fish and Game Code, the California Endangered Species Act (CESA), the federal Endangered Species Act (FESA), the Clean Water Act, the Migratory Bird Treaty Act (MBTA), the Porter-Cologne Water Quality Control Act (Porter-Cologne Act), and the Bald and Golden Eagle Protection Act.

Special-Status Species

For the purpose of this analysis, "special-status species" are plants and animals within any of the following categories:

- Species that are listed under the FESA and/or CESA as rare, threatened, or endangered;
- Species considered as candidates and proposed for federal or state listing as threatened or endangered;
- Wildlife designated by CDFW as fully protected and/or species of special concern (SSC);
- Birds designated by CDFW as watch list species;
- Birds protected under the MBTA;
- Bats designated by the Western Bat Working Group (WBWG) as high (red) or medium (yellow) priority; or
- Plants ranked by CDFW to be rare, threatened, or endangered in California.

Based on focused rare plant surveys and natural community vegetation mapping performed in 2018 and 2019, sensitive natural communities do not occur on the Project Site (Appendix C3).

Invertebrates

The CNDDB query for the Project Site and vicinity identified five federally listed invertebrate species in the region (CDFW, 2020). These species were evaluated for potential to occur in the Project Site. Three of the species, Conservancy fairy shrimp (*Branchinecta conservatio*), vernal pool fairy shrimp (*Branchinecta lynchi*), and vernal pool tadpole shrimp (*Lepidurus packardi*) are specialized for Central Valley vernal pool habitats, which are not present on the Project Site and have no potential to occur. The Shasta crayfish (*Pacifastacus fortis*) has been identified only in the Fall River and Hat Creek subdrainages of the Pit River system upstream of the Project Site drainages in clear gravel shallows. It has low potential to occur in the Project Site. Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is found in association with blue elderberry (*Sambucus mexicanus*) in the Central Valley, south and east of the Project Site. Elderberry shrubs have not been found in the Project Site and therefore the valley elderberry longhorn beetle has a low potential to occur.

Fish

The Site Characterization Study for the Project Site (Appendix C1) examined USFWS and CNDDB species lists and evaluated the available habitat on site. The special-status fish in the region, including bull trout (*Salvelinus confluentus*), Chinook salmon (*Oncorhynchus tshawytscha*) spring and winter run, and Central Valley DPS steelhead (*Oncorhynchus mykiss irideus*), McCloud River redband trout (*Oncorhynchus mykiss ssp.* 2), bigeye marbled sculpin (*Cottus klamathensis macrops*), hardhead (*Mylopharodon conocephalus*), and Pacific lamprey (*Entosphenus tridentatus*) were found to have no potential to occur within the Project Site due to the absence of suitable habitat, or location out of range. These species require large stream and river systems with deep, cold, flowing water. Bull trout are also believed to be extinct in the state of California (Appendix C1).

One California SSC, the Pit roach (*Lavinia symmetricus mitrulus*), has low potential to occur within the Project Site (Appendix C1). Pit roach inhabit both deep pools and areas of low flow, moderate gradients, warm temperatures, and mats of vegetation. There is one CNDDB occurrence of Pit roach 2.7 miles north of the Project Site, within the Pit River and tributaries (Appendix C1). The channels within the Project Site have low potential to support this species. Due to the local terrain for watersheds in the Project's vicinity, hydrological conditions for surface waters tend to be flashy in the winter months and dry in the summer depending on snow melt and winter rains.

Reptiles

Western Pond Turtle

The western pond turtle (*Emys marmorata*), a medium-sized turtle, is a California SSC. The species occurs in a variety of aquatic habitats including streams, rivers, irrigation ditches, ponds, and marshes. Western pond turtles prefer habitats containing ample amounts of aquatic vegetation, muddy or rocky bottoms, and sparsely vegetated banks for basking. The species occurs throughout various elevations in northern California, ranging from sea level to nearly 7,000 feet. Suitable habitat is found within the Project Site, though it is limited to small ponds and/or stream pools (Appendix C1). Within the Project Site, a total of 10.04acres of aquatic habitat resides within

ponds, perennial streams, and intermittent streams (Table 3.4-1). These three aquatic habitat types are most likely to contain suitable western pond turtle habitat. Other aquatic habitat types such as riparian wetlands, freshwater emergent wetlands, wetland meadows, and wetland seep/springs may support western pond turtle populations during wetter years. Approximately 27 acres of potentially suitable aquatic habitat types are present on-site (Table 3.4-2).

While no known populations of the species exist within the Project Site, there is a known CNDDB occurrence from 2004 just outside of the southwestern boundary. This species has a moderate potential to occur within the Project Site.

Amphibians

Coastal Tailed Frog

The Coastal tailed frog (*Ascaphus truei*) is a California SSC. Habitat is restricted to montane areas of hardwood-conifer, redwood, Douglas-fir and ponderosa pine with perennial streams. There is potential suitable habitat within the Project Site, toward the southern boundary, and the species has been documented near the center of the Project Site (Appendix C1). This species has high potential to occur within the Project Site.

Southern Long-Toed Salamander

The Southern long-toed salamander (*Ambystoma macrodactylum sigillatum*) is a California SSC. Preferred habitat is montane meadows and lakes at high elevation and its range includes the Sierra Nevada, Cascade and Klamath mountains (Appendix C1). This species has moderate potential to occur within the Project, as suitable montane meadow habitat is present within the Project Site in burned areas and areas cleared by logging.

Shasta Salamander

Shasta salamander (*Hydromantes shastae*) is a state-listed threatened species (CDFW, 2020). This species is not common, with distribution being comprised of numerous, isolated populations occurring near valley-foothill limestone regions of Shasta County (Appendix C1). Preferred habitat includes hardwood conifer, ponderosa pine, and mixed-conifer habitat typically found from 1,100 to 2,550 feet (335 to 777 meters). These salamanders are most active during wet seasons and retreat to limestone fissures and caves during dry seasons, using logs and talus for cover (Appendix C1). The Project Site is outside of the known species' range, which is limited to the vicinity of Shasta Reservoir to the west. While there does not appear to be suitable habitat within the Project Site boundary, the species has been documented 5 miles to the west. This species has low potential to occur within the Project Site.

Foothill Yellow-Legged Frog

Foothill yellow-legged frog (*Rana boylii* [FYLF]) is a California SSC, a candidate for listing as threatened under the California Endangered Species Act (CESA) and is currently being reviewed for potential listing as threatened or endangered under the FESA. Several occurrences of FYLF have been documented in the vicinity of the Project Site in rocky stream habitat, and although the species has not been documented within the development corridors, and the Project is

proposed on the edge of the species' range, the species has potential to occur within the Project Site (Appendix C13a). However, Project-specific visual encounter surveys in 2018 and eDNA surveys in 2019 throughout the Project Site yielded no detections of this species (Appendix C13a and C13b).

Cascades Frog

The Cascades Frog (*Rana cascadae*) is a California SSC (CDFW, 2020). This species typically inhabits montane lakes, streams, ponds, and wet meadows and can be found in coniferous forests at elevations below 8,200 feet (2,500 meters) (Appendix C1). Reproduction of this species requires shallow, still water, and winter hibernation occurs on lake or pond bottoms. The known current range of this species overlaps only a small area in the southern portion of the Project Site. While the species has been documented 1.2 miles southeast of the Leasehold Area, Project-specific analysis in 2018 indicated only 75 acres of low-quality potential habitat in the southern portion of the Leasehold Area (Appendix C13a). Habitat mapping in the field determined that the potential habitat was not suitable for this species, and visual surveys for Cascade frog were determined to be unnecessary. This area of potential habitat was located in the southernmost portion of the Leasehold Area, and not located within the Project Site.

California Red-Legged Frog

California red-legged frog (*Rana draytonii*) is protected under the FESA (1973) as a threatened species (USFWS, 2020a). California red-legged frog range includes the coast ranges south from Mendocino County and includes part of the Cascades and Sierra Nevada. They are typically found in lowlands or foothills (Appendix C1) below 3,900 feet (1,200 meters) in elevation. Their preferred habitat is shoreline near permanent sources of deep water with dense, shrubby or emergent riparian vegetation (Appendix C1). They also inhabit marshes, calm pools along streams, and ponds. California red-legged frog require year-round pools for larval development. The Project is proposed at the northern extent of the frog's known range, and there may be suitable habitat within the Project Site boundary. However, this species is rare in the region and there have been no documented occurrences within Shasta County or the Project Site during site biological surveys (CDFW, 2020). Thus, the species has low potential to be present.

Birds

California Spotted Owl

The California spotted owl (*Strix occidentalis occidentalis*) is a California SSC (CDFW, 2020). In northern California, this species is associated with dense, old-growth, multi- layered mixed-conifer, redwood, and Douglas fir forests. While the California spotted owl (CSO) was recently petitioned for listing at the federal level, the listing was found not warranted in 2019 (Appendix C11). In their assessment, the USFWS found that the primary threats to the CSO are large-scale, high-severity fire, increased tree mortality, drought, effects of climate change, and the barred owl (*Strix varia*) invasion (USFWS 2019).

Suitable nesting/roosting habitat for CSO includes areas of complex-structured/multi-layered forest, high canopy cover, and the presence of old and decadent trees, large snags, and coarse

downed woody debris (Gutiérrez et al., 2017). The CSO forages in forested habitats that are generally similar to nesting and roosting habitat. The California spotted owl tends to avoid crossing brushy and clearcut forest areas, although they may hunt along forest edges. Their core areas may range from 300 to 2,000 acres.

The Project Site is located at edge of the geographic range of the CSO and high-quality nesting/roosting habitat is not present within the Project Site boundary. Approximately 995 acres of suitable habitat is present in the southern portion of the Leasehold Area, outside the Project Site (Appendix C11).

The Fountain Fire, which burned much of the central half of the Project Site in 1992, has resulted in a limited the amount of nesting habitat for some forest-nesting species, but may be suitable for species preferring more open forest and scrub habitats (i.e., early seral) for nesting such as the American kestrel, red-tailed hawk, great horned owl, and western screech-owl (Appendix C11). However, it is possible that the California spotted owl may forage within or disperse through Project Site and there are historical records of occurrence in the Project Site (CDFW, 2020). CSO have been documented in the vicinity of the Project Site (CDFW, 2020). Three historical activity centers are located within 2.0 miles southeast of the Project Site and one historical activity center was located near the center of the Project Site (Appendix C11). Although these owl detections are older, additional surveys for CSO have likely not been conducted in the area since surveys were conducted in the early 1990's. Therefore, CSO could still inhabit the areas with medium and high predicted habitat suitability in the southeastern portion of the Project Site. It should be noted that during other intensive (non-owl-specific) avian surveys conducted for the Project (Appendices C4, C7, C8 and C9) CSO was not detected. These efforts included two years of avian point count surveys.

Since the Project Site is located in proximity to much larger contiguous areas of high suitability habitat on the Shasta Trinity National Forest to the north and west and the Lassen National Forest to the southeast, CSOs are less likely to select to use the more fragmented and less suitable habitats within the heavily managed timberlands present within the Project Site (Appendix C11).

The northern spotted owl (*Strix occidentalis caurina*), is federally listed as threatened, and prefers mature coniferous forests and multi-layered mixed conifer forests. However, this species is not present within Shasta County, since this northern subspecies, for management purposes, is considered only to occur north of the Pit River, which is outside of the Project Site (Appendix C1). The Pit River runs approximately 4.7 miles north of the Project Site. This species is not discussed further in this EIR.

Great Gray Owl

The likelihood of occurrence of the great gray owl (*Strix nebulosa*) within the Project Site and in the region was assessed for purposes of the Project (Appendix C5). The great gray owl is designated as endangered by the state of California (CDFW, 2020). Great gray owl nesting habitat in California is most commonly associated with dense forest stands adjacent to montane meadow foraging habitat. Suitable nesting habitat includes mature or old-growth conifer stands with greater than 50 percent canopy cover containing potential nest trees. Nest trees include

broken-top snags greater than 16-inches in diameter at breast height,[1] trees containing pre-existing stick nests from other species and mistletoe brooms. The estimated state-wide population size is only 100-200 pairs. Although the Project Site is located within the historical range of the species, there were no known occurrences of great gray owl within or immediately adjacent to the Project Site and the nearest known occupied territories were located approximately 85 miles to the northeast in Modoc County (CDFW, 2020). In addition, during other intensive avian studies conducted for the Project (Appendices C4, C7, C8, and C9), this species was never detected. These efforts included 2 years of avian point count surveys and surveys for northern goshawk and willow flycatcher. However, none of these surveys were conducted at night and no surveys were specifically conducted for this species within the Project Site.

In addition, there is no nesting and foraging habitat available for this species within the Project Site. However, there is a small amount of suitable habitat within a private in-holding located northeast of the Project Site, but this habitat is isolated and not known to be used by great gray owl (Appendix C5). A review of potentially suitable nesting or foraging habitat in other areas of the Project Site found no other suitable habitat (Appendix C5). Therefore, this species is not expected to be present, and will not be discussed further in this EIR.

Northern Goshawk

The northern goshawk (*Accipiter gentilis*) is a medium-large raptor with a broad distribution in the western United States, including California and the Project Site. In California, it is considered an SSC when nesting (CDFW, 2020). The northern goshawk can occupy a variety of habitats but prefers mature coniferous and deciduous forests. They eat a variety of prey that includes small mammals and birds. Catching most prey while in flight, goshawks prefer to hunt in more open areas such as cleared forest patches, dense forests with open understories, and along waterways. This species is particularly sensitive to forest management practices that reduce or fragment habitat.

Mainly resident, some individuals from high latitude regions migrate south for the winter. Individuals in North America migrate south along mountain ridge tops at nearly any time of the fall depending on latitude. Over much of their California range, northern goshawks nest mainly in mature and old-growth forest stands. Suitable stands would occur in a broad range of conifer and conifer-hardwood types such as Ponderosa pine. This hawk prefers the densest stands available for nesting, and those with a high canopy closure and open understories for foraging. There is a limited amount of mature forested habitat within the southeast portion of the Project Site (Appendix C1). Within their territories, goshawks will alternate the use of as many as eight nests sites that can be located up to 1.1 miles (1.8 km) apart.

Project-specific surveys were conducted for goshawks to provide a more current assessment of potential presence of active nests in four historical occurrence areas in CNDDB (Appendix C8). Five goshawk detections occurred within the Project Site between April 2017 and May 2018 during fixed-point large bird use surveys and incidental observations (Appendix C4a, Appendix C4b). Two goshawk nests also were found in the Project Site during nest surveys, both inactive, with one in use

[1] The standard position for diameter measurements at standing trees is at breast height, which in the United States is defined as approximately 4.5 feet.

by a great horned owl (*Bubo virginianus*) and the other in a state of unusable disrepair (Appendix C8). During the acoustic surveys, goshawks were not detected, either visually or by ear, and no evidence of nesting goshawks was observed. Although the report authors concluded that the likelihood of nesting goshawks is low in those areas surveyed, this conclusion is not necessarily representative of the entire Project Site. Suitable goshawk habitat occurs in the southeast portion of the Project Site, and properties overlapping with the Cedar Boots timber harvest plan have timber and goshawk management plans in place that protect the species and their nests during logging practices (CAL FIRE, 2016). Overall, the species has moderate potential to be present onsite.

Bald and Golden Eagles

The bald eagle (*Haliaeetus leucocephalus*) is federally protected by the Bald and Golden Eagle Protection Act, is fully protected in California, and is state-listed as endangered. Aerial and ground-based eagle and raptor nest surveys were conducted for the Project during breeding seasons from 2017-2019, as well as fixed-point eagle use surveys from April 2017 through March 2019 (Appendix C9). Project eagle nest surveys found from nine (2017) to eleven (2019) occupied bald eagle nests within 10 miles of the Project Site, with the majority along the Pit River and the closest 2.9 miles from the Project Site boundary. The Pit and Fall rivers support large populations of breeding and wintering bald eagles (Appendix C9). The results of fixed-point eagle use surveys included 22 observations of bald eagles over a two-year survey period, with 13 of the 22 observations made in winter.

The golden eagle (*Aquila chrysaetos*) is federally protected by the Bald and Golden Eagle Protection Act, and is state fully protected in California. Aerial nest surveys found no nesting golden eagles within 10 miles of the Project boundary; this includes three historical golden eagle nests, which could not be located during either year of aerial surveys. While golden eagle nest habitat is not present in the Leasehold Area, golden eagles may nest in the region. During the two-year fixed-point eagle use survey, three golden eagle observations were made. All three observations of golden eagles were made during the spring migration season (Appendix C4).

Greater Sandhill Crane

Greater sandhill cranes (*Grus canadensis tabida*) were once abundant breeders on the Modoc Plateau of northeastern California but are now less abundant and found in the northern and southern regions of the Central Valley. This subspecies is State Threatened on their nesting and wintering grounds because of declining numbers and a reduction in its Pacific Flyway stopover habitat. *G. c. tabida* of the Central Valley population are migratory between nesting areas in British Columbia, Washington, Oregon and northeast California to wintering areas of in the Central Valley and south (Appendix C1). Sandhill cranes typically use large freshwater marshes, prairie ponds, and marshy tundra during summer and grain fields or prairies during migration and winter. Greater sandhill crane nesting or stopover roosting habitat does not occur within the Project Site. The closest known nesting habitat is located approximately 20 miles east of the Project Site, in the Fall River Valley Important Bird Area (Appendix C1), but cranes may stop over in other suitable open wetlands in the region. Over 100 sandhill cranes were observed in flight during Fountain Wind avian surveys (Appendix C4). Sandhill cranes are moderately likely to migrate over the Project Site in spring and fall.

Sandhill cranes can fly from 15-50 miles per hour, depending on wind speed and direction, and they utilize thermals to help gain altitudes of up to 12,000 feet; typically, they migrate at altitudes of less than 5,000 feet. When migrating, sandhill cranes can average 150 miles to over 400 miles a day, usually during daylight hours to take advantage of favorable wind conditions (USFWS, 2020b). As noted in Table 3.4-3, the potential for this species to occur in the vicinity of the Project Site is moderate.

Willow Flycatcher

In 2018, the willow flycatcher was designated as State Endangered (CDFW, 2020). Surveys for the Project (Appendix C12) found no willow flycatcher within or immediately adjacent to the Project Site. The nearest known occupied territories were located approximately 20 miles to the northeast of the Project Site (CDFW, 2020). Two years of avian point count surveys throughout the Project Site also failed to detect any willow flycatchers. However, avian point count surveys were conducted for the purpose of identifying all birds using the Project Site. Specific surveys for willow flycatcher were not required, based on the lack of records of willow flycatcher presence in the vicinity of the Project Site.

Biologists also assessed the occurrence of willow flycatcher habitat within the Project Site. Willow flycatcher breeding habitat consists of dense deciduous riparian shrub and willow thickets both of which are present within the Project Site. This species stays close to their preferred habitat of willow thickets and brushy riparian areas, perching and flying between low lying willow thickets. Areas of preferred habitat including willow thickets and brushy riparian areas within the Project Site were mapped and then buffered by 300 feet to ensure all the habitat was covered and that the average territory size of the willow flycatcher was also included. Three potential willow flycatcher habitat sites were surveyed during the 2018 nesting season (Appendix C12), with listening periods and playback calls conducted to elicit call responses from breeding birds. No willow flycatchers were detected. The Project Site could be used as stop-over and foraging habitat for migrating willow flycatchers during spring and fall, as suitable riparian habitat likely exists on federally-managed lands to the north and south. However, as noted in Table 3.4-4, the potential for this species to occur on site is low.

Migratory and Resident Raptors

Avian point count studies were conducted over a 2-year period in all four seasons from 2017 to 2019 (Appendix C4a, Appendix C4b). Large birds included waterbirds, waterfowl, shorebirds, diurnal raptors, vultures, upland game birds, doves and pigeons, and large corvids. Large bird surveys were conducted approximately once per month at 39 observation points, with approximately 9-10 points surveyed each week of the study period (Appendix C4a, Appendix C4b). During 60-minute large bird surveys, a total of 3,267 observations were recorded in Year 1 and 8,459 observations were recorded in Year 2. This included documentation of 25 and 22 separate large bird species in Year 1 and 2, respectively.

The surveys found that seasonal trends in diurnal raptor use were very similar between years, with the fall and spring migration periods having the highest use (Appendix C4b). Fifteen species of diurnal raptors were detected over all seasons during the two years of surveys, including

Cooper's hawk, northern goshawk, sharp-shinned hawk, ferruginous hawk, red-tailed hawk, rough-legged hawk, northern harrier, red-shouldered hawk, bald eagle, golden eagle, merlin, American kestrel, osprey, prairie falcon and turkey vulture (Appendix C4b). The red-tailed hawk had the highest use of any diurnal raptor species during all four seasons. Among other diurnal raptor species, sharp-shinned hawk and Cooper's hawk had relatively high use in fall and spring. Overall, raptor use was higher during migration seasons.

Diurnal raptors that have the potential to occur within the Project Site include the State Threatened Swainson's hawk, white-tailed kite and American peregrine falcon (the latter two are state fully protected species). None of these three species was recorded during two years of large bird surveys. The northern harrier, a California SSC, was recorded in both years within the Project Site. Six other species of raptors on the CDFW watch list that were observed include the Cooper's hawk, ferruginous hawk, merlin, prairie falcon, osprey, and sharp-shinned hawk (Appendix C4b).

Nine owl species have potential to nest within the Project Site or surrounding area including the barn owl (*Tyto alba*), barred owl (*Strix varia*), flammulated owl (*Otus flammeolus*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), northern pygmy owl (*Glaucidium gnoma*), northern saw whet owl (*Aegolius acadicus*), California spotted owl (*Strix occidentalis occidentalis*), and western screech-owl (*Megascops kennicottii*) (Appendix C1). Additionally, short-eared owl (*Asio flammeus*) may be a permanent resident and breeder regionally, and burrowing owl (*Athene cunicularia*) may be a winter resident regionally but neither is likely to be found in the forested habitats of the study area. Of the owl species potentially occurring within the Project Site, the California spotted owl and long-eared owl are California SSC. During the two years of avian surveys (not focused owl surveys), only the northern pygmy owl and great horned owl were detected within the Project Site (Appendix C4).

Other Resident and Migratory Birds

The Project Site is located within the Pacific Flyway and numerous species of birds are known to migrate through the region. The Pacific Flyway is a major north-south flyway for migratory birds and extends from Alaska to Patagonia and spans the western U.S. From the results of two years of avian point count studies conducted within the Project Site, the site contains some stopover habitat for migratory birds including raptors and songbirds, but not for waterfowl or waterbirds (Appendix C4a, Appendix C4b). This habitat ranges from forests to grassland/ shrub-scrub habitats with smaller areas of riparian and wetland habitat.

Waterfowl

Five species of waterfowl were recorded during two years of surveys within the Project Site, with snow goose (*Chen caerulescens*) accounting for the majority of use in winter and fall, and greater white-fronted goose (*Anser albifrons*) accounting for nearly all spring use (Appendix C4a, Appendix C4b). Other waterfowl species observed over the two years of surveys included the cackling goose (*Branta hutchinsii*), Canada goose (*Branta canadensis*), and tundra swan (*Cygnus columbianus*). Tundra swans were observed rarely but in large flocks. Waterfowl were observed most frequently during winter and during migration.

Waterbird use, comprising two species, American white pelican (*Pelecanus erythrorhynchos*) and sandhill crane (*Antigone canadensis*), was highest in winter. The American white pelican is a California SSC. No waterbird use was recorded in summer. Almost all the waterfowl and waterbird use occurred in the fall and winter indicating that these birds were migrating over the area and neither using migratory stop-over habitats within the Project Site nor breeding there.

Other large birds commonly detected in both years of avian surveys within the Project Site included band-tailed pigeon (*Patagioenas fasciata*) and common raven (*Corvus corax*). Very small numbers of mountain quail (*Oreotyx pictus*), common nighthawk (*Chordeiles minor*), and American crow were also detected (*Corvus brachyrhynchos*) (Appendix C4a, Appendix C4b).

Songbirds

Songbird (small bird) surveys were conducted separately from large bird surveys. Two years of small bird surveys were conducted at the same 39 observation points used for the large bird surveys. During 10-minute small bird surveys in Year 1, 2,408 small bird observations were recorded of 71 species while in Year 2, 1,711 small bird observations were recorded of 50 species (Appendix C4b). The most abundant birds observed in the two years of avian surveys included dark-eyed junco (*Junco hyemalis*), mountain chickadee (*Poecile gambeli*), western bluebird (*Sialia mexicana*) and Steller's jay (*Cyanocitta stelleri*), with woodpeckers also common. Small bird abundance in both years of avian surveys was highest in the fall, followed by summer and spring, and lowest in the winter. Species richness across both years of small bird surveys was highest in summer. The seasonal abundance and species richness results suggest that small bird use is moderate and relatively consistent across seasons and across the Project Site. The results of small bird avian surveys further suggest that there is no specialized use of nesting habitats by resident birds, use of the area by migratory songbirds is non-concentrated. The following sections highlight songbirds observed on the Project Site that are California SSC.

Vaux's Swift

Little is known about life history traits of the Vaux's Swift (*Chaetura vauxi*) in California, where the species generally arrives the first week of April through late May. Vaux's Swift may roost individually or in communal groups. Communal roosts are typically large specialized structures capable of accommodating more than a hundred individual birds and can include mature and old-growth conifers with large top or side cavities as well as man-made structures like chimney (Shuford and Gardali, 2008). In fall, birds arrive to roost sites in northwestern California around late September. This species is a diurnal migrant that flies at heights just at the limit of sight, gathering and circling in large flocks up before dusk in the vicinity of roost sites. The Avian Use Study reported observing a fly-by of a single group comprised of 35 individuals. No communal nest locations or potential nest sites were identified in the Project Site (Appendix C4).

Olive-sided Flycatcher

The olive-sided flycatcher (*Contopus cooperi*) breeds along the edges and openings of forests, including burned areas, and around the edges of wetlands. It uses tall, prominent trees and snags for singing and as foraging perches because of the unobstructed air space they offer. It arrives in northern California from wintering grounds in early May and leaves again in fall. It is more often

detected along edge habitats than elsewhere in the forest interior and it is often present near water, possibly because of higher insect abundance in these areas. The species in western North America has a proclivity for burned areas. Migratory habitat in spring is mainly mountain areas, although winter habitat includes more riparian and non-coniferous habitats. This species feeds on flying insects caught on the wing; hunting in this manner requires open air space for launching from and returning to foraging perches – as opposed to other flycatcher species that forage in mid-air.

Yellow Warbler

The yellow warbler (*Setophaga petechia*) is a widespread and abundant bird in North America, but occurrence is fragmented and local in the southwest part of the country where it is limited to riparian corridors. The species is largely absent from the Central Valley region and the southern and eastern desert areas of California. Migrants pass through northwest California in April and again in August to September. Found typically in riparian habitats, it is primarily an insectivore. During migration, collision fatalities occasionally occur at television towers and other tall, lighted structures. Preferred breeding areas are wet, deciduous thickets dominated by willows and in disturbed and early successional habitats.

Cassin's Finch

The Cassin's finch (*Haemorhous cassinii*) typically inhabits high elevation coniferous forests in the spring and summer months, descending to lower elevations or migrating south in the winter, though populations in northeastern California may be year-round residents. Conspicuous and vocal in mixed species foraging flocks, and excellent at mimicking the calls of other species, this species primarily eats fruits including berries, plant buds, and seeds, and infrequently insects while foraging on the ground. There is little information on nesting habits of this species, but nest building likely occurs May and June, with timing influenced by elevation. Cup nests are placed in outer branches away from the tree's trunk and, in California, in primarily ponderosa and Jeffrey pine trees. Birds depart the nest and the area as soon as chicks fledge.

Lewis's Woodpecker

Lewis's woodpecker (*Melanerpes lewis*) is a California SSC (CDFW, 2020). When pursuing insects on the wing in summer months, it exhibits prolonged gliding and complex aerial maneuvers; in winter its diet is acorns and other nuts, which it caches in bark crevices. In fall and winter, high concentrations of this species can occur in northern California where oak mistletoe berries are abundant. This woodpecker prefers open forests, ranging from low-elevation riparian areas to higher-elevation burns and pine forests for breeding, and it requires snag trees either standing, dead, or partly dead for nesting. Rather than excavating cavities in wood, this species selects trees already well decayed. Lewis's woodpeckers tend to be locally distributed within their range but is somewhat sporadic in occurrence. It arrives to breeding grounds in early May and departs again around late August or early September. Trends are difficult to assess for this species, but indications point to broad-scale and local-scale decline, probably due to loss of suitable habitat, habitat degradation, and pesticides.

Mammals

Gray Wolf

The gray wolf (*Canus lupis irremotus*) is federally endangered (USFWS, 2020a) and California threatened (CDFW, 2020). Once extirpated from California, gray wolves have been detected in Northern California in recent years, beginning in 2011 (Appendix C1). Gray wolf habitat preference and utilization often reflects the distribution of prey on the landscape rather than direct selection for cover type, with seasonal movements following ungulate migration. Wolf territories usually encompass a variety of habitat types, including forests, meadows, rocky ridges, lakes, and rivers. Springtime natal dens are constructed in well-drained soils in meadows near water sources, in hollow logs, under tree roots, or rock outcrops. CDFW has noted that gray wolves have passed through or adjacent to the Project Site in recent years, and a suspected wolf track was documented at the Project Site in the winter of 2018 (Appendix C10). An adult female gray wolf was found dead in Shasta County in February 2020 (KRCRTV, 2020).

The species requires large, diverse, and undisturbed territories. These habitat preferences limit the possibilities for coexistence with silvicultural and development activities on the Project Site. While the likelihood of gray wolves within the Project Site increases as the species population increases in Northern California, the tendency of this species to traverse long distances and to avoid disturbance would decrease its likelihood of denning in the Project Site.

California Wolverine

The California Wolverine (*Gulo gulo*) is state listed as threatened in California, where its preferred habitat includes higher elevation mixed conifer forests with seasonal snowfall in the Northern Sierra Nevada (CDFW, 2020). The species primarily subsists on a diet of small mammals and carrion, often hunting in open areas adjacent to mixed conifer forests, where dense forest cover provides denning habitat. California wolverines tend to avoid human disturbance and can range large distances within suitable habitats (Appendix C1). Within the Project Site is suitable mixed conifer forest habitat, although the site is a working forest landscape with frequent disturbance. Several occurrences of this species have been noted to the east and on the northeast boundary of the Project Site, though the records are 50 years old (CNDDB, 2020). This species is unlikely to occur within the Project Site.

American Badger

The American Badger (*Taxidea taxus*) is an uncommon permanent resident of California, most commonly found in grassland, shrubland, agricultural, and woodland edge habitats with friable soil for burrowing. It is a California SSC. Badgers are carnivorous and prey on a variety of species, including ground squirrels, reptiles, birds, and carrion depending on seasonal availability. The CNDDB documents badgers 6.5 miles east of the Project (CDFW, 2020), but suitable open habitat for badgers is lacking on the Project Site; thus, this species is unlikely to occur.

Fisher

The West Coast distinct population segment (DPS) of fisher (*Pekania [=Martes] pennant*) is proposed Threatened by the USFWS and currently under review (USFWS, 2019). The Northern

California evolutionarily significant unit (ESU) – consisting of fishers that occur within California in the Klamath Mountains, Coast Range, southern Cascades, and northern Sierra Nevada – is a California SSC. Fishers are opportunistic, generalist predators, that prefers mature, dense forest stands. Suitable habitat will also contain snags, hollow logs, brush piles, and similar types of denning cover. The CNDDB documents several occurrences of fishers within the Project Site, and in the surrounding area (CDFW, 2020). This species has high potential to occur within the Project Site.

Oregon Snowshoe Hare

The Oregon Snowshoe Hare (*Lepus americanus klamathensis*) is a subspecies of snowshoe hare that occurs in the vicinity of Mt. Shasta, the Trinity Mountains, and the Warner Mountains. It is a California SSC. The snowshoe hare prefers heterogeneous habitats with dense understory, as well as riparian habitats, and is rarely found in open habitat or mature closed canopy forests. The Project landscape is patchwork of heterogeneous habitats, due to both logging and fire, and appears to contain suitable habitat for the snowshoe hare. This species is moderately likely to occur within the Project Site.

Deer Habitat

The Project Site includes Columbian black-tailed deer (*Odocoileus hemionus columbianus*) fawning habitat, according to CDFW (2020). The Columbian black-tailed deer, one of six subspecies of black-tailed deer in California, is recognized by black-tipped tail and large, pointy ears. Fawns are usually born in late spring/early summer in dense forests and shrublands, including riparian and mountain habitats, with abundant forage and water nearby. Within the Project Site, a total of 1,217.5 acres of forest/shrub habitat is present within forests/woodlands, chaparral, and shrublands (Table 3.4-1). Deer fawning habitat is present within the Project Site.

Bats

Seventeen bat species have the potential to occur within the Project Site; none are federally or state listed, and five are considered California SSC. Fourteen of the seventeen species have been acoustically detected within the Project (Appendix C6). Of these fourteen species, two species, the spotted bat (*Euderma maculatum*) and the western mastiff bat (*Eumops perotis*), are California SSC. A full list of bat species with potential to occur within the study area can be found in Appendix C6.

Bat fatality rates documented at nearby wind facilities can provide regional context for identifying and mitigating impacts. The Hatchet Ridge Wind Project, which has been in operation since 2010 and is located approximately 1 mile from the Project Site, has documented bat fatality rates for the first three years of operations (i.e., between November 18, 2010 and December 13, 2013) using standardized carcass searches, including searcher efficiency and carcass persistence trials to adjust for inherent biases in estimating Project-related fatality rates (Tetra Tech, 2014). Over the three years of monitoring, a total of 63 bat fatalities were found from four species (silver-haired, Brazilian free-tailed, hoary, and big brown). Estimated annual bat fatality rates ranged from 5.13 to 12.02 bats/turbine, of predominantly hoary, silver-haired, and Mexican free-tailed during their late summer/fall migration period (Tetra Tech, 2014). Rates were highest in

summer (July–September) and predominantly composed of hoary bats, silver-haired bats, and Mexican free-tailed bats. These three species are consistent with the species most commonly detected during the bat acoustic surveys conducted for this Project (Appendix C6). Further, the timing of peak fatalities at the Hatchet Ridge Wind Project aligns with peak activity rates documented at the Project Site.

Pallid Bat

The pallid bat (*Antrozous pallidus*) hunts on and near the ground: approximately 10-20 feet (3-6 meters) off the ground. This opportunistic foraging bat is a generalist, preying on myriad insects like arthropods, whether prey is flying or stationary. They may echolocate while flying, but generally use passive acoustic cues to locate prey.

Pacific Townsend's Big-eared Bat

The Pacific Townsend's big-eared bat (*Corynorhinus townsendii*) occupies myriad habitats up to 3,000 feet in elevation. Distribution is strongly correlated with the availability of caves and cave-like roosting habitat, including abandoned mines. Roost site use varies within seasons and among years. Both maternity and winter hibernating colonies vary in size from a few individuals to colonies of several hundred, with wintering groups composed of both sexes. *C. townsendii* forages in edge habitats preferably along streams and around and in a variety of wooded habitats and can cover large distances while foraging.

Spotted Bat

The spotted bat (*Euderma maculatum*) is a solitary species that infrequently will roost or hibernate in small groups. It is found to nearly 9,000 feet in elevation and prefers to inhabit areas of rock cliff and canyons, roosting in highly fractured rock crevices. During summer, bats may travel from low- to high-elevation feeding areas and return prior to dawn. *E. maculatum* is capable of long distance and rapid flight, and foraging ranges can be large. Individuals forage alone about 6.6-164 feet above ground.

Western Red Bat

The western red bat (*Lasiurus blossevillii*) is broadly distributed through much of the western United States. Generally solitary, this species is highly migratory, moving in groups and loosely grouping together to forage in summer. It roosts predominantly in the foliage of trees or shrubs. Little is known about their winter behavior. Roost characteristics are specific: hidden from view, opening beneath to allow bats to drop into flight, dark, sheltered from elements, and generally on south or southwest side of a tree. Prey includes large, nocturnal, winged insects like moths, leafhoppers, and flies; this species forages on the wing and around artificial nighttime lights.

Western Mastiff Bat

The western mastiff bat (*Eumops perotis*) is colonial bat species that occurs from western Texas to parts of southern California, and most recently in northern California to within a few miles of the Oregon border. In California, it was previously thought that this species occurs only to 1,230 feet (375 m) elevation, however, this species roosts up to 4,593 feet (1,400 m) and can forage up to 8,858 feet (2,700 m). This bat species has limited maneuverability in flight. The

distribution of *E. perotis* likely is present only where there are significant rock features offering suitable roosting habitat. It may be found in broad, open habitats, including desert scrub, chaparral, oak woodland, grasslands, and high elevation meadows of mixed conifer forests. This bat requires open, unobstructed waterways for drinking, and drought conditions can impact the species.

Hoary Bat

A migratory species, the hoary bat (*Lasiurus cinereus*) is the most widespread of all North American bats. This common, solitary species winters along the California coast and in southern California, breeding inland and north of the winter range. Habitats suitable for roosting include woodlands and forests with medium-to-large trees and dense foliage. Hoary bats prefer open habitats or habitat mosaics with access to trees for cover, and open areas or habitat edges for feeding. They have a strong foraging preference for moths, although various flying insects are also taken (Zeiner and Laudenslayer 1990). This species is documented on the Project site and at the nearby Hatchet Ridge Wind Project (Appendix C6).

Special-Status Plants

Special-status plants include any of the following:

1. Listed or proposed for listing as threatened or endangered under the FESA or candidates for possible future listing as threatened or endangered under FESA (50 C.F.R. §17.12).
2. Listed or candidates for listing by the State of California as threatened or endangered under CESA (Fish and Game Code §2050 et seq.).
3. Listed as rare under the California Native Plant Protection Act (CNPPA), (Fish and Game Code §1900 et seq.). A plant is rare when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens (Fish and Game Code §1901).
4. Meets the definition of rare or endangered under CEQA Guidelines section 15380, subdivisions (b) and (d), including:
    a. Plants considered by CDFW to be "rare, threatened or endangered in California, including plants tracked by the California Natural Diversity Database (CNDDB) or designated as California Native Plant Society Rare Plant State Rank (CRPR) 1 or 2.
    b. Plants that may warrant consideration based on declining trends, recent taxonomic information, or other factors, which could include plants tracked by the CNDDB and California Native Plant Society as CRPR 3 or 4.
5. Locally significant plants, those that are not rare from a statewide perspective but are rare or uncommon locally within a county or region (CEQA Guidelines §15125(c)), or designated as significant in local or regional plans, policies or ordinances.

The California Native Plant Society has identified five categories of California Rare Plant Ranks (CRPR):

- List 1A—Plants presumed to be extinct in California

- List 1B—Plant species considered rare, threatened, or endangered in California and elsewhere
- List 2—Plant species considered rare, threatened, or endangered in California but more common elsewhere
- List 3—Plants about which more information is needed (a review list)
- List 4—plants of limited distribution (a watch list)

Each CRPR category may include an extension indicating the level of endangerment in California:

- 1—Seriously endangered in California (more than 80 percent of occurrences are threatened and/or high degree and immediacy of threat)
- 2—Fairly endangered in California (20–80 percent of occurrences are threatened)
- 3—Not very endangered in California

CDFW recommends and local governments may require that CEQA review of proposed projects address plants on Lists 1A, 1B, and 2.

No federally listed or candidate plant species are known to occur within the Project Site or vicinity. Based on data from the California Native Plant Society, 191 plant species that occur in Shasta County are considered sensitive. The California Natural Diversity Database (CNDDB) list of special-status plants and plant communities within ten miles of the Project and the California Native Plant Society Inventory of Rare and Endangered Plants list for Shasta County of special-status plant species and sensitive natural vegetation communities were used to identify rare plants with potential to occur in the Project Site. Two federally listed plant species were identified as having potential to occur within the Project Site: Greene's tuctoria (*Tuctoria greenei*) and slender Orcutt grass (*Orcuttia tenuis*; Table 3.5-5). However, based on the absence of vernal pools and open grasslands within the Project Site, these species are unlikely to occur. Federally designated critical habitat for slender Orcutt grass is located approximately 6.0 miles (9.7 km) north of the Project Site.

Four state-level sensitive plants (California rare plant rankings) have been documented within the vicinity of the Project Site (Appendix C3): Butte County morning-glory (*Calystegia atriplicifolia* ssp. *buttensis*), rattlesnake fern (*Botrypus virginianus*), northern clarkia (*Clarkia borealis* ssp. *borealis*), and English Peak greenbriar (*Smilax jamesii*).

Rare plant surveys were conducted in 2018 and 2019 (Appendix C3a, Appendix C3b). Rare plant surveys covered all proposed development corridors throughout the Project Site; however, approximately 800 acres of the Project Site were not surveyed due to modifications to the Project Site that occurred following the 2019 survey. No special-status plants were documented during the rare plant surveys. There is a high level of disturbance to natural vegetation communities within the Project Site due to continued logging operations and the 1992 Fountain Fire, which burned lands surrounding and throughout the central area of the Project site. Based on the negative survey results and current land use activities on the site, occurrence of special-status plants is not expected in the areas which were not included in the 2018 and 2019 surveys; however, this

conclusion remains to be verified. For this analysis, special-status plants (FESA, CESA, CNPPA, CNDDB CRPR 1 or 2) not detected on the Project Site during rare plant surveys are presumed absent. Rare plants were considered in the focused assessments (Appendix C3a, Appendix C3b). Per CDFW protocol, rare plant surveys are typically valid for a period of five years from the date conducted.

3.4.1.3 Regulatory Setting

Biological resources in California are protected and regulated by a variety of laws, regulations, plans and policies administered by federal, state, and local agencies. This section summarizes the biological resource-related agencies, regulations, and policies relevant to the Project and alternatives.

Federal

Federal Endangered Species Act

The Secretary of the Interior (represented by the USFWS) and the Secretary of Commerce (represented by NOAA Fisheries) oversee the federal Endangered Species Act (FESA). The USFWS implements and enforces FESA for terrestrial species; NOAA Fisheries implements and enforces it for aquatic and anadromous species. For purposes of this analysis, the USFWS is the oversight agency. Section 7 of the FESA mandates that all federal agencies consult with the USFWS to ensure that federal agencies actions do not jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat for listed species. The federal agency is required to consult with the USFWS if it determines its action may affect a listed species or critical habitat will occur in association with its action(s). The FESA prohibits the unlawful "take"[2] of any fish or wildlife species listed as threatened or endangered, including the destruction of habitat that could hinder species recovery.

Under Section 9 of the FESA, the take prohibition applies only to wildlife and fish species. However, Section 9 does prohibit the removal, possession, damage, or destruction of any endangered plant from federal land. Section 9 also prohibits acts to remove, cut, dig up, damage, or destroy an endangered plant species in non-federal areas in knowing violation of any state law or in the course of criminal trespass. Candidate species and species that are proposed or under petition for listing receive no protection under Section 9 of the FESA.

Section 10 of the FESA requires the issuance of an "incidental take" permit before any public or private action may be taken that would potentially harm, harass, injure, kill, capture, collect, or otherwise hurt (i.e., take) any individual of an endangered or threatened species. The permit requires preparation and implementation of a habitat conservation plan that would offset the take of individuals that may occur, incidental to implementation of the project by providing for the overall preservation of the affected species through specific mitigation measures.

[2] Take is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct.

Under the FESA, the USFWS designates critical habitat for listed species. Critical habitat designations are specific areas within a geographic region that are occupied by a species and determined to be critical to its survival in accordance with FESA. Federal entities issuing permits or acting as a lead agency must show that their actions do not adversely modify the critical habitat to the extent that it impedes the recovery of the species. Within designated critical habitat, USFWS protects habitat that provides the primary constituent elements (PCEs) for survival of the listed species. PCEs are the physical and biological functions considered essential to species conservation that require special management considerations or protection.

Federal Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA) (16 U.S.C. §703 et seq.) is the domestic law that affirms and implements a commitment by the United States for the protection of shared migratory bird resources. Except as permitted by regulations, the MBTA makes it unlawful to intentionally pursue, hunt, take, capture, or kill migratory birds anywhere in the United States. The law also applies to the intentional disturbance and removal of nests occupied by migratory birds or their eggs during the breeding season. In December 2017, the U.S. Department of the Interior issued memorandum M-37050, which redefined “incidental take” under the MBTA such that, “the MBTA's prohibition on pursuing, hunting, taking, capturing, killing, or attempting to do the same applies only to direct and affirmative purposeful actions that reduce migratory birds, their eggs, or their nests, by killing or capturing, to human control.” The current interpretation of the MBTA’s definition of “take” does not prohibit or penalize take of migratory birds that results from actions that are not intentional.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. §§668-668c) makes it illegal to trade in any bald eagle or golden eagle or parts thereof. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

State

California Endangered Species Act

The California Endangered Species Act (CESA) prohibits the take of endangered and threatened species. Habitat destruction is not included in the State’s definition of take. Section 2090 of CESA requires State agencies to comply with endangered species protection and recovery and to promote conservation of these species. CDFW administers the act and authorizes take through Section 2081 agreements (except for designated “fully protected species”).

State-listed plants are protected mainly in cases where State agencies are involved in projects under CEQA. In this case, plants listed as rare under the California Native Plant Protection Act are not protected under CESA but can be protected under CEQA.

California Fully Protected Species (Fish and Game Code Sections 3511, 4700, 5050 and 5515) and Species of Special Concern

The classification of "fully protected" was CDFW's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, amphibian and reptiles, birds, and mammals. Most of the species on these lists have subsequently been listed under CESA and/or FESA. The California Fish and Game Code sections (fish at Section 5515, amphibians and reptiles at Section 5050, birds at Section 3511, and mammals at Section 4700) dealing with "fully protected" species states that these species "…may not be taken or possessed at any time and no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected species," although take may be authorized for necessary scientific research. This language makes the "fully protected" designation the strongest and most restrictive regarding the "take" of these species. In 2003, the code sections dealing with fully protected species were amended to allow CDFW to authorize take resulting from recovery activities for State-listed species.

California SSC are animals not listed under the FESA or CESA, but are nonetheless of concern because they are declining at a rate that could result in listing or historically occurred in low numbers and known threats to persistence currently exist. This designation is intended to result in special consideration for these animals by CDFW, land managers, consulting biologists and others, and is intended to focus attention on the species to help avert the need for costly listing under FESA and CESA and cumbersome recovery efforts that might ultimately be required. This designation also is intended to stimulate collection of additional information on the biology, distribution, and status of poorly known at-risk species, and focus research and management attention on them. Although these species generally have no special legal status, they are given special consideration in the CEQA process and are analyzed along with listed species in the CEQA Appendix G checklist.

Protection for rare plant species under CESA is afforded by the California Native Plant Protection Act (NPPA) of 1977 (Fish and Game Code §§1900-1913), which prohibits the importation of rare and endangered plants into California, take of rare and endangered plants, and sales of rare and endangered plants. The California Native Plant Society also identifies rare or endangered plants and ranks their rarity as 1A, 1B, 2, 3, and 4 species. Plant species with a California Rare Plant Rank 1A, 1B, or 2 are considered to meet CEQA significance criteria and Fish and Game Code sections 1901, 2062 and 2067 criteria as rare or endangered species.

California Fish and Game Code 3503

Fish and Game Code Section 3503 establishes that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto. In addition, birds of prey are protected under Fish and Game Code Section 3503.5, which states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes (diurnal birds of prey) or Strigiformes (owls) or to take, possess, or destroy the

nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. CDFW considers any disturbance that causes nest abandonment and/or loss of reproductive effort to be "taking."

California Department of Fish and Game Code Sections 1600-1616

CDFW regulates activities that would interfere with the natural flow of, or substantially alter, the channel, bed, or bank of a lake, river, or stream. These activities are regulated under Fish and Game Code Sections 1600 to 1616. Requirements to protect the integrity of biological resources and water quality are often conditions of Streambed Alteration Agreements. Requirements may include avoidance or minimization of the use of heavy equipment, limitations on work periods to avoid impacts on wildlife and fisheries resources, and measures to restore degraded sites or compensate for permanent habitat losses. A Streambed Alteration Agreement may also be required by CDFW for construction activities that have the potential to result in an accidental release of debris, waste or other material into a lake, river or stream.

Porter Cologne Act and Responsibilities of the State Water Resources Control Board under the Clean Water Act

The Clean Water Act requires that the discharge of dredged or fill material into waters of the U.S. does not violate state water quality standards. Applicants for Section 404 or Section 10 permits must obtain a Section 401 water quality certification from the State Water Resources Control Board.

Pursuant to the Porter-Cologne Act, each of California's nine Regional Water Quality Control Boards (RWQCB) must prepare and periodically update basin plans that set forth water quality standards for surface and groundwater, as well as actions to control nonpoint and point sources of pollution to achieve and maintain these standards. Basin plans offer an opportunity to achieve wetlands protection based on water quality standards.

Z'Berg-Nejedly Forest Practice Act

The Z'Berg-Nejedly Forest Practice Act of 1973 (Public Resources Code §§4511-4360.2) and its implementing regulations, the Forest Practice Rules (14 Cal. Code Regs. §895 et seq.), govern the management of privately owned forestlands in California, including with respect to biological resources. See, for example:

- Rule 939.2 General Protection of Nest Sites (14 Cal. Code Regs. §939.2)
- Rule 939.3 Specific Requirements for Protection of Nest Sites (14 Cal. Code Regs. §939.3)
- Rule 939.4 Non-listed Species (14 Cal. Code Regs. §939.4)
- Rule 939.9 Northern Spotted Owl (14 Cal. Code Regs. §939.9)
- Rule 939.12 Sensitive Species Classification (14 Cal. Code Regs. §939.12)

Local

Shasta County General Plan

The Fish and Wildlife Habitat Element (6.7) of the Shasta County General Plan contains policies (summarized below) to guide County planning for biological resource conservation and management (Shasta County, 2004):

> **Policy FW-b:** Recognition that classification of some fish, wildlife, and vegetation resources designated and used as Timberlands in most cases protects habitat resources. However, if there is a conflict, the timber land use classifications shall prevail in a manner consistent with State and Federal laws.
>
> **Policy FW-c:** Projects that contain or may impact endangered and/or threatened plant or animal species, as officially designated by the California Fish and Game Commission and/or the USFWS, shall be designed or conditioned to avoid any net adverse project impacts on those species.
>
> **Policy FW-d:** The significant river and creekside corridors of Shasta County shall be designated on the General Plan maps. The primary purpose of this designation is to protect the riparian habitats from development and from adverse impacts from conflicting resources uses. Riparian habitat protection along the significant river and creekside corridors, as designated on the plan maps shall be achieved, where appropriate, by the following measures:
>
> - regulation of vegetation removal.
> - design of grading and road construction to restrict sediment input to all streams.
> - establishment of a development set-back.
> - the siting of structures, including clustering.
>
> **Policy FW-f:** The County should encourage and support efforts by State and Federal agencies that implement the Upper Sacramento River Fisheries and Riparian Habitat Management Plan.

Oak Woodland Voluntary Management Guidelines

The County adopted these voluntary guidelines in 1995 to encourage retention of an average canopy of 30 percent or more when harvesting oaks, including trees of a variety of species, ages, and conditions, as well as brush piles, hollow trees and other habitat components. The guidelines recommend the clustering of buildings, protection of residuals, and replacement of removed trees when building occurs among oaks. Development, including roads, cuts and fills, foundations and septic systems should be carefully planned to avoid impacts. The guidelines also recommend landowners consider replacing trees unavoidably removed during construction, and contact a specialist for help maintaining large or specimen trees. Because oak woodland habitat is present within the Project Site, these guidelines are considered in the analysis.

3.4.2 Significance Criteria

A project would result in a significant impact to Biological Resources if it would:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS;

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS;

c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means; or

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

CEQA Guidelines Appendix G Section IV also suggests consideration of local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, and any adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan covering an area that would be affected by a proposed project. See Section 3.4.1, *Environmental Topics Removed from Consideration*.

3.4.3 Direct and Indirect Effects

3.4.3.1 Methodology

The information and analysis presented below are based in part on data provided in Appendix C, *Biological Resources*. The County independently reviewed this and other materials prepared by or on behalf of the Applicant and determined them to be suitable for reliance on (in combination with other materials included in the formal record) in the preparation of this Draft EIR. Potential impacts to biological resources were analyzed by:

1. reviewing species-specific studies and surveys within the Project Site to determine the likelihood of a species' presence;

2. overlaying the proposed Project footprint, including permanent and temporary disturbance areas, with maps of biological resources in the Project Site using GIS;

3. calculating the acres of each habitat type that would be removed or disturbed using GIS;

4. distinguishing between direct impacts, which would include construction of wind turbines, roads, and facilities, and indirect impacts that would include habitat disturbance, operation of the Project, and increased human activities during Project construction and operation;

5. assessing the risk of bird and bat collision with wind turbines and power lines based on analysis of this Project and studies from other wind energy facilities, including the Hatchet Ridge Wind Project, and;

6. determining whether an effect on a candidate, sensitive, or special-status species would be substantial based on whether it could result in an adverse effect on the species' population.

The analysis distinguished between permanent impacts (long-term and built environment) and temporary impacts (temporary and short- or limited-term) and addresses the three general phases of the Project as described in Chapter 2, *Description of the Project and Alternatives*:

1. site preparation and construction;
2. operations and maintenance; and
3. decommissioning and site restoration.

Construction-Related Impacts

Habitat loss and degradation (including noise and increased human activity) are the primary impacts on biological resources that would result from the construction of the Project. Loss of habitat would result from construction of all Project components. Permanent habitat loss would occur in the permanent footprint of the Project components, while temporary habitat loss would occur during construction and while habitats are restored and returned to their preconstruction condition. Temporary habitat degradation would occur due to increased noise and human activity. Additional habitat degradation would result from conversion of habitats that would not be restored or allowed to return to their preconstruction state after construction until the Project is decommissioned.

Operational Impacts

Operational impacts from the Project would include collisions of birds and bats with wind turbines while passing through the rotor swept areas, and barotrauma for bats. Operational impacts on birds may also result from collisions with the overhead electric transmission lines. The Project is designed such that all energized Project components, including the above-ground collection lines, would be constructed in accordance with the current suggested practices of the Avian Power Line Interaction Committee (APLIC, 2006, 2012).[3]

The use of vehicles to maintain operations, including turbine maintenance and repair, and defensive space vegetation clearing may result in collisions with common terrestrial wildlife species.

Decommissioning and Site Reclamation

Decommissioning of the Project would include dismantling wind turbine components facilities, excavation and removal of turbine foundations to a depth of approximately 3 feet below grade, natural revegetation of unused roads, recontouring and revegetation of the site. As discussed in Section 2.4.7, the Applicant proposes to return the Project Site to conditions similar to pre-construction conditions, including by replanting with commercial tree species or other vegetative cover. For purposes of analysis, this EIR assumes that the restoration plan included in the Draft

[3] APLIC publications offer design suggestions including pole design, electrical configuration and the use of insulation materials to reduce the risk of avian electrocutions.

Decommissioning Plan would include a detailed description of pre-construction conditions, and that the Final Decommissioning Plan would comply with the timber stocking standards and related requirements of the Forest Practice Act and Forest Practice Rules. Further, the Draft Decommissioning Plan would detail how facilities and infrastructure would be removed, which facilities would be retained, and include standards for re-establishment and monitoring of vegetation. The timeline for decommissioning is expected to be 18 to 24 months.

3.4.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would have a substantial adverse impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS.

Special-Status Plant Species

Impact 3.4-1: Construction of the Project could, unless mitigated, cause a significant impact to special-status plant species. (*Less than Significant with Mitigation Incorporated*)

As stated in Section 3.4.1.2, no special-status plants were documented in the Project Site during rare plant surveys in 2018 and 2019. Rare plant surveys in forested areas are typically valid for up to 5-years per CDFW protocol. Based on the observed absence of special-status plants, no direct impacts on special-status plants are anticipated within the surveyed areas of the Project Site, provided vegetation clearing and ground disturbance activities occur within 5 years of survey completion.

Approximately 800 acres of the Project Site were not surveyed for special-status plants due to changes in the layout of the Project, which occurred after surveys were completed. If construction activities such as road development, turbine installation, or other ground disturbance occur in the 800-acres of unsurveyed area direct impacts on special-status plants such as removal or crushing could result. Because, special-status plants often occur in isolated non-contiguous populations, damage or destruction of special-status plants would be a significant impact. Implementation of Mitigation Measure 3.4-1 below, Avoid and Minimize Construction Impacts on Special-Status Plants would reduce this impact to a less-than-significant level by conducting rare plant surveys prior to construction, and avoiding or relocating any rare plants found.

> **Mitigation Measure 3.4-1: Avoid and Minimize Construction Impacts on Special-Status Plants**
>
> To prevent adverse impacts to special-status plants, the Project Applicant shall implement the following measures if construction activities are to occur in the area not yet surveyed, or if vegetation removal and ground disturbing construction activities have not been completed within 5 years of the completion of rare plant surveys:
>
> a) A qualified biologist shall conduct a pre-construction survey for special-status plant species with the potential to occur within the unsurveyed area, or other areas if 5 years have passed since completion of rare plant surveys; or as otherwise approved by CDFW. The survey shall follow the procedures outlined in the CDFW (2018) rare plant survey protocol.

b) If special-status plants are found to be present, plant populations shall be avoided using an appropriate (e.g., 20-foot or greater) buffer for the subject population during construction. The buffer shall be staked, roped, and/or fenced off so as to be readily identifiable by construction workers as a buffer area to be avoided.

c) Where special-status plant avoidance is not feasible, the applicant shall mitigate for the loss of plants through the implementation of the following: A qualified ecologist shall develop and implement a restoration and mitigation plan according to CDFW guidelines and in coordination with CDFW. At a minimum, the plan shall include collection of reproductive structures or plant salvage from affected plants, a full description of microhabitat conditions necessary for each affected species, seed germination requirements, restoration techniques for temporarily disturbed occurrences, assessments of potential transplant and enhancement sites, success and performance criteria (e.g., greater than 1:1 replacement of individual plants or the population area), include a minimum 3-year monitoring program, as well as measures to ensure long-term sustainability such as weeding or supplemental water.

d) Survey results shall be provided to the Shasta County Department of Resource Management, Planning Division and CDFW at least 14 days in advance of the initiation of construction activities within the area(s) surveyed. The Shasta County Department of Resource Management, Planning Division shall, in coordination with CDFW, determine whether or not the survey(s) were conducted in accordance with CDFW plant survey protocol and measures b) and/or c) are to be implemented. Construction shall not begin in the surveyed area until the Shasta County Department of Resource Management, Planning Division has confirmed that the survey(s) were conducted in accordance with the protocol and, if necessary, that measures 3.4-1b and/or 3.4-1c have been implemented.

Significance after Mitigation: Less than significant.

Bald and Golden Eagles

Impact 3.4-2: Construction of the Project could, unless mitigated, cause a significant impact on nesting bald and golden eagles. (*Less than Significant with Mitigation Incorporated*)

Nesting Disturbance

Aerial nest surveys conducted in 2017 found 11 occupied bald eagle nests within 10 miles of the project (Appendix C9). Most of these nests were located along or near the Pit River, north of the Project Site and between 4 to 8 miles from the project boundary. The nearest bald eagle nest was found on Lake Margaret, a small reservoir 2.9 miles east of the Project Site boundary (Appendix C9). Over 20 bald eagles were recorded in avian use surveys (Appendix C4).

No golden eagle nests were found during two years of aerial nest searches, and avian use surveys documented only three observations of golden eagles in 914 hours of survey effort over two years (Appendix C4). Typical golden eagle nesting habitat, such as rocky outcroppings or exposed cliffs, may be found in the surrounding region, but is generally absent from the Project Site. The

California Natural Diversity Database identifies three historic golden eagle nests within 10 miles of the project boundary.

Eagles are state fully protected species and are protected under the Bald and Golden Eagle Protection Act in response to declining populations, disturbance of nesting eagles could result in an adverse effect on local bald and/or golden eagle populations and would therefore be substantial. If nests are present within 2 miles of the Project Site, the highest risk to nesting bald and golden eagles during construction activity is disturbance from noise and human activity. Noise from equipment and human disturbance may cause eagles to leave active nests, and repeated or severe disturbance may result in a failed nest attempt or complete nest abandonment, which would be a significant impact. Disturbance from construction could be minimized by measures such as surveying and locating occupied eagle nests, choosing an appropriate time of year for construction phases, establishing buffer distances from active nests according to USFWS recommendations, and monitoring for compliance and effectiveness. The implementation of Mitigation Measure 3.4-2 would reduce the impacts on nesting bald and golden eagles from construction disturbance to less than significant.

Nesting and Foraging Habitat

Open habitat types that could be utilized by foraging golden eagles comprise a low proportion of the mostly forested landscape: out of 4,464 acres within the Project Site, montane meadow accounts for 1.4 acres (<0.1 percent), mixed chaparral 76.2 acres (1.7 percent), riparian scrub 80.0 acres (1.8 percent), and mixed riparian forest 27.2 acres (0.6 percent). Additionally, bald eagles are not expected to use the Project Site landscape for foraging as surface waters within the Project Site tend to be intermittent in the winter months, and dry in the summer, depending on conditions for snow melt and winter rains. Because of the lack of suitable habitat, it remains unlikely that eagles would use the Project Site for nesting or foraging. Given the relatively low use of the Project Site by bald and golden eagles, and the low percentage of preferred habitat types within the Project boundary, permanent impacts from construction of the Project on bald and golden eagle nesting and foraging habitat would be less than significant.

Mitigation Measure 3.4-2: Avoid and minimize construction-related impacts to nesting eagles *(January 1 to August 31).*

To prevent adverse impacts to nesting eagles, the Project Applicant shall implement the following measures if construction activities are to occur during the nesting season:

a) Conduct terrestrial preconstruction eagle nesting surveys of known previously active nest sites to determine whether eagles are actively nesting or maintaining territories within 2 miles of the Project construction boundary. Surveys will be designed and carried out by a qualified biologist with experience in the natural history and nesting behavior of eagles, following USFWS guidelines. Terrestrial surveys will include all suitable eagle nesting habitat within a 2-mile buffer surrounding the Project construction boundary, as accessible, and subsequent observations at known nests to assess territory occupancy and nesting activity by adult eagles.

b) Results of preconstruction eagle nesting surveys will be reported to the Shasta County Department of Resource Management, Planning Division, USFWS, and

CDFW by August 31 of the year in which the survey was conducted. The Shasta County Department of Resource Management, Planning Division shall, in coordination with resource agencies, determine whether or not the survey(s) were conducted in accordance with appropriate protocols and measures c) is to be implemented. Construction shall not begin in the surveyed area until the Shasta County Department of Resource Management, Planning Division has confirmed that the survey(s) were conducted in accordance with appropriate protocols and, if necessary, that measure 3.4-2c has been implemented.

c) If surveys document active eagle nests within the 2-mile survey buffer, the Project Applicant will coordinate with the County, USFWS and CDFW to define and implement recommended protective measures. Typical measures for working within 2 miles of eagle nests are to establish construction buffers (e.g., with flagging, rope, signage, or other similar barriers) in accordance with USFWS recommendations (National Bald Eagle Management Guidelines, 2007; Golden Eagle, 2013) for specific activities (e.g., vehicular traffic, construction work, etc.); and may be adjusted downward based on site-specific conditions following coordination with the USFWS Migratory Bird Program and CDFW.

Significance after Mitigation: Less than significant.

Impact 3.4-3: Operation of the Project could, unless mitigated, result in significant adverse impacts to or direct mortality of bald and golden eagles (*Significant and Unavoidable*)

Operation of the Project could have direct impacts on bald and golden eagles through collision with power lines or operating wind turbine generators, or electrocution from energized components. The most directly relevant data for an assessment of the Project's potential risk to eagles comes from the nearby Hatchet Ridge Wind Project, specifically its two-year preconstruction avian use survey reports and three-year post-construction mortality monitoring report (Tetra Tech, 2014, 2013, 2012). Both the Hatchet Ridge project and the proposed Project are somewhat unique among western wind projects in their high percentage of forested landscape, however, the Project turbines would be 62 percent taller with 70 percent larger blade diameters than the Hatchet Ridge project. Even with these design differences, the Hatchet Ridge project's study results provide the best available data on potential for eagle mortality to occur.

The Hatchet Ridge Wind Project EIR (Shasta County, 2007) identified the potential for significant and unavoidable impacts on bald eagles, as well as special-status raptors, greater sandhill cranes, and other avian species; however, post-construction avian fatality monitoring did not identify any bald or golden eagle mortalities from project operation (Tetra Tech, 2014). Avian use studies of the Leasehold Area for this Project (Appendix C9) found lower use of the area by bald eagles, and comparable use by golden eagles, when compared to preconstruction surveys at the Hatchet Ridge project site. These patterns were consistent across seasons. However, there is uncertainty that there may be relatively greater impacts on bald or golden eagles due to the Project's substantially taller turbines. For comparison, at Hatchet Ridge, each tower has a maximum total tip height of 420 feet, with a rotor diameter between 253 and 312 feet and a wind-swept area up to 980 sq. ft. (Shasta County, 2007). The Project has total tip height of up to

679 feet, a rotor diameter up to 433 feet, and a wind-swept area of up to 1,360 sq. ft. (Figure 2-4a). Because the wind-swept area of the Project is larger than Hatchet Ridge, and the blades cover a greater area, the relative risk to eagles is considered incrementally greater for the Project. Given the close proximity of the Hatchet Ridge project site to the Project Site, and the similar siting of the two projects outside of preferred eagle foraging habitat, the risk of impacts is anticipated to be similarly low between the two projects. Thus, while the risk to eagles from operation of the proposed Fountain Wind facility is relatively low (due to the limited use of the area by eagles), there remains potential for eagle injury and death due to collisions with turbines. As stated previously, eagles are CDFW fully protected species and are protected under the Bald and Golden Eagle Protection Act in response to declining populations, collision related injury or death of eagles could result in an adverse effect on local bald and/or golden eagle populations and would therefore be substantial. Implementation of Mitigation Measures 3.4-3a, 3.4-3b and 3.4-3c would reduce this potential impact by identifying potentially hazardous situations on the Project Site for bald and golden eagles, providing coordination with the USFWS, providing active steps to reduce eagle hazards, and providing compensatory mitigation, if needed, to address the loss of eagles consistent with federal guidance. However, due to the uncertainty related to the larger turbine size and wind-swept area compared to the Hatchet Ridge project, the potential impact on bald and golden eagles would remain significant and unavoidable. Note that these measures additionally include provisions to protect other raptors and bats, which are discussed later in this section, to avoid redundancy in the document.

Mitigation Measure 3.4-3a: Avoid and minimize operational impacts on avian and bat species.[4]

The Project Applicant will avoid and minimize operational impacts on eagles, other raptors, and bats by enacting the following mitigation measures:

a) Discourage raptor use of immediate vicinity of wind turbine generators by taking steps to reduce prey species' numbers, such as minimizing creation of prey habitat such as rock piles.

b) Follow APLIC (2006, 2012) guidance for all energized Project components to minimize electrocution or collision with transmission lines.

c) Follow *Land-Based Wind Energy Guidelines* (USFWS, 2012) for turbine design and best management practices that help to minimize eagle mortality and eliminate potential raptor perches; avoid guy wires on meteorological towers where possible.

d) Prior to Project construction, the Applicant will coordinate with USFWS regarding potential impacts to eagles and demonstrate the Projects' compliance with the Bald and Golden Eagle Protection Act and the USFWS Eagle Conservation Plan Guidance (2013).

e) All Project staff responsible for operations will be trained in reporting avian and bat wildlife fatalities, including those of bald and golden eagles, other raptors, and bats encountered during turbine maintenance and other regular activities on site.

[4] Mitigation measure 3.4-3a encompasses more species than just eagles. This is to avoid redundancy within the document, and the measure is referred to as a means of reducing other impacts throughout the document.

A protocol for project staff will be developed in coordination with CDFW and the County for appropriate handling and reporting fatalities.

Mitigation Measure 3.4-3b: Monitor avian and bat mortality rates during project operations.[5]

To accurately assess operational Project impacts on avian species, including bald eagle, golden eagle, other raptors, and bats, and ensure the effectiveness of avian protection measures, the applicant will design and implement a post-construction mortality monitoring (PCMM) study. The PCMM will include the following elements:

a) The duration of PCMM monitoring to assess ongoing impacts of operation will include post-construction monitoring for eagles, other raptors, and bats. The PCMM monitoring will commence immediately following the beginning of commercial operation and continue for three years following the incorporation of all planned turbines and power generation.

b) PCMM studies will be designed to meet a minimum overall detection probability for bald and golden eagles of 30 percent during the first three years of full operation. Additionally, the PCMM will include a mandatory incidental monitoring and reporting program for other raptors and bats for the life of the Project.

c) Searcher efficiency trials and carcass persistence trials using large raptor carcasses or an appropriate, commercially available proxy will be implemented and used to calculate overall detection probabilities of eagle carcasses. Carcasses of other birds and bats will also be collected and reported.

d) Monitoring will occur over all seasons of occupancy for the species being monitored.

e) Applicant will provide an annual report of PCMM findings to the Shasta County Department of Resource Management, Planning Division, CDFW, and the USFWS. If a bald or golden eagle, other raptors or bats are detected during PCMM, and detections indicate exceedance of the following thresholds, the Applicant and relevant agencies will develop a plan to mitigate the impacts per the *Land-Based Wind Energy Guidelines* (USFWS, 2012).[6]

    - Bald eagle – injury or mortality to one or more bald eagles in any given year.
    - Golden eagle – injury or mortality to one or more golden eagles in any given year.

[5] Mitigation measure 3.4-3b encompasses more species than just eagles. This is to avoid redundancy within the document, and the measure is referred to as a means of reducing other impacts throughout the document.

[6] Injury and mortality thresholds for bald eagle, golden eagle, and California spotted owl stated above were developed based on the low expectation for species mortality during project operations. For northern goshawk, this species is not listed and no California wind farm mortality has been identified in California. Because this species is unlikely to be encountered, a threshold of two individuals was adopted. For other raptors, the adopted threshold was based on the regional populations of Coopers hawk, sharp-shinned hawk, and northern harrier, which are fairly healthy. For most raptor species, mortality to migrating individuals is not anticipated. This assessment was based on focused baseline surveys of the Project area, monitoring findings from the Hatchet Ridge Wind Project, and coordination with raptor experts. For uncommon bat species with low population numbers, four WBWG high priority species are considered to have a low to moderate potential to occur and a threshold of three individuals per species was adopted based their rarity and low encounter numbers at the Hatchet Ridge Wind Project. For two WBWG medium species, a threshold of six bats was adopted based on the absence of habitat in the Project area (western mastiff bat) or the greater abundance of the species (hoary bat).

- Other raptors – injury or mortality to six or more individuals of any sensitive raptor species in any given year, except northern goshawk. For northern goshawk, injury or mortality to two or more individuals in any given year.

- Bats – injury or mortality to three or more bats of a single species identified as Western Bat Working Group (WBWG) high priority (red) species (i.e., pallid bat, Townsend's bat, spotted bat, western red, or western mastiff) in any given year; or injury or mortality to six or more bats of a single species identified as WBWG medium priority (yellow) species (i.e., hoary bat or spotted bat), in any given year.

The Applicant will implement minimization measures recommended by these agencies to limit mortality. Which may include operational modifications such as curtailment of turbine speed. The possible use of low-intensity ultraviolet light and ultrasonic deterrence systems to deter birds and bats from approaching rotating wind turbine blades may also be considered as warranted (AWWI, 2018).

Mitigation Measure 3.4-3c: Offset operational impacts on eagles through compensatory mitigation, if necessary.

a) If bald or golden eagle mortality occurs as a result of the Project, the Project Applicant will fund the retrofitting of electrical utility poles that pose a high risk of electrocution to eagles. Applicant will coordinate with the USFWS and follow the most current USFWS *Eagle Conservation Plan Guidance* (USFWS, 2013). If in coordination with USFWS an alternative compensatory mitigation measure is preferred to pole retrofitting, such alternative compensation measure (e.g., pole reframing or funding carcass removal from roadways) may be implemented.

b) Any compensatory mitigation must occur within the same Eagle Management Unit as the Project, and must be completed within one year of any instance of documented take.

c) Applicant will provide a report to the Shasta County Planning Department and USFWS documenting implementation of measures taken within one year of detection of the eagle take.

d) Annually and after collection of 3 years of post-construction monitoring data, the Shasta County Department of Resource Management's will review the data and, in coordination with the Project Applicant, USFWS and CDFW, will determine which, if any, specific wind turbines generate disproportionately high levels of avian (including eagle) mortalities (based on evidence of statistically significant higher levels of mortality relative to other Project wind turbines). If specific wind turbines are found to result in disproportionately high avian mortalities based on collected data, the Project Applicant shall coordinate with the County to evaluate any feasible measures that can be implemented to reduce or avoid mortalities at those specific wind turbines. Furthermore, if mortalities involve eagles, the County will consider additional measures, including but not limited to carcass removal from roadways or funding for the acquisition of conservation easements on habitat that would provide nesting, foraging, or roosting bald and/or golden eagle habitat.

e) If unauthorized take of a federal or state listed raptor occurs during project operation, the Project Applicant shall immediately notify the appropriate agency (CDFW and/or USFWS) by phone. The Applicant shall submit a written finding to the appropriate

agency and the County within two calendar days that describes the date, time, location, species and, if possible, cause of unauthorized take. The Applicant shall notify the County within three calendar days of the receipt of any USFWS and/or CDFW required or recommended actions resulting from the unauthorized take, including whether an incidental take permit and/or additional requirements is deemed necessary by either agency.

Significance after Mitigation: Due to the uncertainty of potentially increased impacts resulting from larger turbines and wind-swept area when compared to the Hatchet Ridge Wind Project, the impact after implementation of mitigation would be significant and unavoidable.

Impact 3.4-4: Decommissioning of the Project could result in adverse impacts to nesting bald and golden eagles. (*Less than Significant with Mitigation Incorporated*)

The anticipated operational lifespan of the Project is 40 years. Decommissioning of the Project and reclamation of the site is expected to have similar impacts on nesting bald and golden eagles as the construction phase, in terms of noise, disturbance, and equipment used, and would require similar mitigation. The implementation of Mitigation Measure 3.4-4 would reduce this potential impact to less than significant.

Mitigation Measure 3.4-4: Implement Mitigation Measure 3.4-2 (Avoid and minimize construction-related impacts to nesting eagles).

Significance after Mitigation: The implementation of this mitigation measure would reduce this potential impact to less than significant by identifying species presence and providing adequate buffers to avoid direct and indirect impacts to nesting birds.

California Spotted Owl

Impact 3.4-5: Construction, operation and decommissioning of the Project could result in adverse impacts to California spotted owls. (*Less than Significant Impact*)

Nesting and Roosting Habitat

The Project Site is located at edge of the geographic range of the California spotted owl and little high-quality nesting and roosting habitat is present within the Project Site (Appendix C11). The majority (about 75 percent) of the Project Site contains vegetation communities unsuitable, or of low suitability, for California spotted owl nesting (Appendix C11). Areas of the Project Site containing moderate to high suitability for nesting habitat are present only within the southeastern third of the Project Site, with approximately 945 acres classified as having moderate suitability for the species and 50 acres classified as having high suitability. These areas of predicted high suitability for nesting and roosting, are present in small, isolated patches in the Project Site which may limit the potential for these areas to support California spotted owl roosts or nests. Construction of roads and other facilities at the Project Site could remove, fragment, and modify

suitable California spotted owl habitat. As described in the focused California spotted owl assessment prepared for the Project (Appendix C11), although approximately 995 acres of moderate to high suitability CSO habitat occurs within the Project Site, only a portion of this area may need to be cleared for the construction and operation of the Project, since the Project Site includes the disturbance area plus a buffer. For this impact analysis purposes, it was assumed the entire 995 acres would be disturbed. However, because the amount of potential habitat to be cleared for the project is only a small portion of available habitat in the region, and is consistent with current land uses (timber harvest), the loss of this potential habitat is not likely to have a substantial effect on California spotted owl populations or habitat use in the region. Within this regional context, plus the lack of recent (since mid-1990's) California spotted owl detections in areas within or surrounding the Project Site (Appendix C11), indicates the Project's impact on California spotted owl nesting habitat would be less than significant.

Nesting Disturbance

If nesting California spotted owls are present in habitat areas at the time of construction, activities could disturb active nests during the 18- to 24-month construction period. Project construction noise and activities could increase stress levels in owls during daytime roosting/nesting periods, potentially leading to nest abandonment and reduced productivity caused by auditory and visual disturbances. These impacts could occur over two consecutive breeding seasons. Similar construction impacts could occur when the Project is decommissioned. Disturbance of nesting for up to two consecutive years, could adversely affect owl populations due to the small number of California spotted owls present in the region.

Although construction impacts to California spotted owl populations are estimated to be less than significant based on low habitat suitability in the Project area, there is a remaining low risk of nest disturbance if owls were to nest in the area. In an effort to further reduce potential effects on California spotted owl, the County may elect to include additional conservation measures identified below as a condition of permit approval.

Operational Effects

The Project Site has been used primarily for the management of timber production for decades along with its associated timber harvest activities. Timber management and harvest operations have recently been conducted primarily within the southern half of the site. Maintenance of the Project, which will involve episodic driving of project roads by maintenance personnel is not likely to result in vehicle collisions with California spotted owl, as maintenance occurs predominantly during daylight hours when owls are inactive. Additionally, Project maintenance activities will not incrementally increase existing vehicle driving and disturbance levels compared with timber operations.

California spotted owls could incur injury or death as a result of collisions with Project wind turbines during operation in areas where the wind turbine blade height overlaps with the height of the adjacent forest canopy. However, due to the low anticipated use of the Project Site by California spotted owls, the limited extent of mature, complex forest stands within and adjacent to the Project Site, the flight behavior of spotted owls, and the low number of collision fatalities of forest-dwelling owl species documented at wind energy facilities, potential impacts to spotted

owls resulting from collision with Project turbines is anticipated to be very low. As a result, operational impacts on California spotted owl would be less than significant.

Although operational impacts would be less than significant, there is a risk of collisions occurring if species use of the area by owls increases from observed levels, or the larger turbine result in increased collisions. In an effort to further reduce potential effects on California spotted owl, the County may elect to include additional conservation measures, as follows, as a condition of permit approval.

California Spotted Owl Conservation Measures:

Modification of EIR Mitigation Measures 3.4-3a (Avoid and minimize operational impacts on Avian and Bat species) and 3.4-3b (Monitor Avian and Bat Mortality Rates During Project Operations) to include California spotted owl would reduce effects by monitoring mortality rates during project operations and implementing agency-recommended minimization, in response to observed collision injuries or mortalities. Modification of Mitigation Measure 3.4-b (e) would include: if a California spotted owl are detected during PCMM, and detections indicate exceedance of the following threshold, the Project Applicant and relevant agencies will develop a plan to mitigate the impacts per the *Land-Based Wind Energy Guidelines* (USFWS, 2012)

- California spotted owl - injury or mortality to one or more owls in any given year; or three owls over three years.

Minimize construction disturbance to California spotted owl.

To avoid direct impacts to active California spotted owl nests, conduct one season of pre-construction surveys in potentially suitable moderate or high quality habitat areas. Alternatively, the Applicant may choose to assume occupancy in some areas based on the presence of suitable nesting, roosting, or foraging habitat in suitable habitat within the Project Site or within 0.25-mile of the Project roads and wind turbines, and adhere to the guidance and seasonal restrictions described below for operating in an "Un-surveyed Landscape." Also before decommissioning the Project, implement each of the mitigation measures outlined below.

1) ***Surveyed Landscape*** – If pre-construction surveys are completed or are current for the Project Site (based on surveys conducted by the Applicant or other data provided from other entities) and those surveys indicate that the suitable habitat at the site is considered to be occupied by California spotted owl:

    a) Do not conduct activities that result in loud and continuous noise levels above 90 decibels within 0.25 mile (or 1,320 feet) of a nest site between February 1 and July 9.

    b) Do not conduct any modification of suitable habitat within 0.25 mile (or 1,320 feet) of an active nest site between February 1 and September 15. Suitable habitat includes California spotted owl NRF habitat. Modification includes cutting and removal of large trees, down logs or snags. Tree or limb trimming or pruning, brush trimming or removal, and hazard tree felling may occur as long as the noise levels described above are not exceeded during the critical breeding period of February 1-July 9.

c) Do not conduct any smoke-generating activities within 0.25 mile (or 1,320 feet) of a nest site between February 1 and July 31.

2) ***Un-surveyed Landscape*** – If surveys have not been completed or cannot be done, assume occupancy in suitable habitat within the Project Site:

a) Do not conduct activities that result in loud and continuous noise above ambient levels above 90 decibels within 0.25 mile (or 1,320 feet) of un-surveyed suitable habitat between February 1 and July 9. Reduced buffers (e.g., 330 feet to 825 feet) may be appropriate based on the type and volume of anticipated noise, and if the Project Site has higher ambient noise levels. Nest buffer distances may be reviewed by a qualified biologist on a case-by-case basis in accordance with USFWS's *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (USFWS, 2006), and applying the methods to California spotted owl.

b) Do not conduct any modification of suitable habitat within 0.25 mile (or 1,320 feet) of un-surveyed suitable habitat between February 1 and September 15. Modification includes cutting and removal of large trees, down logs or snags. Tree or limb trimming or pruning, brush trimming or removal, and hazard tree felling may occur as long as the noise levels described above are not exceeded during the critical breeding period of February 1-July 9. Prior to the removal of any potential nesting and/or roosting trees, an experienced wildlife biologist will be consulted to assess the usage of these trees by California spotted owls.

Significance after Mitigation: Implementing these mitigation measures would reduce the impacts of construction noise and disturbance on California spotted owls during roosting or nesting periods and would minimize the risk of nest disturbance and increased stress levels that could adversely affect spotted owl behavior and activities.

Migratory and Resident Raptors (excluding Eagles)

Impact 3.4-6: Construction and decommissioning of the Project could result in adverse impacts on nesting raptors (other than goshawks). (*Less than Significant with Mitigation Incorporated*)

Of the 15 species of diurnal raptors recorded in the Project Site, the most common non-eagle raptors were red-tailed hawks (148 observations), sharp-shinned hawks *(*18 observations), and Cooper's hawks (nine observations). Diurnal raptor use documented during the Year 1 surveys was fairly consistent across seasons (Appendix C4a). Common raptor species such as the red-tailed hawk and sharp-shinned hawks and special-status raptor species may nest within or adjacent to the Project Site.

Activities associated with the construction and decommissioning of the Project could adversely affect nesting raptors directly or indirectly. Potential direct impacts include the physical removal of nesting habitat. The Project Site and Leasehold Area are currently managed for timber harvest, resulting in a patchwork of periodically cleared lands resulting in regularly changing nesting habitat conditions. Further, the Leasehold Area and surrounding forested landscape has an

abundance of both forested and open habitats for raptors, including goshawk and other forest raptors. In terms of Project related habitat loss, up to 4,464 acres of land would be cleared of vegetation for the construction of road corridors, electric collection system corridors, and turbine pad areas. Not all of these areas contain suitable raptor nesting habitat and the Project Site is not one large clearance area, but rather a patchwork of forested and open areas throughout the Leasehold Area. The habitat which would be permanently removed would not substantially reduce foraging, roosting, or nesting habitat for raptor populations and therefore, the effect of potential habitat losses to special-status raptors would be less than significant.

Additional direct impacts could include removal of or damage to an active nest from grading or the removal of trees or other vegetation. Potential indirect impacts on nesting raptors could occur if nesting activity is disrupted or abandoned, such as when adult attendance to eggs and young is negatively affected by visual or sound disturbances associated with construction activity.

Because of the abundance of suitable nesting habitat for raptors, it is anticipated that Project construction and decommissioning activities occurring during the nesting season would result in adverse direct and indirect impacts on nesting raptors. As this impact has the potential to disrupt annual nesting cycles for multiple raptors, the impact would be significant. However, it could be reduced to a less than significant level with the implementation of Mitigation Measure 3.4-6.

Mitigation Measure 3.4-6: Avoid and minimize construction-related impacts on nesting raptors (March 1 to August 15)

a) Where feasible, tree and vegetation removal activities shall be avoided in potential raptor nesting habitat during the avian nesting season (March 1–August 15) during each year of construction.
b) If construction is planned to occur during the avian nesting season from March 1–August 15, pre-construction raptor nesting surveys shall be conducted by a qualified biologist to identify raptor nests within 500 feet of proposed work areas. A qualified biologist is defined as a person who is knowledgeable in the distribution, habitat, life history, and identification of Northern California birds, is familiar with the survey methods to locate and survey for active nests within the Project Site and can acquire any permits needed to survey for federally listed or state-listed birds, if such permits become necessary.

c) Results of preconstruction raptor surveys will be reported to the Shasta County Department of Resource Management, Planning Division, USFWS, and CDFW by August 31 of the year in which the survey was conducted. The Shasta County Department of Resource Management, Planning Division shall, in coordination with resource agencies, determine whether or not the survey(s) were conducted in accordance with appropriate protocols and measure 3.4-6d is to be implemented. Construction shall not begin in the surveyed area until the Shasta County Department of Resource Management, Planning Division has confirmed that the survey(s) were conducted in accordance with appropriate protocols and, if necessary, that measure 3.4-6d has been implemented.

d) If active raptor nests are found during pre-construction surveys, a 500-foot exclusion zone shall be established around the nest in which no work would be allowed until the young have successfully fledged or nesting activity has ceased. The determination of fledging or cessation of nesting shall be made by a qualified biologist with

experience in monitoring raptor nests. Any sign of nest disturbances shall be reported to the Shasta County Department of Resource Management, CDFW and USFWS. In coordination with CDFW and/or USFWS, the County may modify the size of the exclusion zone depending on the raptor species and type of construction activity occurring near the nest.

Significance after Mitigation: Implementing the above mitigation measure would reduce the impacts of direct tree and vegetation removal, construction noise and disturbance on nesting raptors that could adversely affect nesting success. These avoidance and minimization measures would reduce this this impact to less than significant.

Impact 3.4-7: Construction and decommissioning of the Project could result in adverse impacts to nesting goshawks. (*Less than Significant with Mitigation Incorporated*)

Northern goshawk is moderately likely to occur within the Project Site; three were observed during avian surveys (Appendix C4). Construction would take place in areas of high quality goshawk nesting habitat and historic northern goshawk occurrence. Mature, dense forest stands with large trees and with an open understory are preferred by goshawks for nesting. Human activities near goshawk nests can cause failure, especially during the incubation period. However, because the area is regularly logged, the likelihood that northern goshawks nest within the Project Site is relatively low. However, if present and nesting, disturbance of nesting for up to two consecutive years, could adversely affect goshawk populations due to the small number of goshawk present in the region. Therefore, impacts on northern goshawk resulting from construction activities in or near active nests would be significant. Nesting goshawks are more difficult to locate than other raptors. Consequently, specialized survey methods are required. Potential impacts on nesting goshawks would be reduced to a less than significant level by implementing Mitigation Measures 3.4-7a and 3.4-7b

Mitigation Measure 3.4-7a: Implement Mitigation Measure 3.4-6: Avoid and minimize construction-related impacts on nesting raptors (March 1 to August 15)

Mitigation Measure 3.4-7b: Avoid and minimize construction-related impacts to nesting goshawks (March 1 to August 15)

a) Prior to any disturbance of forest habitats that fit the nesting criteria of northern goshawks, the Applicant will conduct acoustic surveys for northern goshawk during their nesting season (March 1–August 31) following methods outlined by Woodbridge and Hargis (2006) to assure species is not nesting or using the territory for nesting. If nesting goshawks are found, the nests would be avoided with a suitable buffer distance (minimum 500 feet) in coordination with CDFW.

b) Results of preconstruction goshawk surveys will be reported to the Shasta County Department of Resource Management, Planning Division and CDFW. The Shasta County Department of Resource Management, Planning Division shall, in coordination with resource agencies, determine whether or not the survey(s) were conducted in accordance with appropriate protocols. Construction shall not begin in the surveyed area until the Shasta County Department of Resource Management,

Planning Division has confirmed that the survey(s) were conducted in accordance with appropriate protocols.

Significance after Mitigation: Less than significant.

Impact 3.4-8: Operation of the Project could result in mortality and injury to raptors (including goshawk), as a result of collisions with wind turbines and electrical transmission lines. (*Significant and Unavoidable*)

The Project includes turbine design elements to reduce collision hazards for avian species, such as adherence to APLIC powerline design guidelines, approved tower lighting, and the absence of guy wires. However, the use of such elements does not eliminate the risk of turbine collision during operation. For raptors that are either resident or migrate through the Project Site, operation of the Project could result in direct impacts to this group through injury or mortality if they were to collide with wind turbines. Two years of avian surveys identified no obvious areas of concentrated use or flight corridors by eagles or other diurnal raptors within the Project Site (Appendix C4b) in any season. Topography can significantly influence the migration of raptors where major ridgelines creating lift are often followed by birds, or the shorelines of large bodies of water are also often followed, since both features can provide navigational guidance to migrating raptors (Appendix C4b). Although raptors do migrate through the Project Site, the topography of the sites consists of rolling hills with a lack of large waterbodies or river corridors that would act to concentrate raptors within the Project Site during migration. Hence, the overall risk of raptor collision with turbines is considered moderate, relative to areas where avian species concentrate.

During operations, risk may be low to northern goshawks, because of the small goshawk population in the area, limiting the potential for injury and mortality from transmission lines (collision and electrocution) and wind turbines (collision) that have been recorded elsewhere (Birdlife International, 2015). Because northern goshawks are less common within the Project Site (Appendix C8) and locally (Tetra Tech, 2013) and have had no mortality recorded due to wind turbines in California, there is little projected Project risk to this species during operations and impacts would be less than significant.

A detailed Project risk analysis to migrating or resident raptors is provided in Appendix C4b. Because of the close proximity of the Hatchet Ridge Wind Project, and the similarity of raptor species and vegetation located at the Project Site, data (including 3 years of post-construction raptor fatality surveys) from Hatchet Ridge project site is considered a reliable source of information to assess the likelihood of raptor collision risk at this Project Site. During Year 1 of fatality monitoring at Hatchet Ridge, the estimated annual fatality rate for raptors was 0.06 per wind turbine per year. During the second and third year, raptor fatality rates could not be calculated due to low sample sizes, with only eight diurnal raptor fatalities documented over three years. These included four red-tailed hawks, two sharp-shinned hawks, and one Cooper's hawk, which are the three most common raptors also observed in the proposed Project Site; and one turkey vulture (Tetra Tech 2014). In a comparison of the composition of diurnal raptor species recorded at the Project Site from April 2017 through May 2018 and the Hatchet Ridge project site

from November 2010 to December 2013, the analysis found raptor use was similar between sites, with slightly higher red-tailed hawk and sharp-shinned hawk use found at the Project Site and slightly higher American kestrel and bald eagle use found at Hatchet Ridge project site (Appendix C4a; Tetra Tech 2014). The Project turbines are taller and have a larger rotor-swept area, compared to the Hatchet Ridge project, which would incrementally increase collision risk. The Project-specific study concluded, based on the results of pre- and post-construction studies at Hatchet Ridge and avian use surveys conducted at the Fountain Wind Project Site, that diurnal raptor fatality rates at the Project Site would be similar or slightly higher than those at the Hatchet Ridge project site (Appendix C4a).

Based on the three years of raptor fatality data from the adjacent Hatchet Ridge Wind project, and lower estimates of raptor fatalities from other studies assessed by Tetra Tech, it is likely the proposed Project would result in raptor mortality, between 4.3 and 53 raptors per year.

Because raptors have large home ranges, and thus have low population densities, but have lower reproductive rates due to their longer longevity, operational impacts on raptors would be significant, particularly for special-status species expected to occur regularly on the Project Site such as the Cooper's hawk and sharp-shinned hawk.

> **Mitigation Measure 3.4-8:** Implement Mitigation Measure 3.4-3b (Monitor avian and bat mortality rates during project operations).
>
> **Significance after mitigation:** Implementation of Mitigation Measure 3.4-3b would offset the impacts of Project operations on resident and migratory raptors by documenting any moralities and including operational modifications such as curtailment of turbine speed, ultrasonic deterrence systems or other mitigation to minimize raptor fatalities. However, due to the uncertainty associated with these estimates and the potential for mortality rates projected up to 53 raptors per year, this impact is considered significant and unavoidable. Implementing the above-identified mitigation measures would reduce operations-related impacts to the maximum extent practicable.

Other Resident and Migratory Birds

Waterfowl

Impact 3.4-9: Operation of the proposed project could result in mortality and injury to waterfowl as a result of collisions with wind turbines and electrical transmission lines. (*Less than Significant Impact*)

The majority of waterfowl observations (about 78 percent in Year 1 surveys) comprised three species: snow goose, greater white-fronted goose, and Canada goose, all of which are abundant species in the Pacific flyway (Appendix C4a). An analysis of collision risk to birds using the first year of avian data collected within the Project Site was conducted (Appendix C4a). During Years 1 and 2 of the avian surveys at the Project Site, the majority (97.1 percent and 99 percent, respectively) of waterfowl observations were recorded flying above the estimated rotor swept height of the wind turbines and therefore would not be at high risk of colliding with the Project

turbines. At Hatchet Ridge, waterfowl comprised up to 50 percent of bird mortality, primarily attributed to species making localized movements under high wind and/or low visibility conditions which may cause the birds to fly at a lower altitude and encounter turbines (Tetra Tech 2014). Nonetheless, the overall rate of waterfowl mortality at Hatchet Ridge was still comparatively low for the region and nationally, ranging from 0.27 to 0.39 birds/MW/year (Tetra Tech 2014). In addition, because the Project Site, like Hatchet Ridge, is heavily forested, waterfowl would likely fly at a higher altitude over the trees, and it does not appear that waterfowl or waterbirds use the area as migratory stop-over sites.

In the same avian risk of collision review, waterbirds, including the American white pelican, did not appear to be particularly susceptible to collision with wind turbines. In addition, suitable breeding and stopover habitat for American white pelican is also absent from the Project Site. From Project Site-specific studies (Appendix C4a), it can be concluded that the majority of waterbirds, including the American white pelican, would fly well above the rotor swept height and height of electrical transmission lines within the Project Site. Based on observed species use of the site and review of species habitats, the potential risk of substantial waterfowl mortality is considered low. Because the level of waterfowl collision related injury or mortality is not anticipated to occur at levels which would adversely affect population levels, operational impacts on waterfowl and waterbirds would be less than significant.

Mitigation: None required.

Sandhill Crane

Impact 3.4-10: Construction, operation, and decommissioning of the Project could have potential significant impacts on sandhill cranes during migratory movements in fall and spring, and could result in mortality of and injury to sandhill cranes. (*Less than Significant Impact*)

If present, sandhill cranes at the Project Site during construction and operation could be impacted predominantly during the fall and winter, as well as potentially in the spring when large flocks of birds travel through the vicinity via the North Pacific Flyway on migration. The probability of collision of greater sandhill cranes with powerlines, utility poles, wind turbines, turbine towers, and met station towers during construction and operation of these facilities would increase when: a) flocks are large, b) visibility is hampered, c) wind speeds are excessive, and d) flight occurs at night. Further, the timing of migration late in the fall season and well into winter increases the probability of birds encountering unfavorable weather such as low cloud ceiling, storm winds, or fog over the ridge. There are no available data on the behavior of birds under poor visibility conditions at the Project's ridgetops.

A review of known sandhill crane interactions with wind turbines suggest sandhill crane collisions with wind turbines are rare. (Appendix C4). Wind farms located in local flight routes between foraging and roosting areas present a greater risk to the sandhill crane, particularly during inclement weather conditions, as both factors produce lower elevation flights (Navarrete and Griffis-Kyle 2014). The relative risk to sandhill crane is considered low because the Project

Site is not located within a daily flight route and migrating cranes are known fly at high altitudes (e.g., 3,000 to 5,000 feet above ground) that are generally above the height of proposed facilities (Johnsgard, 2015). Although, injury and fatality could occur to migrating cranes during operation of the turbines, the nearby Hatchet Ridge Wind Project monitored avian fatalities for the first three years of operation and zero sandhill crane mortalities were observed (Tetra Tech, 2014).

Sandhill crane injury or mortality from collision with turbine towers, turbines, and METs could occur during construction of these facilities, especially during migration periods when most crane traffic occurs. Low-light and poor visibility conditions may be particularly hazardous to migrating cranes and increase the probability of collision with unlit structures. Collisions may also occur as a result of crane interactions with ridgetop power lines.

The use of Federal Communication Commission-required lighting on towers during crane migratory periods would increase tower visibility to birds and potentially reduce collisions with towers and turbines during operations. Maintenance and upkeep of the Project facilities during operation is not likely to impact sandhill cranes, because the Project Site does not support suitable stopover or foraging habitat, therefore the species would not be exposed to maintenance activities. Because the likelihood of collision risk would be low, incidental injury or mortality of migrating sandhill cranes would not occur at a level which would result in a decline of sandhill crane populations. Therefore, operating impacts on sandhill cranes would be less than significant.

Although operational impacts would be less than significant, there is a remaining very low risk of collisions occurring if species use of the area increases from observed levels. In an effort to further reduce potential effects on sandhill cranes, the County may elect to include additional conservation measures as a condition of permit approval. Recommended measures include:

> **Sandhill Crane Conservation Measures:** Modify EIR Mitigation Measures 3.4-3a (Avoid and minimize operational impacts on avian and bat species) and 3.4-3b (Monitor avian and bat mortality rates during Project operations) to include sandhill crane. This would offset the impacts of Project operations on sandhill cranes by documenting any mortalities of cranes and implementing operational changes to reduce mortality.
>
> In addition, inclusion of the following conservation measure as a condition of approval would further reduce operational-related impacts to sandhill cranes.
>
> **Sandhill Crane Conservation Measure: Minimize operational impacts to Sandhill cranes by timing the construction of tower and turbine installations, and by putting avian deflectors on ridgetop powerlines.**
>
> 1) Time the installation of METs, turbine towers, and turbine blades so that no tall structures are erected to final heights and left unlit through the fall migration period of sandhill cranes (September through November).
>
> 2) Where mountain top construction of new transmission lines could pose hazards to cranes, efforts would be made to use highly visible markers to aide in bird avoidance of lines. For sandhill cranes, it is expected that most or all collisions with powerlines would take place at night, in low light condition or in inclement weather like fog,

heavy rains, and high winds. Using UV lighting, glow-in-the-dark tape, or bird deflection devices with short gaps between devices would limit risk of collision.

Nesting Songbirds

Impact 3.4-11: Construction and decommissioning of the Project could result in adverse impacts to nesting songbirds, potentially including special-status species. (*Less than Significant Impact*)

Of the 78 species of small birds recorded in the study area, the most common songbirds included dark-eyed junco, mountain chickadee, western bluebird and Steller's jay, with woodpeckers also common. Songbird use in both years of avian surveys was relatively consistent across all seasons and areas surveyed (Appendix C4a, Appendix C4b). The results of avian surveys further suggest that there is no specialized use of nesting habitats by resident small birds. As shown in Table 3.4-3, five special-status songbird species were identified as having a high potential to occur, including Vaux's swift, olive-sided flycatcher, Cassin's finch, Lewis' woodpecker, and yellow warbler. One additional species, willow flycatcher, a state-endangered species was also identified but with a low potential to occur on the Project Site.

Most Songbirds, including special-status species Olive-sided flycatcher, Cassin's finch, and Lewis' woodpecker

Activities associated with the construction, operation, and decommissioning of the Project could potentially adversely affect nesting songbirds, including the special-status species, directly or indirectly. Potential direct impacts to nesting songbirds protected by the Migratory Bird Treaty Act include the physical removal of nesting habitat or the direct removal or damage to an active nest from the grading or the removal of trees or other vegetation that might provide a nesting substrate. Direct impacts to birds include injury, mortality, nest destruction or disturbance resulting in nest abandonment. Potential indirect impacts on nesting song birds could occur if nesting activity or adult care of eggs and young is negatively affected by visual or sound disturbances associated with construction activity. The majority of songbird species using the Project Site including special-status species, olive-sided flycatcher, Cassin's finch, and Lewis' woodpecker do not require hard to find specialized nesting habitat. The removal of nesting habitat within the Project Site and potential nesting disruption due to construction noise are not anticipated to adversely affect songbird species populations. Because the potential effect on any individual songbird species population would not be substantial, the impact on most songbird species including olive-sided flycatcher, Cassin's finch, and Lewis' woodpecker from construction and operation of the project would be less than significant.

Although the impact on nesting songbirds is less than significant, the County may elect to include additional conservation measures as a condition of permit approval to further reduce potential adverse impacts on nesting songbirds.

> **Conservation Measure for Nesting Songbirds:** Avoid and minimize construction-related impacts to nesting songbirds

> Prior to any disturbance of nesting habitat during breeding season (March 1 to August 15), a qualified biologist will survey the area to be impacted to locate any active bird nests. Active nests will be avoided by a suitable buffer distance (e.g., 100 to 250 feet).

Three special-status passerine birds, Vaux's swift, yellow warbler, and willow flycatcher, may occur in the Project Site and have specialized habitat requirements that may be directly impacted by the construction and decommissioning of the Project.

Vaux's swift

Vaux's swifts use communal roosts, typically mature conifers with large top or side cavities year-round, including during nesting and migratory periods. Direct removal of active communal roost trees during the nesting season could result in the temporary displacement of hundreds of individuals. However, the existing use of the Leasehold Area for timber management likely precludes the existence of large trees with suitable roosting cavities, and no communal roosts were identified in the Project Site during the avian surveys (Appendix C4). As a result, the likelihood of a communal roost being affected by vegetation clearing or other construction activities is low. The potential impact on nesting Vaux's swift is less than significant.

Although the impact on Vaux's swift from Project construction, operation and decommissioning is less than significant, if communal roosts, previously undetected are present and active impacts could occur. To further reduce the potential for adverse impacts, the County may include additional conservations as a condition of permit approval. Recommended measures include:

> **Conservation Measure for Vaux's Swift:** To minimize direct and indirect impacts on Vaux's swift, a pre-construction habitat assessment shall be conducted to determine the location of potential roost sites used by this species in the Project Site, as follows:
>
> 1. Conduct a habitat assessment for potential Vaux's swift roost sites: Habitat assessment shall be completed prior to removing or altering any trees, snags, or structures that could potentially provide roosting habitat for Vaux's swift. An assessment of such habitat will take place during the spring and fall roosting seasons. The assessment shall be conducted by an experienced and qualified biologist who is able to identify potential Vaux's swift roosts and nest trees. Emphasis will be on large, live and dead trees with exposed hollowed cavities in tree trunks.
>
> 2. Reduce any temporary impacts to roost sites during construction and decommissioning. Assess any trees (and structures during decommissioning) located within a minimum 200-foot buffer area from construction disturbance areas. In general, the buffer area will cover all habitat within the line of sight from the edge of the disturbance area and may be adjusted and expanded as necessary by a qualified biologist, depending on the severity of planned disturbance. Impact minimization measures may include:
>
>   a. Delaying work in a buffer area until swifts would be absent from their roost, or present but in low numbers.
>
>   b. Employing the use of sound or vision barriers between the active roost and the temporary disturbance activity.

c. Initiating any disturbance prior to a sensitive season and continuing into the following sensitive season so that Vaux's swift can avoid establishing a roost in the area of disturbance or can become desensitized to the disturbance prior to a sensitive season.

d. As an alternative to implementing the above listed measures, all highly suitable roost habitat may be surveyed and assessed, and the qualified biologist can make the determination that survey approaches and results are sufficient to indicate an absence of roosting Vaux's swift in the Project Site.

Yellow Warbler and Willow Flycatcher

The yellow warbler is a migratory species in northern California, with presence in the region during the spring and fall. Throughout its range, the yellow warbler is found exclusively in riparian habitats (Lowther et al., 1999). Riparian habitat in the study area is limited and, within the Project Site, 115.2 acres of riparian habitat may be directly impacted by the Project. As a riparian obligate, the loss of riparian habitat could adversely affect migratory populations of yellow warbler. However, because there is an abundance of riparian habitat in the region, the loss of 115.2 acres of riparian habitat would not result in a decline in yellow warbler populations. Migrating yellow warblers could be also deterred from using habitat within and adjacent to the Project Site by noise and disturbance associated with Project construction and decommissioning, and by collision during Project operation. The number of injuries and mortalities resulting from collisions would not result in a substantial reduction in the population of yellow warbler in the region, and would therefore be less than significant.

No active willow flycatcher breeding populations are specifically known to occur on the Project Site based on the results of protocol-level surveys for willow flycatcher conducted on the Project Site (Appendix C12). However, willow flycatchers may fly over the Project Site during migration and may use available patches of riparian/wetland and meadow habitat as stopover habitat in spring and fall (Appendix C12). As stated above up to 115.2 acres of riparian habitat may be removed or otherwise altered as part of Project construction. Migrating flycatchers could be impacted by noise and disturbance associated with Project construction and decommissioning, and by collision during operation. Due to the lack of breeding populations within the Project Site, and the low potential for willow flycatcher to occur, impacts on willow flycatcher from construction, operation and decommissioning of the Project would be less than significant.

Although, Project impacts on yellow warbler and willow flycatcher would be less than significant, adverse effects would occur. To further reduce the potential for and level of adverse impacts, the County may include additional conservations as a condition of permit approval. Recommended measures include:

Conservation Measure for Willow Flycatcher and Yellow Warbler: The following measures to avoid and minimize the removal and fragmentation of suitable habitat for the willow flycatcher. This measure also would protect yellow warblers, which also use riparian habitat.

1) Using the willow flycatcher habitat model developed by CDFW (Timossi et al., 1995) and using a biologist knowledgeable about willow flycatcher habitat to

examine aerial imagery of the Project Site, map areas of suitable habitat within the final boundaries of the Project Site and ground-truth the presence and quality of this habitat. This information would be used by the Applicant to modify road construction and other plans, if necessary, to minimize the removal or degradation of willow flycatcher habitat. Upon completion of construction, the Applicant will submit to the Shasta County Department of Resource Management Planning Division, CDFW, and USFWS a report detailing the results of these minimization efforts, and shall provide a summary of acreages of breeding and foraging habitat that were temporarily or permanently affected by construction.

2) For all willow flycatcher habitat identified to be impacted within the final Project Site, conduct pre-construction protocol surveys during the breeding season (June 15 to August 15) using the most recent CDFW survey guidelines (Bombay et al., 2003). Survey results will be provided to the Shasta County Department of Resource Management Planning Division and CDFW. If additional areas of potentially suitable habitat than those already surveyed will not be directly impacted during Project construction, then no further willow flycatcher surveys will be required.

   If nesting willow flycatchers or yellow warblers are found, coordinate with CDFW to protect these sites and buffer them from disturbance using a 250-foot exclusion zone (or width recommended by CDFW/USFWS depending on disturbance type) around the habitat or any nest sites found. Within this zone, no work will be allowed until the young have successfully fledged or nesting activity has ceased. The determination of fledging or completion of nesting shall be made by a qualified biologist with experience in nest searching and monitoring for willow flycatchers, in coordination with CDFW. Any active nest sites shall be monitored periodically throughout the nesting season to identify any sign of disturbance and to document nest status.

Pit Roach, Amphibians and Western Pond Turtle

Impact 3.4-12: Site preparation and construction, operations and maintenance, and decommissioning and site restoration of the Project could result in habitat loss and water quality impacts on Pit roach, special-status amphibians and western pond turtle. (*Less than Significant with Mitigation Incorporated*)

The site preparation and construction, operations and maintenance, and decommissioning phases of the Project have potential to cause temporary indirect and direct, and permanent indirect adverse impacts to aquatic and semi-aquatic species within the Project Site. Approximately 38 acres of wetlands and waters were identified on the Project Site (Table 3.4-2). These wetland and other waters habitats may be occupied by aquatic and semi-aquatic (also use upland habitat) species. Although Project development would not impact all of wetlands and waters in the Project Site, some of these habitats would be removed or disturbed. Impacts on wetland and other aquatic habitats are discussed below under Impact 3.4-16. Briefly, permanent impacts to wetlands and other waters would occur on 2.22 acres of wetlands and 1.2 acres of other waters. These impact acreages represent 8 percent of the wetlands and 11 percent of other waters mapped in the aquatic resources survey (Table 3.4-2, Appendix C2), which covered a larger survey area than the Project Site. Temporary impacts would occur on 1.48 acres of wetlands and 0.64 acre of other waters.

The removal or disturbance of wetlands and other waters would reduce available habitat for aquatic and semi-aquatic species in the Project Site. Because of the relatively small amount of habitat present, this could result in an adverse effect on local pit-roach, amphibian and western pond turtle populations, which would be considered a significant impact. This impact could be reduced to a less than significant level, with the implementation of habitat and water quality protective and restoration measures, and with a minimum of 1:1 compensation for permanently removed habitat. Implementation of Mitigation Measures 3.4-16 a, b and c, as described under Impact 3.4-16, would reduce these impacts to a less than significant level.

During construction, there is a low likelihood that semi-aquatic species using upland habitat could also suffer injury or mortality from increased vehicle traffic (compared to current timber harvest activities) and ground disturbing activities. Operational vehicle traffic is expected to be similar or less than current conditions and would not result in increased impacts on semi-aquatic species. Increased injury and mortality of special-status amphibians and western pond turtle during construction is not expected to affect species populations, which are concentrated near aquatic habitat and would be less than significant. The County may elect to include additional measures as conditions of permit approval to further protect semi-aquatic species from temporary construction related impacts. Implementation of the Terrestrial Species Conservation Measure discussed under Impact 3.4-14 would reduce potential impacts on semi-aquatic species including sensitive amphibians and western pond turtle within upland areas.

Additionally, Clearing, grading, and other soil disturbances during construction have the potential to increase erosion from the Project Site into aquatic habitats, which could result in temporary indirect adverse impacts to aquatic species. Indirect impacts may include temporary increases in turbidity of surface waters and transport of other pollutants such as oil from machinery into aquatic habitats. These direct adverse impacts to water quality may have temporary indirect adverse impacts on aquatic species. Unless mitigated, these impacts could reduce local aquatic and semi-aquatic species populations, which would be considered significant. Effects from degraded water quality could be reduced by using erosion control, pollution control, and wetland and waters protective measures. Implementation of Mitigation Measures 3.4-12 would reduce this potential impact to less than significant by avoiding and minimizing impacts on habitat for aquatic and semi-aquatic species.

> **Mitigation Measure 3.4-12:** Implement Mitigation Measure 3.12-1 (Water Quality Best Management Practices during Activities in and near Water) and Mitigation Measure 3.4-16b (Avoid or Minimize Impacts to Wetlands and Other Waters)
>
> **Significance after Mitigation:** Implementing these mitigation measures would reduce the potential water quality impacts of the Project on wildlife by partial avoidance of and compensation for the removal of wetland and other waters habitat. The mitigation measures would also minimize adverse impacts from erosion or other pollution on water quality of Project Site surface waters to less than significant. The recommended Terrestrial Species Conservation Measure would further reduce the less than significant Project impacts to Pit roach, special-status amphibians and western pond turtle.

Bats

Impact 3.4-13: Operation and maintenance of the Project could result in direct mortality and injury to bats, including special-status species. (*Significant and Unavoidable)*

Bats have low reproductive rates and require high adult survivorship to avoid population decline (Thompson et al. 2017). Operation of the Project poses a risk of direct injury and mortality to bats, including special-status species, as a result of wind turbine operation in areas where the flight altitudes of foraging, migrating, and transiting bats coincides with the height of wind turbine blades. Based on the 3-year monitoring completed for the Hatchet Ridge Wind Project (Tetra Tech, 2014) and the Project-specific bat acoustic survey report (Appendix C6), the likelihood of injury risk is considered low for special-status bat species, but risk is higher for other bat species such as hoary bat. Recent mortality estimates (Arnett and Baerwald 2013) and models (Frick et al. 2017), have identified potential population-level effects from wind operations on particular bat species, including hoary bat. Surveys confirm hoary bat as one of the most common species on the Project Site (Appendix C6) and surveys at the Hatchet Ridge wind facility confirm that hoary bat are particularly vulnerable to wind operations in the region (Tetra Tech 2014). Based on this date it is anticipated the operation of the Project would result in adverse effects on bats, potentially affecting bat populations. As a result, the injury and mortality of bats resulting from Project collisions with turbines would result in a significant effect.

Maintenance of the Project would be unlikely to result in a significant adverse impact to bat species, unless unforeseen circumstances arise, for example, if repair work is conducted at night under artificial lighting that attracts flying insects.

To monitor any adverse effects to bats, including special-status species, the Project shall implement Mitigation Measure 3.4-13, which would document and report bat mortalities from the Project, identify appropriate mortality minimization measures, and implement all recommended minimization measures to reduce mortality. Implementing this measure would reduce operational impacts on bats, but impacts would remain significant and unavoidable.

> **Mitigation Measure 3.4-13:** Implement Mitigation Measure 3.4-3b (Monitor Avian and Bat Mortality Rates During Project Operations.
>
> **Significance after Mitigation:** Implementing Mitigation Measures 3.4-13 would allow the identification of potentially hazardous towers to bat species, if present, which would facilitate adaptive management approaches such as curtailment and deterrence to deter bats if, as a result of post-construction monitoring, it is determined that multiple individuals of a particular bat species are being injured or killed by collisions with turbines consistent with the thresholds identified in Mitigation Measure 3.4-3b. Though implementation of this measure would reduce impacts on bat species, impacts on bats would remain significant and unavoidable.

Terrestrial Mammals

Impact 3.4-14: Site Preparation and Construction and Decommissioning and Site Restoration of the Project could result in temporary adverse impacts to special-status mammals. (*Less than Significant Impact)*

Site preparation and construction may result in temporary adverse impacts to special-status mammals including the Oregon snowshoe hare and the Pacific fisher through injury or death to individual animals from interactions with construction equipment; entrapment in open holes or trenches; removing access to cover, forage or water; or through temporary disturbance to or permanent loss of habitat. Construction activity could interfere with normal foraging, breeding, dispersal, and other typical behaviors, particularly from noise, activity, as well as attractants such as food-related trash. Although construction would result in disturbance, because the site is currently active timber managed lands, large truck traffic and vegetation clearing already occurs. The Project would increase the level of activity during construction but is not likely to result in an adverse effect on special-status mammal populations given the abundance of similar habitat available in the region and Project vicinity. Therefore, the impact on special-status terrestrial mammals would be less than significant.

When completed, only substation, switchyard, and operations facilities would be fenced; therefore, movement through the landscape is not expected to be significantly impacted for terrestrial mammals and impacts from operations are expected to be less than significant with no mitigation required.

Although the impacts on special-status terrestrial mammals would be less than significant, the County may elect to include additional measures as conditions of permit approval to further reduce adverse effects. Suggested conservation measures which would provide best management practices to reduce Project-related impacts to terrestrial mammals include:

> **Terrestrial Species Conservation Measure: Avoid and minimize impacts to terrestrial special-status species.**
>
> The Applicant will implement the following measures to minimize and monitor impacts during both construction and decommissioning phases:
>
> a) Applicant will design and implement a plan for workers encountering injured or dead special-status terrestrial species during construction, to include a stop-work order within 50 feet, notification of a qualified biologist, and notification of CDFW and/or USFWS as appropriate.
>
> b) All personnel on-site (i.e., employees, contractors, inspectors, and visitors) will check for presence of wildlife under or in equipment before operating. Wildlife found underneath or within vehicles or equipment will be allowed to leave voluntarily or removed by a biological monitor if it is safe to do so. State or federally listed species will not be handled and USFWS and/or CDFW will be contacted.
>
> c) All excavations will be backfilled, sloped at a 3:1 ratio, covered completely to prevent wildlife access, or fully enclosed with exclusion fencing at the end of each workday. If an animal is found entrapped, construction will be delayed until it has left the excavation or been removed by a qualified biological monitor if it is safe to do so.

d) Natural water sources will remain unfenced in order to provide access for terrestrial and semi-aquatic wildlife.

e) All food-related trash will be contained in secured, wildlife-proof containers to prevent attracting wildlife to work areas.

f) Vehicle speeds will not exceed 15 miles per hour during all phases of the Project; speed limit signs will be posted at all entry points and throughout the Project Site.

g) High-intensity lighting will be minimized to the level needed for worker safety.

h) Nighttime vehicle traffic will be minimized.

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b) Whether the Project would have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS.

Rocky Mountain Maple Riparian Scrub

Impact 3.4-15: Site preparation and construction, operations and maintenance, and decommissioning and site restoration of the Project would result in adverse impacts to riparian habitat or other sensitive vegetation communities. (*Less than Significant with Mitigation Incorporated*)

Site preparation and construction activities occurring within the Rocky Mountain Maple Riparian Scrub sensitive natural community, which also describes most riparian habitat mapped in the Project Site (107.2 acres), would result in a direct impact through the removal of vegetation. Construction activities would include clearing and grubbing, topsoil stripping, grading, compaction, utility trenching and placement of aggregate surfacing. Grading would include removal, storage and disposal of soil, gravel, vegetation, organic matter, loose rock and debris. Although the exact footprint of vegetation removal may not encompass the entire Project Site, the potential loss of over 100 acres of sensitive Rocky Mountain Maple Riparian Scrub would be significant due to both the acreage loss and the fracturing of the community through the creation of cleared areas (i.e. roads).

Ongoing operations and maintenance impacts to sensitive vegetation communities and riparian habitats could occur through edge effect degradation or introduction of weeds. With an anticipated operational lifespan of 40 years, Project-caused changes to the riparian habitats and sensitive natural communities may therefore occur over time from these indirect permanent effects. It is unlikely that edge effect degradation would result in a substantial reduction in the Rocky Mountain Maple Riparian Scrub community. Therefore, the impacts on sensitive vegetation communities from operation and maintenance activities would be less than significant.

Project decommissioning and site reclamation would include restoration of the site to pre-construction conditions. This would include the restoration of lost Rocky Mountain Maple Riparian Scrub and rehabilitation of adjacent areas that were affected by edge effect disturbance or introduction of weeds. Therefore, impacts associated with decommissioning and restoration activities would be beneficial to sensitive vegetation communities.

To avoid potential significant impacts of construction, specifically the removal of up to 107.2 acres of Rocky Mountain Maple Riparian Scrub habitat or other sensitive vegetation communities, implementation of Mitigation Measures 3.4- 15a and b would be required.

Mitigation Measure 3.4-15a: To minimize the amount of riparian vegetation removed during construction. Implement Mitigation Measure 3.4-16b for wetlands (Avoid and minimize impacts to wetland and other waters).

Mitigation Measure 3.4-15b: Compensate for Impacts to Rocky Mountain Maple Riparian Scrub Habitat.

The Applicant shall implement a Reclamation and Revegetation Plan that includes detailed measures for the compensation, restoration, and/or enhancement of Rocky Mountain Maple Riparian Scrub Habitat on a per-acre basis. The standard for mitigation shall be no net loss. If restoration is selected as a method of compensatory mitigation, the Applicant shall prepare a riparian mitigation and monitoring plan as part of the Project's reclamation and revegetation plan and shall submit it to the County for review, determination of adequacy, and approval. Mitigation ratios shall be at a1:1 level.

The Rocky Mountain Maple Riparian Scrub Habitat mitigation and monitoring plan shall be written by a qualified biologist and shall include the following elements, at minimum:

a) goals of the plan and permitting requirements satisfied;

b) Riparian habitat restoration activities and locations, including the restoration of temporarily affected riparian habitat to preconstruction conditions;

c) monitoring and reporting requirements (including monitoring period), and criteria to measure mitigation success; and

d) remedial measures, should mitigation efforts fall short of established targets.

The County may consult with CDFW about the adequacy of the plan and may consult with other agencies, if the plan aims to fulfill multiple permitting and mitigation requirements.

Significance after Mitigation: With implementation of these mitigation measures, impacts on sensitive vegetation communities and riparian habitat would either be avoided, minimized or impacts would be compensated at a 1:1 or greater ratio, consistent with any resource agency commitments discussed in Mitigation Measure 3.4-15b Waters). Therefore, following mitigation, this impact would be less than significant.

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c) Whether the Project would have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

Impact 3.4-16: Site preparation and construction, operations and maintenance, and decommissioning and site restoration of the Project could result in adverse impacts to wetlands and other waters. (*Less than Significant with Mitigation Incorporated)*

Project site preparation and construction would result in both temporary and permanent direct impacts to wetlands and other waters subject to federal and State jurisdiction under Sections 401 and 404 of the Clean Water Act. Therefore, implementing the Project would require a Clean Water Act Section 404 permit from USACE and a Water Quality Certification from the Central Valley RWQCB. Wetlands that meet USACE criteria for hydrology, hydric soils, and hydric vegetation as mapped for purposes of the Project (Appendix C2) are subject to USACE jurisdiction These and other mapped features may be determined to be Waters of the United States (WOTUS) and/or waters of the State of California, and therefore subject to jurisdiction of the USACE and/or RWQCB.

Based on anticipated Project disturbance (Table 2-1), permanent impacts to wetlands and other waters would occur to 2.22 acres of wetlands and 1.2 acres of other waters. These impact acreages represent 8 percent of the wetlands and 11 percent of other waters mapped in the aquatic resources survey (Table 3.4-2; Appendix C2), which covered a larger survey area than the Project Site. The permanent removal or filling of 3.44 acres of wetlands and other waters would be considered a substantial adverse effect and therefore a significant impact. Temporary impacts would occur to 1.48 acres of wetlands and 0.64 acre of other waters. These direct impacts would occur from the ground-disturbing activities listed above and would be considered temporary in nature in areas where wetlands and other waters are not filled, and functions are not lost. Temporary impacts to wetlands would not permanently alter wetland hydrology (though soils or vegetation may be altered) and would only apply to wetlands in which restoration is deemed feasible prior to project implementation.

The Project would require road crossings at a total of 32 streams. Twenty-four new road crossings would be required, including 5 perennial streams, 12 ephemeral and intermittent streams and 7 non-vegetated ditches. Eight crossings would occur where there are existing roads and crossings, which may require improvement or replacement. These include 3 perennial streams and 5 ephemeral and intermittent streams. Construction of stream crossings (Figure 3.12-1 and Figures 3a and Figure 3b in Appendix C2) would temporarily affect water quality of other waters during construction and installation of culverts, which may result in erosion of bank soils into waterways, as well as potential spills of oils and other hazardous materials used with equipment. Following construction, permanent impacts would only be to the crossing itself.

Permanent impacts due to filling and grading from road construction activities would result in wetland functional loss, including loss of habitat functions, water quality functions, and hydrology functions. Construction or widening existing access roads, installing or replacing existing culverts, and placement of project staging areas would result in direct impacts to aquatic resources. Moreover, incidental leakage of hazardous materials (for example fuel and lubricants)

or erosion caused by construction activity may result in surface runoff and inputs of sediment and contaminants into aquatic resources. In addition to proposed direct impacts, indirect impacts to wetlands and other waters may include introduction of invasive species, upslope introduction of dust and other contaminants, and vehicle emissions associated with the construction and operation of the project. If hazardous materials or erosion occur and effect wetlands or other waters, the impacts would be significant.

The exact types and extent of impacts to aquatic resources would be determined upon completion of the final site plan as part of the Clean Water Act Section 404 permitting process.

The implementation of Mitigation Measure 3.16a, which would require the implementation of best management practices to minimize damage to waterways during construction, and Mitigation Measure 3.4-16b and 3.4-16c would reduce or compensate for impacts from loss and damage to wetlands and other waters to less than significant.

> **Mitigation Measure 3.4-16a:** Implement Mitigation Measure 3.12-1 (Water Quality Best Management Practices during Activities in and near Water)
>
> **Mitigation Measure 3.4-16b: Avoid and Minimize Impacts to Wetlands and Other Waters.**
>
> The Applicant will avoid and minimize impacts on wetlands and other waters by implementing the following mitigation measures:
>
> a) Avoid direct and indirect impacts to wetlands and streams in final siting and design to the maximum extent feasible.
>
> b) Design stream crossings, including culverts, to pass a 100-year event without increasing average flow velocity or bed/bank scour potential.
>
> c) Monitor stream crossings in burn areas seasonally and maintain culverts and drains, since burned areas may experience sediment and debris loads that could result in clogged or blocked culverts.
>
> d) The Applicant shall also submit a site plan showing all aquatic resources and appropriate regulatory buffers or setbacks to Shasta County.
>
> e) The Applicant shall assign a qualified wetland scientist to mark all aquatic resources associated with the final project site plan. Temporary high visibility fencing, and signage may be used to help protect these areas. The qualified wetland scientist would also identify corresponding setbacks to aquatic resources, as required by Project permits.
>
> f) On a continuous basis, a qualified wetland scientist or biological monitor shall be assigned to visually inspect aquatic resources, and surrounding areas, for evidence of hydrologic loss in aquatic areas.
>
> g) Develop a Spill Prevention, Control, and Countermeasures (SPCC) Plan to minimize adverse impacts to wetlands.

Mitigation Measure 3.4-16c: Compensate for Impacts to Wetlands and other Waters.

The Applicant shall implement a Reclamation and Revegetation Plan that includes detailed measures for the compensation, restoration, and/or enhancement of wetlands and other waters on a wetland type per-acre basis. The standard for mitigation shall be no net loss. If restoration is selected as a method of compensatory mitigation, the Applicant shall prepare a wetland mitigation and monitoring plan as part of the Project's reclamation and revegetation plan and shall submit it to the County for review, determination of adequacy, and approval. Mitigation ratios shall be calculated following USACE wetland mitigation procedures and shall be based on the actual impact acreage of final design per as-built construction drawings and the results of the preconstruction surveys. After review and approval by the County and pertinent regulatory agencies, mitigation shall be carried out at a ratio no less than 1:1, or another ratio approved by the appropriate jurisdictional agency, whichever is higher.

The wetland mitigation and monitoring plan shall be written by a qualified biologist and shall include the following elements, at minimum:

a) goals of the plan and permitting requirements satisfied;

b) wetland restoration activities and locations, including the restoration of temporarily affected wetlands and other waters to preconstruction conditions;

c) monitoring and reporting requirements (including monitoring period), and criteria to measure mitigation success; and

d) remedial measures, should mitigation efforts fall short of established targets.

The County may consult with USACE about the adequacy of the plan and may consult with other agencies, if the plan aims to fulfill multiple permitting and mitigation requirements.

Significance after Mitigation: Implementing these mitigation measures would reduce the potential impacts of the Project on wetlands and other waters to less than significant because impacts on these resources either would be avoided or would be compensated for at a ratio of 1:1 or higher, as directed by the appropriate jurisdictional agencies. A 1:1 ratio would be adequate to achieve a no-net-loss scenario if the following mitigation measures are adhered to and wetland revegetation efforts are successful after the monitoring period. The mitigation measures would reduce construction-related impacts of the Project on wetlands and other waters to less than significant.

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d) Whether the Project would interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

Impact 3.4-17: Site preparation and construction, operations and maintenance, and decommissioning and site restoration of the Project would not result in adverse impacts to movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. (*Less than Significant Impact*)

Although the Project Site is privately owned and managed for timber production, the forested area of the site likely helps connect older forest habitats of the Lassen and Shasta Trinity national

forests at a landscape-level. However, in desktop review of the Project Site (Appendix C1), and in conducting 2 years of a variety of wildlife surveys within the Project Site, no evidence of any significant movement corridor for wildlife species was documented (Appendix C10).

Suitable deer fawning habitat is present on the Project Site and includes dense forests and shrublands, including riparian and mountain habitats, with abundant forage and water nearby. Disturbance to deer fawning habitat and mammal travel corridors could occur during construction activities, depending on the time of year that activities occur. Although development of the Project is not expected to exceed levels of activity that would occur at the Project Site during timber harvest operations or associated activities such as road maintenance or construction, the development of the Project will remove vegetation that may serve as fawning habitat and cover for travelling mammals. However, there remains substantial areas of underbrush and forestland in the vicinity to provide fawning habitat. Security fencing or other physical barriers that may impede terrestrial animal movements would be limited during construction (e.g., chain-link fencing around the proposed O&M building or other secure structures). The operation and maintenance phase of the Project is unlikely to have significant adverse impacts to deer fawning habitat and mammal travel corridors. It is expected that traffic levels would be similar to those currently used for forest management and timber harvest and for other land uses in the area. A small increase in traffic on existing and proposed access roads is very unlikely to present a barrier to wildlife movement because the roadways would remain rural and lightly traveled after Project construction. Turbine operation is not expected to impact migration corridors as the turbines themselves do not block passage of species through the site. The risk of collision with the turbines has been accounted for elsewhere.

Potential collisions of wildlife and vehicles would be low due to the Applicant's proposal to work primarily during daylight hours with speed restrictions (see Section 2.4.5.5, *Construction Schedule and Workforce*). Potential impacts during decommissioning and reclamation of the Project Site are expected to be similar to site preparation and construction, but with a shorter duration of adverse impacts. Impacts would be less than significant.

Due to the local terrain for watersheds in the Project's vicinity, hydrological conditions for surface waters tend to be intermittent or ephemeral in the winter months and dry in the summer depending on snow melt and winter rains. While native resident or migratory fish may traverse the Project Site when surface drainage allows, impacts to movement of fish from the Project would be less than significant because of the seasonality of the watercourses. Although impacts are less than significant, implementation Mitigation Measure 3.4-16b protecting wetlands and other waters would further reduce the likelihood of any potential impacts to fish.

Thus, impacts to resident or migratory fish or wildlife species, established wildlife corridors, or native wildlife nursery sites from Project construction, operation and maintenance, and decommissioning would be less than significant. Although impacts are less than significant, implementation of Mitigation Measure 3.4-14 (Avoid and Minimize Impacts to Terrestrial Mammals) would reduce the potential for vehicular wildlife mortality and disturbance to fawning habitat.

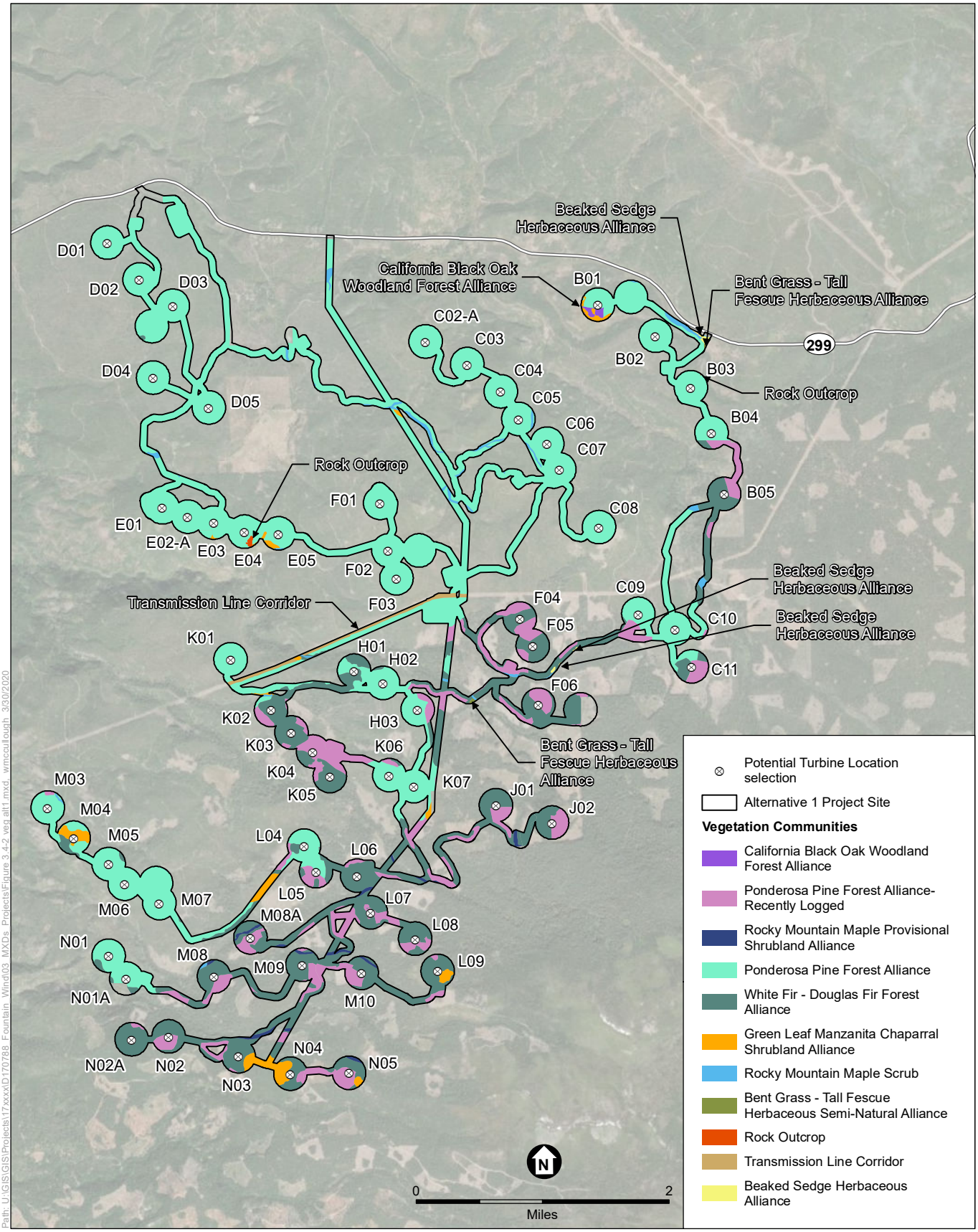
Mitigation: None required.

3.4.3.3 PG&E Interconnection Infrastructure

The Project would include interconnection infrastructure as described in Section 2.4.3, *Project Substation, Switching Station and Interconnection Facilities*. These elements would include both overhead and underground collection system. Overhead collector systems (rather than trenched construction) would be implemented for stream and wetland crossings, to avoid steep terrain, and for other sensitive resource avoidance areas. Construction of the substation, switching stations, and interconnection components would include up to 19 acres of temporary disturbance, and 13 acres of permanent disturbance (including the footprints of the collector substation, switching station, graveled parking and maintenance areas). The proposed location for PG&E interconnection infrastructure is immediately adjacent to the existing PG&E central east-west transmission corridor in under 30-year aged, mixed conifer forest that burned in the 1992 Fountain fire. No sensitive vegetation communities, riparian, wetland or aquatic resources would be directly impacted through construction and operation of the PG&E interconnection infrastructure. The PG&E infrastructure permanent footprint of 13 acres would remove only 0.5 percent of the mixed conifer forest (burned) within the Project Site, and is unlikely to attract non-avian wildlife or hamper wildlife movement corridors through the Project Site and surrounding area. The PG&E infrastructure may contribute to impacts to resident, nesting birds during construction and maintenance and impacts to birds during operation from collision with transmission lines or from electrocution as a result of perching on transmission lines. All other mitigation measures that would be required for the Project also would be implemented to address impacts specifically of the PG&E infrastructure.

Alternative 1: South of SR 299

Under Alternative 1, the Project would be constructed, operated and maintained, and ultimately decommissioned as proposed south of SR 299, and none of the up to seven turbines proposed to the north of SR 299 (turbine numbers A01 through A07) or related infrastructure would be developed. The Alternative 1 Site would consist of the approximately 4,086 acres located south of SR 299, while the approximately 378 acres of the Project Site located north of SR 299 would continue to be managed for timber production (see **Figure 3.4-2**, *Vegetation Communities within the Alternative 1 Site*). Each of Alternative 1's up to 65 turbines could be up to 679 feet above ground level at the top of the blade (the same as the Project) and would have a generating capacity of 3 to 5.7 MW (also the same as the Project). Compared to the Project, this alternative would have 1.8 miles less of new access roads, 4.1 miles less of widening of existing access roads, 2.1 miles less of underground electrical collector lines, and 2.2 miles less of overhead electrical collector lines. Total anticipated temporary construction disturbance areas and expected permanent disturbance areas would be 125.0 acres and 60.5 acres less than the Project, respectively. This is 2.8 percent and 1.3 percent reduction in the expected acres of temporary and permanent disturbance areas within the Project Site (4,464 total acres) respectively. This small reduction in disturbed acres is due to fewer acres of total disturbance from turbines and pads, access roads, overhead and underground electrical collector lines, temporary laydown areas, and other facilities. Since the



SOURCE: WEST Rare Plant & Natural Vegetation Communities Report; 2018/2019

Fountain Wind Project

Figure 3.4-2
Vegetation Communities within the Alternative 1 Site

seven turbines that would not be built are located in the area burned by the 1992 Fountain fire, the largest difference in the acreage of habitats included in the Project Site between Alternative 1 and the Alternative 2 is a reduction in burned mixed conifer forests of 343 acres. There is also expected to be less acreage included in the Project Site of mixed montane riparian scrub (31 acres), and unmapped habitats (3.6 acres). The acres of black oak woodland, mixed montane riparian forests, unburned mixed conifer forests, mixed montane chaparral, montane meadow, and wet montane meadow habitat included in the Project Site would not change. For the purpose of comparison, only changes in impacts to resources that would require mitigation or need additional or less mitigation compared to the Project are detailed below for Alternative 1.

Bald and Golden Eagles, California Spotted Owl, Migratory and Resident Raptors, Sandhill Crane, and Nesting Songbirds

It is estimated that the elimination of 7 turbines (9.7 percent) out of the 72 turbines proposed would likewise reduce the total estimated collision risk to migratory and resident birds, but not substantially so. Under Alternative 1, direct impacts to riparian habitat that may support yellow warbler would be reduced by 31.3 acres, or a 27 percent reduction. Conservation measures for songbirds identified in Impact 3.4-11 would further reduce the less than significant impacts on songbirds. Similarly, operation would pose direct impacts on songbirds through collisions with turbine structures during operation of the 40-year term of the requested conditional use permit. Although some impacts may be reduced under Alternative 1, the same types of impacts would occur, and would be addressed by the same mitigation measures. Therefore, as with the Project, the mitigation measures from Section 3.4.3.2 would be implemented and would help to reduce impacts on birds. Following the implementation of Mitigation Measures 3.4-2, 3.4-3a, 3.4-3b, 3.4-3c, 3.4-4, 3.4-6 and 3.4-8, as with the Project, Alternative 1 would offset the impacts of Project operations on bald and golden eagles, and resident and migratory raptors by documenting any moralities and providing adaptive management to respond to avian fatalities. However, due to the uncertainty associated with the Project turbine size and wind-swept area, the raptor impact estimates, and the potential for unexpectedly higher raptor mortality rates, impacts on bald and golden eagles and other raptors would remain significant and unavoidable. Implementing the above-identified mitigation measures, and conservation measures identified in Impacts 3.4-5 (California spotted owl), 3.4-10 (greater sandhill crane), and 3.4-11 (songbirds) would reduce operations-related impacts to the maximum extent practicable.

Bats

Although Alternative 1 would entail somewhat less surface disturbance, less loss of wildlife habitat, and less potential impact to special-status species due to the removal of seven turbines and associated roads, the nature of the impacts would remain the same, and the same mitigation measures would need to be implemented to reduce potential impacts below established thresholds. Therefore, the mitigation measures outlined in Section 3.4.3.2 would be implemented for Alternative 1. Impacts to bats would be reduced but could still be potentially significant and unavoidable.

Sensitive Vegetation Communities and Riparian Habitats

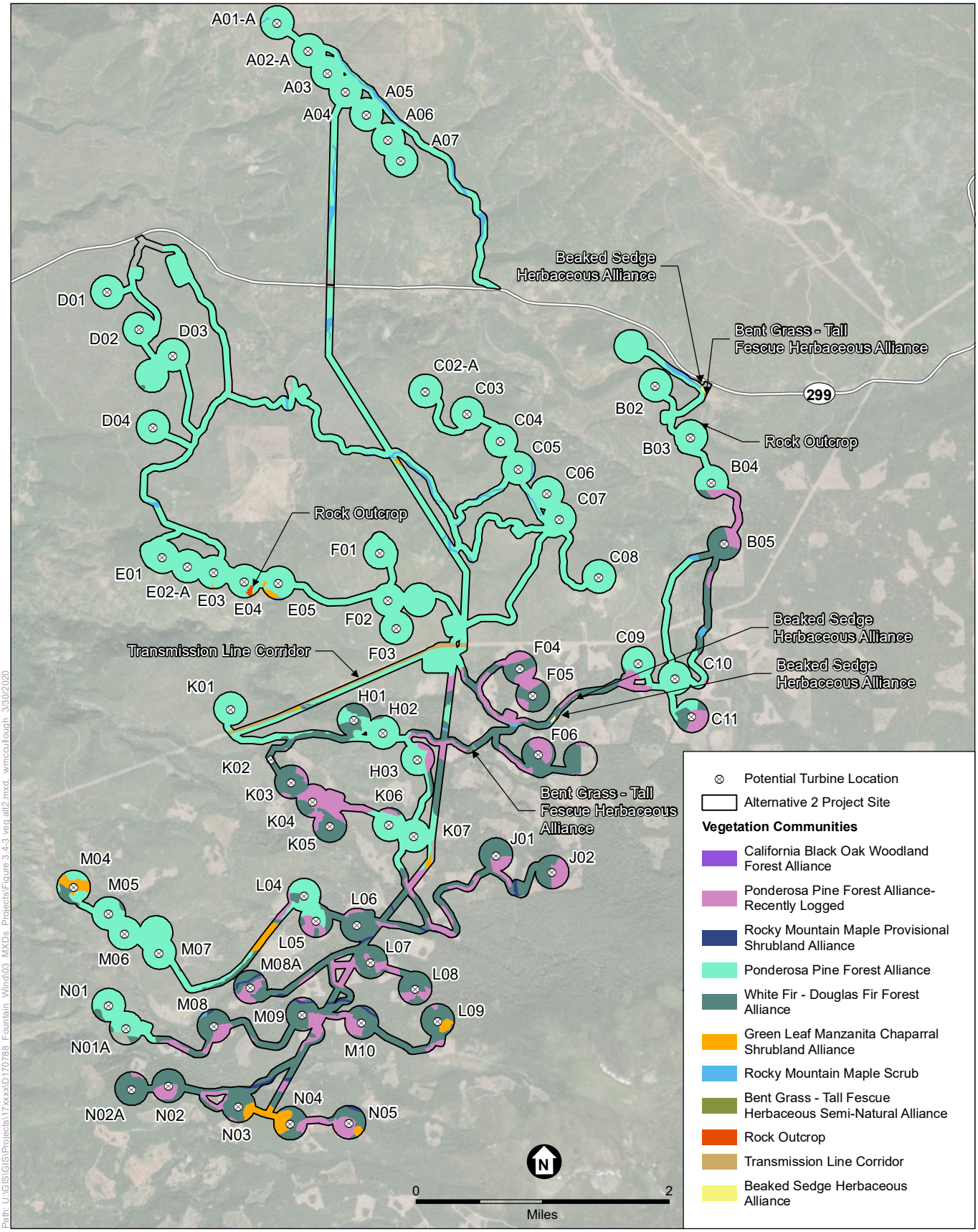
Alternative 1 would directly impact the same vegetation communities as the Project but would reduce the development footprint by 377.9 acres, or 8.5 percent. Under Alternative 1, direct impacts to sensitive vegetation community Rocky Mountain Maple Riparian Scrub would be reduced by 31.3 acres (76 acres of disturbance), or a 27 percent reduction compared to the Project. Although reduced under Alternative 1, impacts to sensitive vegetation would still occur and Mitigation Measure 3.4-16c (Compensate for Impacts to Wetlands and other Waters) would need to be implemented to reduce construction-related disturbances and impacts to a less than significant level.

Aquatic Resources

Alternative 1 would entail less surface disturbance and less potential impact to aquatic resources. Although the area of disturbance for the entire Project would be decreased by 377.9 acres, the types of potential impacts would remain the same throughout the remaining Project Site, which contains numerous aquatic resources, including wetlands and other waters. Under Alternative 1 approximately 2.11 acres of wetlands and 1.33 acres of other waters would be permanently impacted, a slight decrease relative to the Project. As with the Project, Mitigation Measures 3.4-16a and 3.4-16b would be implemented to reduce construction and decommission-related disturbances and impacts related to temporary indirect impacts to aquatic resources from the Project Site to a less than significant level.

Alternative 2: Increased Setbacks

Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within three times the height of the turbine (i.e., within 2,037 feet) of a residential property line and within 1.5 times the height of the turbine (i.e., within 1,018.5 feet) of SR 299, any other publicly-maintained public highway or street, and of Supan Road or Terry Mill Road (see **Figure 3.4-3**, *Vegetation Communities within the Alternative 2 Site*). Implementation of these setbacks would preclude construction of proposed turbines M03, D05, and B01 based on the residential property line setback, and would preclude turbine KO2 based on the roadway setback. Related infrastructure and work areas for these four turbines (including temporary turbine construction areas, access roads and crane roads) would not be needed. The remaining turbines, infrastructure and other improvements would be the same as proposed for the Project. Compared to the Project, Alternative 2 would have 1.0 mile less of new access roads, 4.1 miles less of widening of existing access roads, 2.1 miles less of underground electrical collector lines, and 2.2 miles less of overhead electrical collector lines. Total anticipated temporary construction disturbance areas and expected permanent disturbance areas would be 125.0 and 60.5 acres less than the Project, respectively. This is a 2.8 and 1.3 percent reduction in the expected acres of temporary and permanent disturbance areas within the Project Site (4,464 total acres) respectively. This total disturbance area is identical to Alternative 1. This small reduction in disturbed acres is due to fewer acres of total disturbance from turbines and pads, access roads, overhead and underground electrical collector lines, temporary laydown areas, and other facilities. Since the four turbines that would not be built are located in the area burned by the 1992 Fountain fire, the largest difference in the acreage of habitats included in the Project Site between Alternative 2 and the Project is a reduction in burned mixed conifer forests of



Path: U:\GIS\GIS\Projects\17xxxx\D170788_Fountain_Wind\03_MXDs_Projects\Figure 3.4-3 veg all2.mxd wmcullough 3/30/2020

SOURCE: WEST Rare Plant & Natural Vegetation Communities Report; 2018/2019

Fountain Wind Project

Figure 3.4-3
Vegetation Communities within the Alternative 2 Site

100.5 acres. There is also expected to be less acreage included in the Project Site of black oak woodland (5.5 acres), unburned mixed conifer forest (12.4 acres), mixed montane chaparral (6.9 acres), and mixed montane riparian scrub (1.7 acres). The acres of mixed montane riparian forests, montane meadow, and wet montane meadow habitat included in the Project Site would not change.

For the purpose of comparison, only changes in impacts to resources that would require mitigation or need additional or less mitigation compared to the Project are detailed below.

Bald and Golden Eagles, California Spotted Owl, Migratory and Resident Raptors, Sandhill Crane, and Nesting Songbirds

Since the four turbines that would not be built are located in the area burned by the 1992 Fountain fire, the largest difference in the acreage of habitats included in the Project Site between Alternative 2 and the Project is a reduction in burned mixed conifer forests of 100.5 acres. This reduction of impacts to this habitat type would have little benefit to raptors as it is likely few raptors nest in this area. In addition, the reduction of 4 turbines out of the 72 (5.5 percent) turbines would reduce the collision risk to migratory and resident raptors, but not substantially. Under Alternative 2, direct impacts to riparian habitat would be reduced by 1.7 acres, or 1 percent of suitable habitat for the yellow warbler. Similarly, operation would pose direct impacts to songbirds through collisions with turbine structures during operation of the 40-year term of the requested conditional use permit. Although some impacts may be reduced under Alternative 2, the same mitigation measures would apply. Conservation measures identified in Impacts 3.4-5 (California spotted owl) and 3.4-10 (greater sandhill crane) would further reduce less than significant operations-related impacts to these species.

Following the implementation of Mitigation Measures 3.4-2, 3.4-3a, 3.4-3b, 3.4-3c, 3.4-4, and 3.4-6, and 3.4-8, as with the Project, Alternative 2 would reduce impacts of Project operations on resident and migratory raptors by documenting any moralities and providing adaptive management to respond to avian fatalities. However, due to the uncertainty associated with the Project turbine size and wind-swept area, the raptor impact estimates, and the potential for unexpectedly higher raptor mortality rates, impacts on bald and golden eagles and other raptors would remain significant and unavoidable.

Bats

Although Alternative 2 would entail somewhat less surface disturbance, less loss of wildlife habitat, and less potential impact to special-status species due to the removal of four turbines and associated roads, the nature of the impacts would remain the same, and the same mitigation measures would need to be implemented to reduce potential impacts below established thresholds. Therefore, the mitigation measures outlined in Section 3.4.3.2 would be implemented for Alternative 2 and would reduce construction-related and operational disturbances and impacts to local bat populations and their habitats. However, impacts could be considered significant and unavoidable.

Sensitive Vegetation Communities and Riparian Habitats

Alternative 2 would directly impact the same vegetation communities as the Project, except for California black oak woodland, which would be excluded, reducing the Project footprint by 137.6 acres or 3.1 percent. Under Alternative 2, direct impacts to sensitive vegetation community Rocky Mountain Maple Riparian Scrub, a riparian habitat, would be reduced by 1.7 acres (105.6 acres of disturbance), or 1 percent compared to the Project. The implementation of Mitigation Measure 3.4-16c (Compensate for Impacts to Wetlands and other Waters) would reduce construction-related disturbances and impacts to a less than significant level.

Aquatic Resources

Although Alternative 2 would entail somewhat less surface disturbance, 2.22 acres of wetland and 1.33 acres of other waters would be permanently impacted, the same area as under the Project. Because the impacts would remain the same, the same mitigation measures would need to be implemented to reduce these potential impacts. Therefore, Mitigation Measures 3.4-16a and 3.4-16b would be implemented reduce construction and decommission-related disturbances and impacts related to temporary indirect impacts to wetlands and other waters in the Project Site to a less than significant level.

No Project Alternative

If the No Project Alternative is implemented, none of proposed wind turbines or associated infrastructure or facilities would be constructed, operated and maintained, or decommissioned on the Project Site. The proposed overhead and underground electrical collector system and communications lines would not be developed. No disturbance, noise, attractants, or collision hazards would be introduced to the Project Site relative to baseline conditions. The Project Site would continue to be operated as managed forest timberlands. No impacts would result from the No Project Alternative.

3.4.4 Cumulative Analysis

3.4.4.1 Geographic Extent/Context

The geographic scope for the analysis of cumulative impacts to biological resources includes Shasta County and adjacent migration and movement corridors, including local rivers and streams and the portions of the Pacific Flyway for migratory birds proximate to the Project site. This cumulative impact analysis considers past, present and reasonably foreseeable future actions that will or could contribute impacts that are similar in nature to those of the Project and that overlap geographically and temporally with impacts of the Project. The discussion of existing environmental conditions (as described in Section 3.4.1.2, *Environmental Setting*) reflects ongoing impacts of past projects, including past timber harvests.

The incremental impacts of the Project to biological resources are disclosed in Section 3.4.3, *Direct and Indirect Effects*. In summary, they include the temporary and permanent loss of habitat, avian and bat mortality, loss of individuals of certain special-status wildlife species, and temporary construction impacts. The operational impact on raptors is considered significant and

unavoidable. A cumulative impact to biological resources would occur if the Project, combined with all past, present, and reasonably foreseeable cumulative projects in the vicinity of each resource being evaluated, would result in: (1) regulated biological resources becoming limited in extent within the cumulative analysis area; (2) population declines of special-status wildlife resources within the cumulative analysis area; or (3) if compensation for those impacts cannot be achieved.

3.4.4.2 Existing Cumulative Conditions

The 100 MW Hatchet Ridge Wind Project is the only existing wind energy project in the cumulative scenario (Section 3.1.3.1, *Cumulative Scenario*). There are no other wind energy projects currently proposed in Shasta County. The 2007 Hatchet Ridge Wind Project EIR identified significant and unavoidable impacts to greater sandhill cranes, bald eagles, and special-status raptors and other avian species; however, post-construction avian fatality monitoring has not identified any sandhill crane or bald eagle mortalities resulting from that project. Given the close proximity of the Hatchet Ridge project site to the Project Site and the similarity of the two wind energy generation efforts, similar impacts are anticipated to avian species.

Aside from wind projects, other reasonably foreseeable projects in Shasta County include 25 projects that either have applied for or have received approval to proceed. Among them are requests for or implementation of use permits and reclamation plans for mining operations, which would not pose collision hazards to avian species; relatively short towers or poles for cellular and radio uses that could have limited and localized impacts related to avian collisions; timber harvest plans, which would be performed in conformance with federal and state regulations protecting nesting birds and would not substantially reduce habitat for avian species; and urban development, mostly in urban centers, which would have limited impacts on biological resources.

3.4.4.3 Construction, Operations, and Decommissioning

Direct impacts to wildlife as a result of the Project include temporary and permanent loss of habitat along with the displacement and/or potential mortality of mostly common wildlife species that are poor dispersers such as snakes, lizards, and small mammals. The combined effect of impacts to common wildlife species (i.e., species with no special status) from the Project and impacts of the cumulative projects is considered less than significant because the potentially affected area is largely undeveloped and the species are common and wide-ranging within it.

Collision Risk

Impact 3.4-18: The Project could cause a cumulatively considerable contribution to a significant cumulative impact to avian and bat species from collisions with Project infrastructure. (*Significant and Unavoidable*)

Resident and migratory bird and bat species are at risk of collision with features of the Project as well as past, current, and reasonably foreseeable projects in the cumulative scenario. Cumulative projects that could contribute to a collision risk include the Hatchet Ridge Wind Project and three tower projects: Cellular Tower Use Permit use permit (County project #UP18-0006), Hat Creek

Radio Observatory (project #AMND18-0004), and the T-Mobile Wireless Mono Pole (project #UP19-0005). These projects are located in relatively undeveloped areas and have the potential to pose risks to birds and bats during operations resulting from collisions with overhead transmission lines, utility poles, wind turbines, turbine towers, and meteorological towers.

Project-level impacts related to collisions with infrastructure were identified for raptors species (e.g., red-tailed hawk, sharp-shinned hawk, Cooper's hawk, northern goshawk, bald eagle, and golden eagle), and special-status bat species. These impacts, combined with losses associated with past, present, and future projects are considered a significant cumulative impact to these bird and bat species because the impacts have the potential to limit the populations of the species within the cumulative impacts analysis area. For this reason, the cumulative impact is considered significant. As discussed below, the Project's incremental contribution to this significant cumulative effect would not be cumulatively considerable.

For goshawk, no recent breeding activity has been locally described locally and low number of goshawks have been detected at the Project Site or the Hatchet Ridge project site. Sandhill cranes do not use the Project Site for roosting and breeding, and but sandhill cranes have been detected at the Project Site and the Hatchet Ridge project site during migration. Use of the Project Site by smaller bat species is limited, and mortality from turbines appears low at Hatchet Ridge, compared to other wind facilities. Several conservation measures are suggested to further reduce several less than significant impacts to California spotted owl, nesting songbirds and greater sandhill crane, include conservation measures for Impact 3.4-11 (Conservation Measure for Nesting Songbirds; Conservation Measure for Vaux's Swift, and Conservation Measure for Willow Flycatcher and Yellow Warbler), one conservation measure for Impact 3.4-10 (Sandhill Crane Conservation Measure), and one conservation measure for Impact 3.4-5 (California Spotted Owl Conservation Measure).

The Project and similar cumulative projects would be required to minimize potential avian and bat impacts by implementing mitigation measures. For the Project, these include Mitigation Measures 3.4-3.4-3b (Monitor Avian and Bat Mortality Rates During Project Operations), 3.4-3c (Offset Operational Impacts on Eagles through Compensatory Mitigation, if Necessary). Implementation of these mitigation measures would reduce the Project's contribution to this cumulative impact for most avian species and bats; however, due to the uncertainty associated with eagle, other raptor and bat mortality estimates and the potential for unexpectedly high mortality rates, this impact would not be reduced to less than significant under CEQA. In other words, the Project could have a cumulatively considerable (significant) contribution to a significant cumulative effect to eagles, other raptors and bat species based on the uncertainty associated with mortality estimates and the potential for unexpectedly high mortality rates and the uncertainty regarding whether cumulative impacts could result in population-level declines in these species. Because no additional reasonable, feasible mitigation measures are available that, if implemented, would reduce the Project's contribution below the established level of significance, the Project's contribution to this impact would remain significant and unavoidable.

Electrocution Risk

Overhead transmission lines associated with the Project and the Hatchet Ridge Wind Project also pose an electrocution risk for avian species, particularly for large, aerial perching birds such as hawks and eagles, because of their large wingspan (APLIC, 2006). Impacts to golden eagle and other raptors associated with the Project combined with losses of individual birds from electrocution associated with past, present, and future projects are considered a significant cumulative impact to these species because the impacts have potential to limit the populations of the species within the cumulative impacts analysis area. For this reason, the impact would be considered significant under CEQA. For the Project, potential impacts associated with electrocution would be minimized through the proposed adherence to APLIC guidance for new power poles and transmission lines. The Hatchet Ridge Wind Project also incorporates APLIC design guidelines to reduce potential electrocution impacts. Implementation of the Project's mitigation measures would reduce the Project's contribution to this cumulative impact such that it would not be cumulatively considerable.

Waters of the U.S. and Sensitive Natural Communities

Construction activities associated with the Project could result in the temporary and/or permanent placement of fill material into waters of the United States, including wetlands. The Hatchet Ridge Wind Project is the only other project in the cumulative scenario with identified impacts to sensitive natural communities; and the project-level and cumulative impacts to these resources were considered less than significant and fully mitigated following project implementation. Under the Project, 37.96 acres of wetlands and other waters were identified in the study area, of which a small portion would be subject to temporary or permanent impacts. The actual acreage of impacts would be refined and likely significantly reduced during project design, engineering, and permitting. Similarly, a portion of the identified Rocky Mountain Maple Riparian Scrub natural community within the study area would be impacted during Project construction. This natural community is likely not subject to impacts from other projects in the cumulative scenario. For the Project, potential impacts the loss of waters of the U.S. and sensitive natural communities would be minimized through implementation of Mitigation Measures 3.4-16b (Avoid and minimize impacts to wetland and other waters) and 3.4-16c (Compensate for Impacts to Wetlands and other Waters). The Hatchet Ridge Wind Project also implemented mitigation measures to minimize and fully mitigate losses of waters of the U.S., including wetlands and sensitive natural communities. Implementation of the Project's mitigation measures would reduce the Project's contribution to this cumulative impact such that it would not be cumulatively considerable.

When considered in combination with the impacts of other projects in the cumulative scenario, the Project's incremental contribution to avian and bat mortality and impacts to sensitive natural communities would not be cumulatively considerable because implementation of Project's mitigation measures would reduce the impacts to less than significant under CEQA.

3.4.5 References

American Wind Wildlife Institute (AWWI), 2019. AWWI Technical Report: A Summary of Bird Fatality Data in a Nationwide Database. February 25.

AWWI. 2018. Bats and Wind Energy: Impacts, Mitigation, and Tradeoffs. November 15. https://awwi.org/wp-content/uploads/2018/11/AWWI-Bats-and-Wind-Energy-White-Paper-FINAL.pdf.

Arnett E.B., Baerwald E.F. (2013) Impacts of Wind Energy Development on Bats: Implications for Conservation. In: Adams R., Pedersen S. (eds) Bat Evolution, Ecology, and Conservation. Springer, New York, NY.

Avian Power Line Interaction Committee (APLIC), 2012. *Reducing Avian Collisions with Power Lines: The State of the Art in 2012*. Edison Electric Institute and APLIC. Washington, D.C. Available online: http://www.aplic.org/uploads/files/11218/Reducing_Avian_Collisions 2012watermarkLR.pdf.

APLIC 2006. *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006.* Edison Electric Institute and APLIC. Washington, D.C.

Birdlife International 2015. Guidance on appropriate means of impact assessment of electricity power grids on migratory soaring birds in the Rift Valley / Red Sea Flyway. Regional Flyway Facility. Amman, Jordan.

Bombay H. L., T. M. Benson, B. E. Valentine, and R. A. Stefani. 2003. Willow flycatcher survey protocol for California. California Department of Fish and Wildlife.

California Department of Fish and Wildlife (CDFW), 2020. Rarefind 5 Report from the California Natural Diversity Database (CNDDB). April 1, 2020.

California Department of Fish and Wildlife (CDFW), 2018. Letter of Curt Babcock, Habitat Conservation Program Manager, to the Shasta County Department of Resource Management Planning Division. March 2, 2018.

California Department of Forestry and Fire Protection (CAL FIRE), 2016. Timber Harvest Plan No. 2-16-077-SHA, Cedar Boots. Available online: ftp://thp.fire.ca.gov/THPLibrary/ Cascade_Region/THPs/THPs2016/2-16-077SHA/. Approved October 23, 2017.

California Native Plant Society (CNPS), 2020. Inventory of Rare and Endangered Plants. Sacramento, CA.

CNPS, 2019. Guidelines for Mapping Rare Vegetation of California. Website http:/cnps.org/wp-content/uploads/2019/Guidelines.

Environmental Science Associates (ESA). 2019. Fountain Wind Project Scoping Report.

Frick et al. 2017. Fatalities at wind turbines may threaten population viability of a migratory bat. Biological Conservation 209 (2017) 172–177.

Gutiérrez, R.J.; Tempel, Douglas J.; Peery, M. Zachariah, 2017. The biology of the California spotted owl. In: Gutiérrez, R.J.; Manley, Patricia N.; Stine, Peter A., tech. eds. The

California spotted owl: current state of knowledge. Gen. Tech. Rep. PSW-GTR-254. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 11-47.

KRCRTV, 2020. Wildlife officials investigate if endangered gray wolf was illegally killed in Shasta Co. https://krcrtv.com/news/local/officials-look-into-whether-wolf-was-illegally-killed-in-shasta-county.

Johnsgard, P.A. 2015. A Chorus of Cranes; The Cranes of North America and the World. University Press of Colorado; 208 pages.

Lowther, P. E., C. Celada, N. K. Klein, C. C. Rimmer, and D. A. Spector, 1999. Yellow Warbler (*Setophaga petechia*), version 2.0. *In* The Birds of North America (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bna.454.

Mayer and Laudenslayer, 1988. *A Guide to Wildlife Habitats of California.* 1988. State of California, Resources Agency, Department of Fish and Wildlife. Sacramento, CA.

Natural Resources Conservation Service (NRCS). 2017. Web Soil Survey. US Department of Agriculture. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Navarrete. L, and K. L. Griffis-Kyle. 2014. Sandhill crane collisions with wind turbines in Texas. Proceedings of the North American Crane Workshop 12:65-67.

Regional Water Quality Control Board (RWQCB). 2018. Central Valley. Scoping Letter.

Sawyer, J.O., T. Keeler-Wolf, J.M. Evens, 2009. A Manual of California Vegetation, 2nd Edition. California Native Plant Society Press, Sacramento, CA.

Shasta County, 2007. Hatchet Ridge Wind Project Environmental Impact Report.

Shuford, W. D., and Gardali, T., editors, 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Tetra Tech, 2014, Hatchet Ridge Wind Farm Post-Construction Mortality Monitoring Comprehensive Three Year Report. May 2014.

Tetra Tech, 2013, Hatchet Ridge Wind Farm Post-Construction Mortality Monitoring Year Two Annual Report. March 2013.

Tetra Tech, 2012, Hatchet Ridge Wind Farm Post-Construction Mortality Monitoring Year One Annual Report. February 2012.

Timossi, I. C., E. L. Woodard, and R. H. Barrett, 1995. Habitat suitability models for use with ARC/INFO: Willow flycatcher. California Department of Fish and Game, California Wildlife Habitat Relationships Program, Sacramento, California. Technical Report No. 26. 24 pp.

U.S. Fish and Wildlife Service (USFWS), 2020a. iPac Information for Planning and Conservation. Online database powered by ECOS Environmental Conservation Online System.

USFWS, 2020b. Sandhill Cranes; Columbia National Wildlife Refuge. Website. Accessed on July 1, 2020. https://www.fws.gov/refuge/Columbia/Wildlife_Habitat/Sandhill_Cranes.html.

USFWS, 2019. Endangered and Threatened Wildlife and Plants; 12-month Finding for the California Spotted Owl. Federal Register 84(217):60371-60372.

USFWS, 2019. Endangered and Threatened Wildlife and Plants; Threatened Species Status for West Coast Distinct Population Segment of Fisher with Section 4(d) Rule. https://www.federalregister.gov/documents/2019/11/07/2019-23737/endangered-and-threatened-wildlife-and-plants-threatened-species-status-for-west-coast-distinct.

USFWS, 2013. Eagle Conservation Plan Guidance, Appendix G. https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf.

USFWS, 2012. Land-based Wind Energy Guidelines. https://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf.

USFWS, 2007. National Bald Eagle Management Guidelines. https://www.fws.gov/southdakotafieldoffice/NationalBaldEagleManagementGuidelines.pdf.

USFWS, 2006. Estimating auditory and visual disturbance to northern spotted owls and marbled murrelets in northwestern California, July 26, 2006.

Woodbridge, B. and C. D. Hargis, 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 pp.

Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds., 1990. California's Wildlife. Vol. I-III. California Depart. of Fish and Game, Sacramento, California.

3.5 Communications Interference

This section identifies and evaluates issues related to Communications Interference in the context of the Project and alternatives. It includes the physical and regulatory setting, the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment.

Communications Interference is not a topic typically addressed in the County's CEQA analyses. However, the County has elected to address potential interference with communications as a potential impact on the physical environmental impact in this EIR in light of the critical function of communications in emergency response, which is a public safety topic that is addressed under CEQA, and because interference with cell, radio, television, and other communications could adversely affect human health and the physical environment if emergency response communications were prevented, interrupted or delayed. Also, as summarized below, the County received scoping comments expressing concern about the potential for the Project to cause interference with communications (see **Appendix J**, *Scoping Report*). The analysis in this section addresses those comments.

Frontier Communications provided initial input for the County's environmental review process shortly after the CUP application was filed for the Project. In it, the company confirmed that it has existing facilities along State Route (SR) 299 (Frontier Communications, undated). Later, in response to the issuance of notice of intention to prepare this Draft EIR, the County received scoping input about the potential for Project components (e.g., wind turbines or meteorological towers) to cause communications interference that adversely affects residents' and others' ability to coordinate with emergency service providers via cell phone, 2-way radio, landlines, or the internet. One comment also asked about potential interference with television reception. Concerns were raised specifically regarding potential interference with the communications infrastructure and communications needs of the Shasta Area Safety Communications Agency (SHASCOM), California Highway Patrol (CHP), air ambulance service providers such as PHI and REACH, aviation companies that use the flight path over the proposed site, and Valley Industrial Communications, which repairs and handles repeaters and radio problems for public safety entities such as the Sherriff's Office and SHASCOM. All scoping input received, including regarding communications interference, is provided in Section 4.1 of the Scoping Report (Appendix J).

This section relies in part on the information provided by the communications interference engineering report prepared on behalf of the County for this Project by Evans Engineering Solutions. A copy of the report is provided in **Appendix D**, *Communications Interference*. The report describes the results of a study to determine the locations of FCC-licensed microwave and fixed station radio frequency facilities that may be adversely impacted as a result of the construction of wind turbines at the Project Site and an analysis to determine whether interference is likely to occur.

3.5.1 Setting

3.5.1.1 Study Area

The study area relevant to the analysis of communications interference includes the potential impact zone for Project interference on communications signals. The study areas and database search distances relevant to different types of communications signals are summarized in **Table 3.5-1**, and their relevance is explained in more detail in Section 3.5.2.2, *Environmental Setting*.

TABLE 3.5-1
STUDY AREAS AND DATABASE SEARCH DISTANCES FOR RELEVANT COMMUNICATIONS TYPES

Communications Type	Study Area and/or Database Search Distance	Rationale for Study Area/Search Distance
Land mobile/public safety radio transmitter stations	About 1,400 feet	Wind-turbine-caused interference at land mobile transmitter stations typically occurs only within 425 meters or about 1,400 feet of a turbine site.
Satellite earth stations	65 miles	Impact potential depends on satellite arc; 65 miles encompasses any stations that could have impacts.
AM broadcast facilities	1.8 miles	Large metallic structures such as wind turbines can adversely affect the transmitted signals of AM broadcast stations up to 3 kilometers (1.8 miles) away.
TV broadcast facilities	3 miles	About 10 percent of receiver locations can be affected to some extent within 3 miles of a large turbine when the turbine is between the TV station and the receiver.
Aircraft navigation	10 miles	Interference with aircraft navigational communications is not anticipated from structures more than 10 miles from a navigational radio beacon.
Microwave and cellular communications	Study area is a modeled zone described in Section 3.5.3.1 Search radius for microwave towers is 2 miles	The “first Fresnel zone” of microwave signal paths is the zone in which microwave transmissions travel from the point of origin to a receiver. A search radius of 2 miles from the Project Site encompasses all towers within any of the modeled first Fresnel zones.

SOURCE: Appendix D; Angulo et al., 2014.

3.5.1.2 Environmental Setting

Radio and Television Communication

Four types of radio and television communications facilities are considered in this section: land mobile/public safety radio transmitter stations (“land mobile stations”), satellite earth stations, AM broadcast stations, and television broadcast facilities.

Although the engineering report used a database search area of 2 miles, it indicates that wind-turbine-caused interference at land mobile transmitter stations typically occurs only within

425 meters or about 1,400 feet of a turbine site; this distance is referred to as the "worst-case recommended setback" from land mobile stations. The closest station to a proposed turbine location is 592 meters (about 1,950 feet) from Turbine M08 (Appendix D). The known locations of land mobile stations near the Project Site are outside the area of potential impact.

The report also identified one FCC-authorized satellite earth station whose range extends across the Project Site. It is located about 37 kilometers (23 miles) from the nearest proposed turbine location (B03), and its signal would be clear of the turbine's blades by over a mile in vertical distance, and would therefore be outside of the three-dimensional impact area for the Project.

Large metallic structures such as wind turbines can adversely affect the transmitted signals of AM broadcast stations up to 3 kilometers (1.8 miles) away. There are no AM broadcast facilities within 1.8 miles of the Project Site; therefore, no such facilities would be within the impact area for the Project (Appendix D). Because none of these facility types would be close enough to experience impacts from the Project, land mobile stations, satellite earth stations, and AM broadcast facilities are not discussed further.

Finally, television broadcast signals can be interrupted when the direct path from a broadcast station to a television viewer's residence or other receiver is reflected by turbine blades, and the engineering report indicates that typically, approximately 10 percent of the receiver locations could be affected to some extent within 3 miles of a large turbine when the turbine is between the TV station and the receiver (Appendix D). Up to 22 television broadcast stations currently are licensed to send broadcast signals through or immediately adjacent to the Project Site,[1] and these stations serve customers in an area of approximately 215 square miles surrounding the Project Site.

Aircraft Navigational Systems

There are three public airports in Shasta County: the Redding Municipal Airport, Benton Airpark, and Fall River Mills Airport. The nearest airport to the Project Site, the Fall River Mills Airport, is located approximately 20 miles northeast of the Project Site. There are no nearby airports operated by the U.S. Military.

The Fall River Mills Airport and Benton Airpark have Common Traffic Advisory Frequency (CTAF) radio communication capability, but no tower and aircraft instrumentation systems (AirNav.com, 2020a, 2020b). Radio transmissions are addressed above, and as noted, known radio signals are located outside the potential impact area of the Project and are not addressed further.

The Redding Municipal Airport has a Very High Frequency Omni-Directional Range (VOR) aircraft navigational radio system that supports instrumented aviation and is maintained by the Federal Aviation Administration (FAA) (AirNav.com, 2020c). Although interference with VOR communications is not anticipated from structures more than 10 miles (15 kilometers) from a

[1] Up to 13 of these 22 stations are currently off the air and target dates for return to operation are unknown (Appendix D).

beacon (Angulo et al., 2014) and the Redding Municipal Airport is over 35 miles from the Project Site, aircraft navigational systems are addressed in the impact analysis because the Applicant would be required to file a notice with the FAA to determine potential effects on navigation signal reception as explained in Section 3.5.1.3, regardless of this distance.

Cellular Phone and Microwave Communication

Microwaves are a type of electromagnetic wave used to carry information such as radio, cellular phone, and digital communications at high speeds. Microwaves travel along direct line-of-sight paths and their transmission requires the use of multiple towers to receive, amplify, and re-transmit signals over long distances. The engineering report identified 72 licensed microwave paths within 2 miles of the Project Site, many of which cross the Project Site near the proposed locations of turbines. Licensees include but are not limited to Pacific Gas and Electric Company (PG&E), the State of California, Citizens Telecom Company of California, Southern Oregon University, New Cingular Wireless, Transmission Agency of Northern California, KCVU-TV, and T-Mobile. Microwave transmissions can be obstructed if structures such as wind turbines or buildings interrupt these line-of-sight paths or cause reflections of signals (Appendix D).

SHASCOM provides notifications from local emergency response teams to registered cell phones in the event of emergency situations or critical community alerts. County residents can register their cell phone numbers with SHASCOM's Code Red system to receive emergency notifications like evacuation notices, bio-terrorism alerts, boil-water notices, and missing child reports (SHASCOM, 2020). This notification system is specific to cell phones, is distinct from the County's alert system using landline phones, and was put in place in response to declining landline telephone use as more County residents switched to using cell phones exclusively (Sandhu, 2018).

3.5.1.3 Regulatory Setting

Federal

Federal Communications Commission

The FCC regulates interstate and international communications by radio, television, wire, satellite, and cable. The FCC implements the Communications Act and several commission rules and orders prohibiting radio frequency interference, and addresses complaints from consumers and public safety providers regarding communications interference.

FAA Regulations on Structures Affecting Navigation Signal Reception

The FAA is the federal agency that identifies potential impacts related to air traffic and related safety hazards. The FAA Federal Aviation Regulations (FAR) establish standards and notification requirements for proposed structures that will be in proximity to a navigation facility and may impact the assurance of navigation signal reception. FAA standards (14 CFR Part 77.9) generally require that applicants for any temporary or permanent structure that exceeds an overall height of 200 feet above ground level (as the proposed wind turbines would) or could impact the assurance of navigation signal reception file with the FAA prior to construction to obtain a determination

regarding potential obstructions to air navigation or navigational aids or facilities. This requirement to file a notice with the FAA would apply to the Project (FAA, 2020).

State

California Public Utilities Commission

The CPUC regulates privately owned telecommunications companies and other utilities including several licensees of the cellular and microwave communications signals described in Section 3.5.1.2, such as Pacific Gas & Electric Co. and telephone service providers such as T-Mobile. The CPUC may have regulatory oversight of certain aspects of changes to communications facilities if any are necessary as a result of the Project.

Local

Shasta County Multi-Jurisdictional Hazard Mitigation Plan

The Shasta County and City of Anderson Multi-Jurisdictional Hazard Mitigation Plan identifies communications as one of the "utility lifeline systems" deemed critical facilities by the Federal Emergency Management Agency (FEMA). Critical facilities are those in either the public or private sector that provide essential products and services to the general public, are otherwise necessary to preserve the welfare and quality of life in the region, or fulfill important public safety, emergency response and/or disaster recovery functions (Shasta County and City of Anderson, 2017).

3.5.2 Significance Criteria

Neither CEQA nor the CEQA Guidelines discusses interference to communications as a topic for analysis in CEQA documents. Nonetheless, as described above, the County chooses to address potential interference with communications as an environmental impact in this EIR. Accordingly, for purposes of this EIR, project would result in a significant impact to Communications Interference if it would:

a) Cause substantial interference to existing television and radio reception at residences in the vicinity;

b) Substantially interfere with existing navigational systems operated by the Federal Aviation Administration (FAA) or the U.S. military; or

c) Obstruct or prevent point-to-point microwave relay station transmissions that traverse the project site.

3.5.3 Direct and Indirect Effects

3.5.3.1 Methodology

For impacts on television broadcast communications, the 10 percent general rule described in Section 3.5.1.2 was used to estimate the number of households likely to be affected within the 215-square-mile service area of the stations that broadcast over the Project Site.

Microwave transmissions do not travel in perfectly straight lines. Each wave travels along an arc, and the arcs from multiple waves in a transmission form an ellipsoidal[2] shape between the transmitter and a receiver. For impacts on microwave communications, Evans Engineering Solutions created three-dimensional models of each proposed turbine and modeled the ellipsoidal zones in which microwave transmissions from known transmitters travel from the point of origin to a receiver (called a "Fresnel zone"). To determine whether the Project could have an adverse effect on microwave communications, the three-dimensional turbine models and Fresnel zones of microwave transmission paths were compared to determine whether these modeled shapes would intersect. See Appendix D for additional details.

3.5.3.2 Direct and Indirect Effects of the Project

Because the potential for interference on communications signals discussed in this section occurs as a result of the physical presence of wind turbines, any potential impacts would occur primarily during operation and maintenance. Impacts would begin during the construction phase as turbines are installed, and would persist through decommissioning for as long as turbines remain in place. However, the site clearing and reclamation phases, and the construction and decommissioning activities that would occur during those phases, would not affect communications. Therefore, the impact discussions below focus on the operation and maintenance phase.

a) Whether the Project would cause substantial interference to existing television and radio reception at residences in the vicinity.

Impact 3.5-1: The Project could cause intermittent interference to or freezing of television reception at some residences in the service area of the stations that broadcast over the Project Site. (*Less than Significant with Mitigation Incorporated*)

There are an estimated 600 residences within the 215-square-mile service area of the stations that broadcast over the Project Site. The engineering report assumes that about 55 percent of these residences use satellite or cable to receive television, meaning that the remaining 45 percent (270 residences) would rely on "over-the-air" television reception (Appendix D). However, because the County has not independently substantiated this assumption, this analysis conservatively uses a range of 270 to 600 residences relying on "over-the-air" reception. Using the 10 percent rule described in Section 3.5.3.1, an estimated 27 to 60 residences could experience intermittent interference or freezing of television reception as a result of the Project. The impact would be long-term, persisting throughout the life of the Project, but would cease after wind turbines are decommissioned and removed. This would be a significant impact because of the reliance of rural residents on "over-the-air" television broadcasts to receive information.

Mitigation Measure 3.5-1 is proposed to ensure that television interference impacts would be avoided or corrected, reducing the impact to less than significant.

[2] Ellipsoidal here refers to a shape similar to an elongated football.

Mitigation Measure 3.5-1: Correct or mitigate conflicts with television signals.

Prior to issuance of a construction permit from the County, the Applicant shall send notifications, via certified mail or other means that documents receipt, to all property owners of residences within the service area of the stations that broadcast over the Project site notifying them of the potential for interference with "over-the-air" television signals received by antenna. The notification shall provide contact information and instructions so that recipients may file a complaint with the Shasta County Department of Resource Management, Planning Division if interference occurs.

In the event that the County receives a verified complaint regarding television broadcast interference that is attributable to this Project, the Applicant will resolve receiver interference through coordination with property owners. Verification shall include a letter or report from a qualified third party supporting the conclusion that interference is attributable to the Project. The Applicant shall not be required to provide qualifying residents with better reception than they had before the construction and operation of the Project.

Significance after Mitigation: Less than significant.

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b) Whether the Project would interfere with existing navigational systems operated by the FAA or the U.S. military.

Impact 3.5-2: The Project would not interfere with existing navigational systems operated by the FAA or the U.S. military. (*Less-than-Significant Impact*)

Wind turbines have the potential to interfere with VOR aircraft navigational systems. The nearest airport with a VOR navigational system is over 35 miles from the Project Site. Little or no signal interference is anticipated when wind turbines are located more than 10 miles from a VOR beacon location (Angulo et al., 2014). Therefore, the impact would be less than significant.

Nonetheless, the FAA requires that a Notice of Proposed Construction (Form 7460-1) be filed for any object that would extend more than 200 feet above ground level. One aspect of the FAA's review of the Applicant's notice would evaluate the potential physical or electromagnetic effects on air navigation, communication facilities, and other surveillance systems (14 CFR §77.29[6]). Once the Form 7460-1 is reviewed by the FAA, the Applicant must implement measures to reduce any potential impacts on aircraft navigation in accordance with the requirements of FAA's analysis of the Form 7460-1. It is unlikely that the Project would cause physical or electromagnetic interference with aircraft navigational systems due to the distance to the nearest airport (Appendix D). However, if the FAA identifies potential effects, then the measures to reduce potential impacts may include an operational curtailment agreement (i.e., to bring turbines causing interference to a temporary stop) based on air navigation schedules may be negotiated, or the FAA could negotiate with the Applicant to fund upgrades to the existing potentially affected radar system (Department of Energy, 2016). Implementation of such legally required measures, if any are identified, also would ensure that this impact would remain less than significant.

Mitigation: None required.

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c) Whether the Project would obstruct or prevent point-to-point microwave relay station transmissions that traverse the Project Site.

Impact 3.5-3: None of the Project turbines would obstruct or prevent known point-to-point microwave relay station transmissions; however, interference could occur due to turbine location adjustments or currently unknown transmissions. (*Less than Significant with Mitigation Incorporated*)

As explained in Section 3.5.1.2, microwaves carry information such as radio, cell phone, and digital communications. The engineering report (Appendix D) found that none of the Project turbines would intersect with the Fresnel zones of the known microwave paths that cross the Project Site; therefore, they would not obstruct or prevent point-to-point microwave transmissions. No impact would occur based on the proposed turbine locations and known microwave paths.

However, as noted in the engineering report, although the third party and FCC databases relied on for this analysis typically are very accurate, it is possible that some microwave facilities have not been accurately represented, and that interference could occur. Additionally, if wind turbine siting were to be adjusted during final design, it is possible that wind turbines could overlap with the transmission zones. Either scenario could result in interference with microwave transmissions, which could result in a significant impact on County residents and public safety because these transmissions are frequently used for emergency communications. If such an impact were to occur, it would be long-term, persisting throughout the life of the Project, but would cease after wind turbines are decommissioned and removed.

Therefore, while no significant impact is anticipated based on information known at the time of this analysis, Mitigation Measure 3.5-3 is proposed to ensure that microwave interference impacts would be avoided or corrected, reducing the impact to less than significant.

Mitigation Measure 3.5-3: Correct or mitigate conflicts with microwave signals.

Prior to issuance of a construction permit from the County, the Applicant shall notify, via certified mail or other means that documents receipt, all owners of frequency-based communication stations and towers within 2 miles of the Project Site. The notification shall provide the locations of all turbines and shall provide contact information and instructions so that recipients may file a complaint with the Shasta County Department of Resource Management, Planning Division if interference occurs.

In the event that the County receives a verified complaint regarding microwave transmission interference that is attributable to this Project, the Applicant will resolve receiver interference through coordination with owners of frequency-based communication stations and towers. Verification shall include a letter or report from a qualified third party supporting the conclusion that interference is attributable to the Project. Possible actions include the Applicant being responsible for installation of high-performance antennas at nearby microwave sites, if required. The Applicant shall not be

required to provide qualifying owners with better signals than they had before the construction and operation of the Project.

Significance after Mitigation: Less than significant.

3.5.3.3 PG&E Interconnection Infrastructure

The PG&E interconnection infrastructure described in Section 2.4.3 would be substantially shorter in height than the proposed wind turbines, and so would have commensurately less potential to cause communications interference. This infrastructure would not contribute to potential interference with microwave and cellular communications or television broadcast signals because the structures would be much smaller than the wind turbines and would not involve the movement of turbine blades. Additionally, the PG&E facilities could require a relay microwave tower or overhead fiber optic communication circuits; however, these facilities would be designed to avoid or minimize interference with existing communication facilities. Therefore, impacts on these communication types would be less than significant and Mitigation Measures 3.5-1 and 3.5-3 would not apply to the PG&E interconnection infrastructure. The minor modifications or upgrades to the existing 230 kV line and the additional poles needed to connect the Project switching station would not involve structures taller than 200 feet and thus would not need FAA review for navigation interference. The impact related to navigational communications also would be less than significant.

3.5.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, fewer turbine locations would be developed (with A01 through A07 omitted), and all of the turbine locations included in this alternative would be at least as far away from land mobile/public safety radio transmitter stations, earth satellite stations, AM broadcast facilities, television broadcast facilities, aircraft navigation beacons, and microwave and cellular communication facilities as described for the Project. Therefore, the potential impacts on television reception (Impact 3.5-1), aircraft navigation (Impact 3.5-2), and microwave and cellular communication (Impact 3.5-3) would be the same as described for the proposed Project, although there may be a small reduction in the potential for unforeseen microwave communication interference because the turbines north of SR 299 would not be constructed (turbines A01, A02, and A03 are some of the closest to known microwave paths, as identified in Appendix D, but would not interfere with the Fresnel zones of these paths and so are not expected to cause interference). Mitigation Measures 3.5-1 and 3.5-3 would apply to Alternative 1 and would reduce impacts 3.5-1 and 3.5-3 to less-than-significant levels, respectively.

Alternative 2: Increased Setbacks

Under Alternative 2, fewer turbine locations would be developed (with B01, D05, K02, and M03 omitted), and all of the turbine locations included in this alternative would be at least as far away from land mobile/public safety radio transmitter stations, earth satellite stations, AM broadcast

facilities, television broadcast facilities, aircraft navigation beacons, and microwave and cellular communication facilities as described for the Project. Therefore, the potential impacts on television reception (Impact 3.5-1), aircraft navigation (Impact 3.5-2), and microwave and cellular communication (Impact 3.5-3) would be the same as described for the proposed Project, although there may be a small reduction in the potential for unforeseen microwave communication interference because several turbines would not be constructed (turbine D05 is one of the closest to known microwave paths, as identified in Appendix D, but does not interfere with the Fresnel zones of these paths and so is not expected to cause interference). Mitigation Measures 3.5-1 and 3.5-3 would apply to Alternative 2 and would reduce impacts 3.5-1 and 3.5-3 to less-than-significant levels, respectively.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind turbines, meteorological towers, or other related infrastructure would be constructed, operated and maintained, or decommissioned on the Project site. The Project site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to Communications Interference.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect.

3.5.4 Cumulative Analysis

Although a potential less-than-significant impact on aircraft navigational systems is identified under Impact 3.5-2, the Project ultimately would avoid any impacts on navigation and could not contribute to a cumulative impact on aircraft navigational systems because the Project would be required by law to comply with the requirements of FAA's analysis of impacts on navigation prior to construction and operation of the Project. For this reason, neither the Project nor an alternative would cause or contribute to a potential cumulatively significant impact in this regard.

The geographic scope for cumulative effects related to television reception includes the 215-square mile combined service area of the stations that broadcast over the Project Site. For impacts on microwave and cellular transmissions, the geographic scope includes the extent of the paths crossing the Project Site; this includes transmission stations at either end of each path. The temporal scope of impacts on both types of transmissions includes the time from initial construction of any turbine causing interference to full resolution of the interference as required by Mitigation Measures 3.5-1 and 3.5-3.

The existing Hatchet Ridge Wind Project site is located about 6 miles east of the Project Site and is crossed by some of the same television broadcast signals that cross the Project Site. As explained under Impact 3.5-1, the Project could cause intermittent interference to television reception, a potentially significant impact before mitigation. The existing wind turbines at Hatchet Ridge already have been evaluated in the EIR for that project and their role in television broadcast transmission interference addressed by implementation of Mitigation Measure USS-1, which required notification and correction of interference similar to what is required under Mitigation Measure 3.5-1 for the proposed Project (Shasta County, 2008). Therefore, the existing Hatchet Ridge Wind Project would not cause interference with the same television broadcast signals during the same timeframe that the Project could cause interference, and the two projects' impacts would not combine to result in a significant cumulative impact.

The existing Hatchet Ridge Wind Project is located within an area crossed by the same microwave paths that cross the Project Site, which include paths licensed to the State of California, PG&E, Citizens Telecom of California, Southern Oregon University, New Cingular Wireless PCS, Transmission Agency of California, Smg-Redding LLC, Paradise KCVU-TV, and Sinclair California (Appendix D; Comsearch, 2007). As explained under Impact 3.5-3, the Project would not cause transmission interference for any of these paths based on the location information currently known; however, interference is possible if these paths have not been accurately represented in existing databases. Therefore, the Project could cause a significant impact on these transmissions before mitigation. The existing wind turbines at Hatchet Ridge already have been evaluated in the EIR for that project and their role in microwave and cellular transmission interference addressed by implementation of Mitigation Measure USS-1, which required notification and correction of conflicts similar to what is required under Mitigation Measure 3.5-3 for the proposed Project (Shasta County, 2008). Therefore, the existing Hatchet Ridge Wind Project would not cause interference with the same signals during the same timeframe that the Project could cause interference, and the two projects' impacts would not combine to result in a significant cumulative impact.

3.5.5 References

AirNav.com, 2020a. Fall River Mills Airport. Available online at: http://www.airnav.com/airport/O89. Accessed May 22, 2020.

AirNav.com, 2020b. Benton Field Airport. Available online at: https://www.airnav.com/airport/O85. Accessed May 22, 2020.

AirNav.com, 2020c. Redding Municipal Airport. Available online at: https://www.airnav.com/airport/KRDD. Accessed May 22, 2020.

Angulo, I., D. de la Vega, I. Cascón, J. Cañizo, Y. Wu, D. Guerra, P. Angueira, 2014. Impact analysis of wind farms on telecommunication services. In Renewable and Sustainable Energy Reviews Volume 32, April 2014, Pages 84-99. Available online at: https://www.sciencedirect.com/science/article/pii/S1364032114000100. Accessed May 22, 2020.

Comsearch, 2007. Licensed Microwave Search & Worst Case Fresnel Zone. Prepared for Renewable Energy Systems Hatchet Ridge Wind Farm. Available online at: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/hatchet-ridge/App_E.pdf.

Federal Aviation Administration (FAA), 2020. Notice Criterial Tool. Available online at: https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp. Accessed May 22, 2020.

Frontier Communications, undated. Form signed by Chuck Wadowski to Bill Walker.

Shasta County, 2008. Final Environmental Impact Report for the Hatchet Ridge Wind Project, Chapter 4, MMRP. June. Available online at: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/hatchet-ridge/08_Ch_4_MMRP.pdf.

Shasta County and City of Anderson, 2017. Multi-Jurisdictional Hazard Mitigation Plan. November 16, 2017. Available online at: https://www.co.shasta.ca.us/docs/libraries/public-works-docs/hmp-documents/shasta-county-hazard-mitigation-plan-november-2017.pdf.

Shasta Area Safety Communications Agency (SHASCOM), 2020. SHASCOM-911. Available online at: http://www.shascom911.com/. Accessed June 25, 2020.

Sandhu, Amber, 2018. “Shasta County rolls out emergency alert system for cell phones users.” Redding Record Searchlight. Available online at: https://www.redding.com/story/news/local/2018/01/02/shasta-county-residents-advised-register-cell-phones-code-red-notification-system/996051001/. Accessed June 25, 2020.

U.S. Department of Energy (DOE), 2016. Federal Interagency Wind Turbine Radar Interference Mitigation Strategy. January. Available online at: https://www.energy.gov/sites/prod/files/2016/06/f32/Federal-Interagency-Wind-Turbine-Radar-Interference-Mitigation-Strategy-02092016rev.pdf. Accessed June 25, 2020.

3.6 Cultural and Tribal Cultural Resources

This section identifies and evaluates issues related to Cultural Resources and to Tribal Cultural Resources in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of resources and potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. The information and analysis presented in this section are based in part on the *Fountain Wind Energy Project Cultural Resources Phase 1 Inventory of 4,463 Acres, Shasta County* (Stantec, 2019), the *Addendum 1: Update to The Fountain Wind Energy Project Cultural Resources Phase 1 Inventory of 4,463 Acres, Shasta County, California* (Stantec, 2020a) and *Addendum 2: Updated Cultural Resources Inventory Report: Tribal Coordination and Correspondence* (Stantec, 2020b).

The County independently reviewed these and other materials prepared by or on behalf of the Applicant and determined them to be suitable for reliance on (in combination with other materials included in the formal record) in the preparation of this Draft EIR.[1]

During the pre-scoping process, the Pit River Tribe provided initial input for the County's environmental review process shortly after the CUP application was filed for the Project (McDaniels, 2018). This input confirmed that the Project Site is within the Ancestral territories of the Madesi, Itsatawi, and Atsugewi Bands of the Pit River Tribe. Later, in response to the issuance of notice of intention to prepare this Draft EIR, the County received scoping input about potentially affected historical resources including Moose Camp, official historic sites on the Buffum Homestead that were certified after the 1992 Fountain Fire, and a cabin within the Project Site that was built in the 1800s.The potential to disturb human remains, including Native American burials and burial sites, also was identified. The County also received scoping input specifically regarding Tribal Cultural Resources from the Pit River Tribe and Tribal members, including the Ilwami Band, the Madesi Band, and the Atsuge Band. The County also received scoping input about Tribal Cultural Resources from the Susanville Indian Rancheria, a political entity comprised of Maidu, Paiute, Pit River, and Washoe ethnographic tribes. All scoping input received, including regarding Cultural Resources and Tribal Cultural Resources, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

3.6.1 Setting

3.6.1.1 Study Area

The Project Site (consisting of approximately 4,464 acres of private property) is located approximately 6 miles west of Burney, 35 miles northeast of Redding, immediately north and south of SR 299. The Project Site is located within the southern end of the Cascade Range with

[1] The Report and Addenda are not provided for public review because Shasta County, as the CEQA Lead Agency for this Project, will maintain the confidentiality of sensitive cultural resource inventories or reports generated for this EIR. This decision is consistent with existing law's protecting sensitive cultural information, including, for example, information about the location of an archeological site, sacred lands, graves, cemeteries, and sacred places and records of Native American places, features, and objects (see, e.g., Pub. Res. Code §§5097.9, 5097.993; 14 Cal. Code Regs. §15120(d)).

topography characterized by buttes and peaks separated by small valleys. The Lassen National Forest lies to the southeast, and the Shasta-Trinity National Forest is to the north. Other surrounding lands are privately owned; many are used for timber harvesting purposes.

Elevations within the Project Site range from 3,000 to 6,000 feet above sea level. Little Cow Creek and the south fork of Montgomery Creek cross the Project Site from east to west. Other small tributaries run through the valleys. Existing land uses within the Project Site consist exclusively of managed forest lands. Unpaved logging roads and transmission lines cross the Project Site. The total anticipated construction disturbance is 1,384 acres and the total permanent disturbance is 713 acres. The total disturbance area (1,384 acres) is the *Area of Direct Impact (ADI)* for the analysis of impacts to archaeological resources and human remains; that is, areas that could experience direct ground disturbance from construction, operation and maintenance, and decommissioning of the Project. The Project Site, as well as all areas that could experience indirect impacts such as visual impacts or changes in use, are the *Study Area* for this analysis of impacts to tribal cultural resources.

3.6.1.2 Environmental Setting

This section has been adapted from a Project-specific study (Stantec, 2019) commissioned by the Applicant that has been independently reviewed by the County and found to be suitable for reliance in combination with other sources of data to inform this analysis. All references cited are included in that document.

Natural Setting

The Project is located near the southern end of the Cascade Range between Redding and Burney, California. The area provided, and still provides, a rich resource base that was exploited by prehistoric and historic Native American populations. Beginning in the 1800s, Euroamericans also exploited the area primarily for gold, timber, and ranching. Fauna associated with these habitats includes raccoon, rabbit, mule deer, California ground squirrel, western gray squirrel, coyote, bobcat, black bear, mountain lion, rattlesnakes, gopher snakes, Northwestern pond turtle, turkey vultures, red-railed hawks, great horned owls, killdeers, a variety of sparrow, Steller's jay, western scrub jay, mourning doves, Canadian geese, ducks, other small birds, salmon, and rainbow trout.

The Cascade Range is characterized by a north-south trending chain of large volcanos and is primarily composed of volcanic and sedimentary deposits. Two of the Cascade Range's best-known volcanic peaks, Mount Rainier in Washington and Mount Lassen in California, have both been active in recent or historical time. The Cascade Range also includes areas of flat lava plateaus, lava and cinder cones, plug domes, ash beds, steep ridges, and glacial deposits. The Project Site consists mainly of Tertiary volcanic flow rocks. It is also characterized by several buttes and peaks separated by small valleys formed by a number of tributaries in the Pit River and Cow Creek Watersheds. Other significant waterways in the vicinity of the Project Site include the north and south forks of Montgomery Creek and Little Cow Creek.

Cultural Setting

Prehistoric Overview

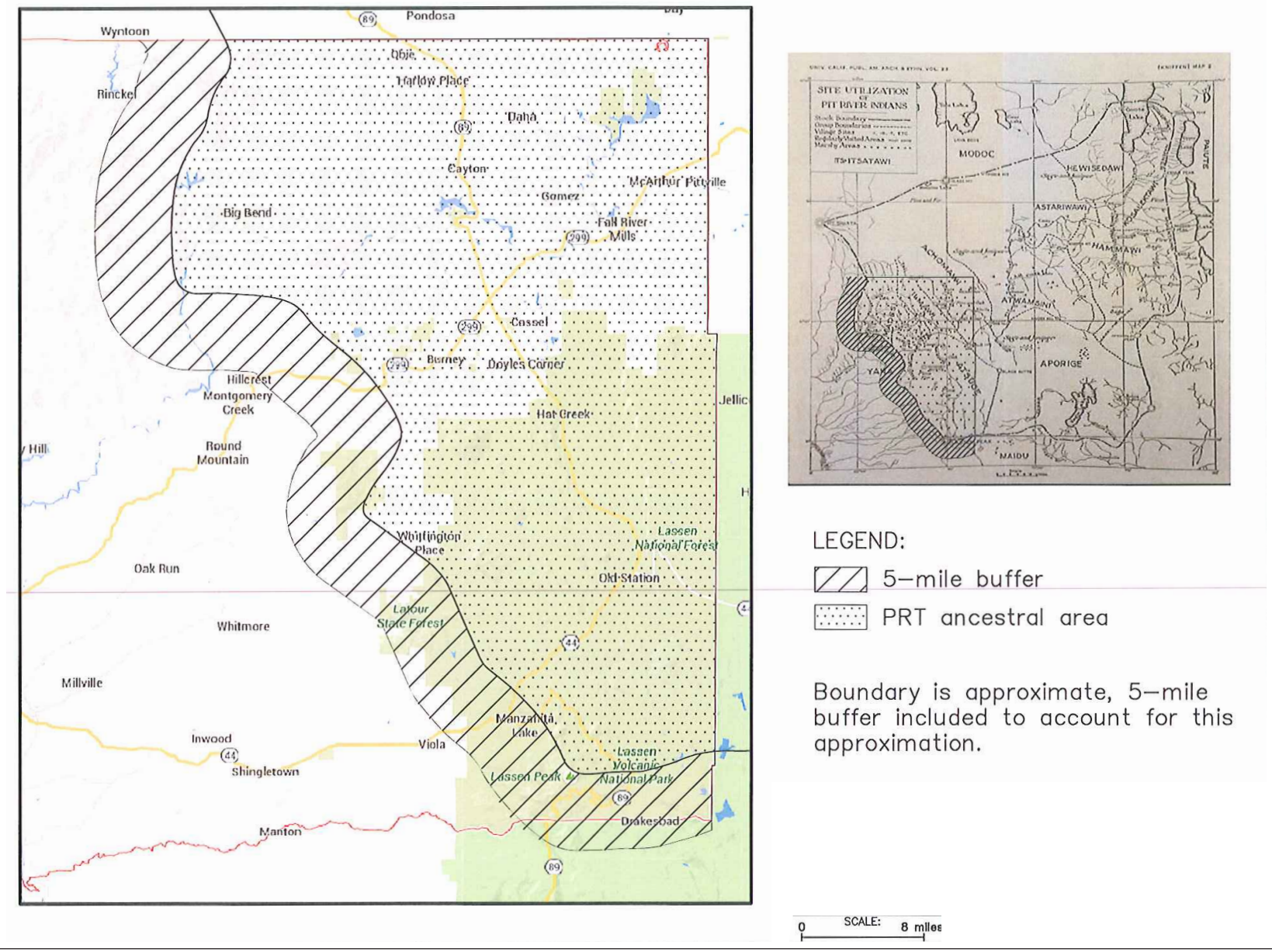
Regional archaeological investigations have developed classification schemes that attempt to place assemblages of cultural material in specific temporal and spatial contexts. Many of these schemes also attempt to associate artifact assemblages with specific groups and/or settlement/subsistence strategies. One of the more comprehensive of these chronologies includes five generalized cultural patterns spanning 8,000 years: the Borax Lake Pattern (6050–3050 B.C.), the Squaw Creek Pattern (3050–1050 B.C.), the Whiskeytown Pattern (1050–950 B.C.), the Tehama Pattern (A.D. 150–1200), and the Augustine Pattern of the Redding Aspect (beginning A.D. 1200). The Borax Lake Pattern included assemblages of wide-stemmed points, handstones, milling slabs, and ovoid flake tools, and is attributed to Hokan speaking peoples entering the area. The Squaw Creek Pattern appears to represent more intensive occupation of the southern Cascade region than the previous period as well as new artifact assemblages, which may reflect the migration of ancestral Yokuts and Miwok into the southern Cascades. The Whiskeytown Pattern appears to represent a shift in settlement and subsistence strategies in the Redding area. The Tehama Pattern appears to be associated with the appearance of the bow and arrow in the region, and is thought to reflect a mobile settlement/subsistence strategy that exploited multiple environments. The Augustine Pattern, Redding Aspect is associated with the prehistoric Wintu, is highlighted by the establishment of permanent villages along the banks of rivers, and a subsistence pattern that is orientated toward riverine resources and acorn processing. Others have proposed revised cultural chronologies; the refinement of these schemes integrate various regional chronologies and research frameworks. In summary, archaeological research in the northern Sacramento Valley and surrounding area has provided cultural chronologies for the area and other information regarding its use and occupation by Native American populations, but questions persist regarding the chronologies, patterns of prehistoric settlement, and subsistence in the region.

Ethnographic Overview

Prior to the arrival of Euroamericans in the region, California was inhabited by groups of Native Americans speaking more than 100 different languages and occupying a variety of ecological settings. The Project location is within or near the ethnographic territory of the Madesi, Itsatawi, and Atsugewi Bands of the Pit River Tribe. Ethnographic and historic records indicate that there were villages associated with these groups in the general vicinity of the Project Site. See **Figure 3.6-1**, *Pit River Tribe Ancestral Boundary*.

Achumawi (meaning River People), also known as the Pit River Indians, have traditionally inhabited areas of Shasta County in northeastern California from southern Goose Lake in the north to Eagle Lake in the south and from the Warner Range in the east to Mount Shasta in the west, including a large segment of the Pit River drainage. Achumawi along with the Atsugewi dialect form the Palaihnihan language family that is part of Hokan stock. Achumawi comprise several bands that function as autonomous political units.

Atsugewi have traditionally inhabited the territory adjacent to the southern boundary of the Achumawi on the north and extending to Mount Lassen on the south. The village is the basic autonomous political unit of the Atsugewi.



SOURCE: Shasta County Department of Public Works

Fountain Wind

Figure 3.6-1
Pit River Tribe Ancestral Boundary

D170788.00 - Shasta County-Fountain Wind\05 Graphics-GIS-Modeling\Illustrator

ESA

Yana, also known as the Redding Rancheria, traditionally inhabited the Upper Sacramento River Valley and foothills east of the river. On the east, Yana territory encompasses the upper Deer Creek drainage through the upper Battle, Cow, and Montgomery Creek drainages. Yana speak a Hokan language, and comprise several bands that function as autonomous political units. Much of what is known about Yana culture was provided by Ishi, a Yahi Yana, who was brought to the University of California in 1911 after his family group died and he was left alone to survive.

Technology and subsistence strategies of the Achumawi, Atsugewi, and Yana are relatively similar. However, subsistence strategies (e.g., use of various plants and animals) do vary among the three groups because of access to different plant and animal habitats in their individual territories. Achumawi, Atsugewi, and Yana remain active in their communities and retain strong interests in the management and protection of their heritage and natural resources in the area encompassing the Project Site.

Historic Overview

The expedition of Peter Skene Ogden across the northern Sacramento Valley in 1827–1828 is probably the earliest encounter between Native Americans and Euroamericans in the general area of the Project Site. Succeeding expeditions of Euroamerican explorers and fur trappers brought foreign diseases that took a huge toll on the Native Americans in northern California. In 1846, Mexico granted Pearson B. Reading the 26,000-acre San Buenaventura land grant, also known as Rancho Buenaventura, and Native Americans soon found themselves in competition for resources with settlers who were rapidly moving into the area. In 1848, Reading discovered gold in Clear Creek and his discovery caused an influx of large numbers of gold-seekers to the area. A community named Horsetown located west of present day Redding, quickly grew up around Reading's discovery site, which was also called Reading's Bar or Clear Creek Diggings. The initial dramatic growth of mining and miners in the area was relatively short lived and mining operations declined and eventual stopped. The decline and cessation of mining forced landowners and other residents to turn to other industries to survive. Agriculture, primarily cattle ranching and logging, became the alternatives of choice in the area. Elias Anderson, one of Shasta County's first settlers, purchased the American Ranch in 1856. His original land holdings are approximately the center of present-day Anderson.

The Project vicinity is associated with the development and growth of logging in Shasta County. A sawmill was constructed on the top of Hatchet Mountain in 1872 and an associated flume (known as the Terry Lumber Flume) ran from the sawmill to eventually, the community of Bella Vista through the area of Buzzards Roost. By 1872, the area around Hatchet Mountain was being logged with timber being transported from the area via a 5-mile-long flume. The flume carried rough cut lumber from a mill on Hatchet Mountain to Bella Vista for final processing at Enright's lumber mill. Bella Vista expanded around and along with Enright's logging and milling operations. Flume tender houses were built on stilts level with the flume along the route. These houses were occupied by flume tenders and their families.

In 1897, Joseph Terry took over Enright's holdings, including the flume, and operated the business until 1919 when it and the flume were closed due to financial problems. In 1920, the business was purchased by the Red River Lumber Company, which only remained in business for two years. The

flume, however, continued to and is still known as the Terry Lumber Flume. The only known existing piece of the flume is located at the Shasta College Museum and Research Center in Redding. The Terry Lumber Company also built a railroad system across its holdings. The railroad system connected with a branch of the Central Pacific and subsequently the Southern Pacific Railroad at Bella Vista. The railroad system facilitated the transportation of timber and timber products from sites of more remote logging operations to local mills and eventually to Redding.

The growth and development of the northern Sacramento River Valley and surrounding area between the 1870s and 1880s is highlighted by the founding of the City of Redding in 1872. The city was named in honor of Benjamin B. Redding, a land agent for the Central Pacific Railroad Company. The town was rechristened "Reading" in 1874, to honor the early pioneer Pierson B. Reading, but the railroad would not recognize the name change. Consequently, the original name, Redding, was restored in 1880. Redding was located at the end of the Central/Southern Pacific railroad line until 1883, when the line was extended further north. Redding was incorporated in 1887 as the first municipality in Shasta County and became the county seat in 1888. By 1910, the city had a population of 3,572 that was supported by a significant mineral extraction industry, principally copper and iron. With the decline of these industries, the population dramatically dropped by 1920, but by 1930 the population was recovering and then boomed during the 1930s with the construction of Shasta Dam. The building of the dam, which was completed in the 1940s, caused the population to nearly double by 1940. Logging was an industry in the area since the Gold Rush, but in the late 1940s it expanded in the area and joined agriculture and mining as an important regional industry. From the 1950s to the 1960s, Redding continued to grow with the expansion of the lumber industry, the building of Whiskeytown and Keswick Dams, and the completion of Interstate 5. Logging continues to be an important business in the area today, but tourism also has become a thriving business centered on places such as Shasta Dam and Lake, Whiskeytown Reservoir, Shasta State Historic Park, Lassen Volcanic National Park, and McArthur Burney Falls State Park.

Existing Conditions

To identify the presence or absence of potentially significant cultural resources in the ADI and Study Area that could be considered a historical resource, unique archaeological resource, or tribal cultural resource for the purposes of CEQA, a California Historical Resources Information System (CHRIS) record search, a desktop review of historic-era documents, and a field survey of the proposed ADI were conducted.

Background Research

Personnel conducted a records search at the Northeast Information Center (NEIC) of the CHRIS on September 13, 2017 (NEIC File No. D17-150) to obtain and review previous cultural resource records, cultural resource studies, and any additional documentation pertaining to properties located within a 0.25-mile extent of the ADI. In addition to conducting a record search at the NEIC, historical maps, aerial photographs, and literature were reviewed to determine past land use activities within and surrounding the Study Area that could indicate the likelihood of encountering cultural resources. The results indicate the entire area had been previously studied and 64 previously recorded cultural resources are located within the ADI and within a 0.25 mile of the ADI.

Survey Effort

Between January 17 and September 20, 2018, and October 7 and November 3, 2019, Stantec archaeologists, led by three Secretary of the Interior-qualified archaeologists, conducted six rotations of pedestrian field surveys of the original and revised Project Site. The final Project Site encompassed 4,463 acres of private property. The entire 4,463-acre Project Site was subject to analysis as part of this inventory. The majority (80 percent) of the Project Site was inventoried by archaeologists walking linear transects at an interval not more than 15 meters (m) apart. Areas of extreme slope (defined as greater than 30 percent) or impassable vegetation were considered unsafe to inventory at the set transect interval. These areas (20 percent) were inventoried by walking established safe paths downslope where possible and inspecting adjacent areas visually. If the crew encountered topographical features considered sensitive for cultural resources, such as springs, drainages, or rock outcrops, those features were thoroughly inspected by the individual encountering them when this was safe to do so. No subsurface testing was undertaken in the course of this survey. Areas with limited ground visibility were inspected using a combination of visual inspection of rodent burrows, road cuts, and periodic removal of vegetation cover by the surveyors (done at a frequency of about every 25 meters on a given transect) using shovel and/or boot scrapes. If sites were identified in areas with limited to no surface visibility a visual inspection of boot scrapes, rodent burrows, road cuts, and topography was implemented to determine site boundaries.

The purpose of the Phase I pedestrian surface survey was to inspect the Project Site for cultural resources such as chipped stone (obsidian, chert, and basalt) flakes and tools (e.g., projectile points, knives, scrapers, flake tools), shellfish remains, ground stone, fire-affected rock, and other indicators of prehistoric archaeological resources. The field surveyors also inspected the Project Site for evidence of historic-era archaeological resources, such as surface scatters of logging, and farming or domestic type artifacts (e.g., glass, ceramic, metal), as well as features such as alignments of stone or brick, foundation elements from previous structures, minor earthworks, and historic plantings (e.g., old fruit, nut, or other types of trees and ornamental plants). Certain site types were identified as likely to occur in the Project Site. Because most of the Project Site is located on ridgetops, prehistoric sites are most likely to occur as surface expressions of artifacts associated with subsistence and resource extraction activities. The types of artifacts that might be present include cutting tools and groundstone artifacts associated with seed, nut, and root/tuber collection and processing, as well as projectile points and flake tools associated with capture and butchery of terrestrial fauna. Historic site types could include logging related artifacts and features in forested areas and ranching related features including, barns, houses, roads, corrals, fences, water conveyance features, improved spring areas, livestock loading and unloading (chutes and corrals), and feeding and salt lick sites.

Twelve newly discovered cultural resource sites were recorded on Department of Parks and Recreation (DPR) 523 forms using iPads and paper field notepads. Site recordation included photographic documentation and Global Positioning System (GPS) data, including site area boundary polygons, sketch maps, and location maps. Site boundaries were recorded up to 30 meters beyond the Project Site boundary. Twelve newly-discovered cultural resource sites were distinguished from isolated finds based on density of artifacts per unit area. Artifact concentrations greater than three artifacts within a 10-square-meter area were recorded as sites. All new identified artifacts received an artifact photograph and GPS location, with a distance and

bearing to the site datum. Previously recorded cultural resources were revisited and a continuation sheet documenting any changes was completed. The cabin noted during scoping was not identified during the survey effort. Isolated finds were recorded using a DPR 523 series Primary Record form, including a photograph and a GPS location.

Inventory Results and Evaluations

Stantec archaeologists revisited and updated 8 previously recorded cultural resource sites and recorded 12 newly discovered cultural resource sites in the ADI. Additionally, the crew identified and recorded 24 isolates in the ADI.

FOU0919-1-1

This site consists of two features located approximately 5 meters north of a wetland area. Feature one is a possible collapsed structure and includes a board scatter and tin siding. Feature two is a wooden plank dam and reservoir. Several faunal bones were found in the vicinity. The survey crew was unable to fully record this site due to safety concerns from the deteriorated condition of the resource. This resource is an unassociated habitation debris with undiagnostic artifacts. This site is likely associated with historic logging or hunting located throughout the area.

FOU0919-2-14

This site consists of an irregular mound, approximately 3 feet high with a circumference of 90 feet and is most likely a yarder mound.[2] The site is located adjacent to a dirt access road in a wooded area. The area is heavily disturbed by modern logging activity. The mound has been heavily disturbed.

FOU0920-2-1

This resource consists of a small can scatter located south of an access road under a transmission line. Artifacts observed include three tin cans, two of which have puncture holes and one is a hinge top. Miscellaneous metal parts also were observed. The site measures 50 feet north/south by 10 feet east/west. The area has been heavily disturbed by the access road.

FOU0922-1-1

This site consists of a small concentration of historic debris located on the north side of Goat Creek Road. The artifacts have been dispersed throughout the area by the construction of a road cut. Artifacts include logging cable, a metal car part, concrete base with iron pipe attached, a metal can, and a crushed metal bucket. The site measures 10 feet by 10 feet.

FOU0923-1-2

This site consists of a small historic trash scatter located on the western side of Supan Road. Artifacts observed include eight fuel cans, one small oil reservoir, one crushed metal bucket, two metal oil cans, and one small metal gas can. The site measures 100 feet north/south by 10 feet east/west. A metal car part is located in the northern portion of the site with no other diagnostic elements.

[2] A yarder is a machine or system of winches used to haul logs onto a landing.

FOU1015

This resource consists of historic debris and features measuring 85 feet north/south by 100 feet east/west located directly south of 270P Access Road. Feature 1 is a yarder mound measuring 94 feet east/west by 45 feet north/south. Feature 2 is a rail segment measuring 13 feet long. Feature 3 is a linear ditch running northeast/southwest and measuring 14 feet long. Associated artifacts include a logging cable.

FW 03

This is a small historic refuse scatter in a cleared-out forest plantation. The inventory includes one "Bayer Aspirin" tin, one vegetable can, four sanitary cans, one "Kerr Mason" jar lid, various assorted brown and clear glass fragments, two modern bottle caps, and one clear glass jar with screw top and a maker's mark "40 57."

FW 06

This site consists of historic debris located within a transmission line corridor. Artifacts include a barrel hoop, tobacco can, and a railroad spike. One obsidian flake also was observed; it was recorded as an isolated find.

FW 09

This site consists of a small historic refuse scatter located within a transmission line corridor. Artifacts include steel cable and two sanitary cans.

FW 11

This multicomponent site consists of a lithic scatter and other prehistoric loci, and historic logging artifacts. The prehistoric (within the primary lithic scatter) cultural resources include four primary, seven secondary, and 12 tertiary grey-black fine grain basalt flakes, as well as two primary, one secondary, and eight tertiary black obsidian flakes. There is also one basalt core fragment and two flake tools consisting of a secondary basal flake tool with a serrated margin and a black obsidian overshot flake tool with two working margins. One working margin is along an edge of the flake extending from the striking platform and the other working margin is along the distal end of the tool where the flake was cleaved off the edge of a previously form flaked tool.

Outside of the primary scatter, three additional resources were observed that are most likely associated with this site. The first prehistoric locus of artifacts is located approximate 77 meters northwest of the primary lithic scatter and consists of a handstone located on a small terrace east of a drainage that runs downhill into the riparian area in which the primary site is located. Fragments of basalt from the same material in the primary site (possibly flaked) also were found in the drainage.

The second locus of prehistoric artifacts is located across the riparian area 52 meters south of the datum along the edge of a mixed conifer forest and on the north side of an unimproved access road. Though this is outside the primary lithic scatter, low visibility in the marshy meadow between these two resource locations may have additional cultural materials that link the two sites. Resources in this area include one black obsidian biface fragment, proximal end; four tertiary black obsidian

flakes; and one secondary and two tertiary fine grain basalt flakes. Additional historic resources in this area include one segment of logging cable, one colorless clear glass bottle body fragment, one slightly crushed 55-gallon fuel drum, and one choker cable fragment.

The third locus consists of one tertiary grey-black fine grain basalt flake and one tertiary black obsidian flake located 34 meters southeast of the primary lithic scatter in the south side of the riparian area. These flakes are also 51 meters east of the resources in locus 2.

Additionally, historic artifacts in this area include the remains of a rusted chain saw chain, and a non-diagnostic fragment of iron metal sheeting.

FW 12

This is a historic refuse scatter consisting of multiple fragments of white earthenware. Some fragments are crazed, or covered in a web of cracks. Fragments appear to be part of a larger serving plate, possibly all from the same plate. One fragment has a partial makers mark that cannot be identified. Ferrous metal fragments from cans and other domestics are also present. Most are crushed and twisted beyond recognition but appear to be from sanitary cans. Two hole-in-cap lids found (base missing).

FW 13

This site consists of a diffuse historic refuse scatter on a slightly southwest sloping terrace in a mixed conifer woodland. Artifacts include fragments of ferrous metal from crush sanitary cans. Three large hole-in-cap can tops were visible (although the bodies were crushed). One small hole-in-cap sanitary can, also crushed, was observed. Additional artifacts include three fragments of whiteware with medium grain white paste and clear glaze (two vessels), as well as one fragment of a steel knife (partial blade and handle only). Ground visibility at the site is 25–75 percent. The site is 60 feet north/south by 43 feet east/west.

P-45-001986

This site was originally recorded in 1992 consisting of a historic railroad logging camp along a railroad grade. The linear feature is part of the larger P-45-002025 resource (described below). Three features associated with structures were identified and recorded. Associated artifacts include glass, ceramic, and metal. Some artifacts were collected at the time of the recording. On September 20, 2018, Stantec relocated the site. Feature 2, a 15-foot by 20-foot rectangular pit with an earthen berm, was identified. Features 1 and 3 were not relocated. Artifacts associated with the camp were relocated, including barrel hoops, braded cable, nails, cast iron stone part, can fragments, and brown glass fragments.

P-45-001988

This site was recorded in 1993 as a historic-era railroad logging camp. One concrete pad and hearth, two earthen mounds, and a concentration of artifacts scattered over the northeast portion of the site consisting of more than 200 cans. Some artifacts were collected at the time of the 1993 recording. On October 12, 2018, Stantec archaeologists relocated the site. Two possible privy pits and linear ditch depressions were observed. Artifacts included a can scatter, milk glass jar, metal stove parts, logging cables, brown glass fragments, and metal strips. The site extends into P-45-0001989.

P-45-001989

This site was originally recorded in 1993 and consists of a 90-meter north/south by 65-meter east/west historic-era resource. The site consists of the remnants of logging operations and associated artifacts. Some artifacts appear to have been collected at the time of the 1993 recording. Historic debris is present in between the original site boundaries for P-45- 001988 and P-45-001988. These resources are likely one larger site.

P-45-002014

This resource was originally recorded in 1992 as a logging camp with log chutes, loading decks, numerous structures and associated artifacts. The 2018 Stantec visit relocated datum B, a large stump with cable wrapped around it; Feature F12, a large structure flat that does not match its original configuration because its edges eroded away distorting its shape and creating a gradual slope along its edges; a large, diverse artifact scatter; railroad grade segments; twisted cable; butchered bone; condensed milk cans; steel pipe; sheet metal; barrel hoop straps; white improved earthenware; and a heating apparatus. Other features previously recorded, including structures and chutes could not be relocated. The resource has been heavily disturbed and impacted by recent logging, fire, road maintenance, and erosion.

P-45-002025

This resource is the historic-era remains of the Terry Mill Railroad Logging System consisting of through cuts and fills located in various locations. On September 19, 2018, Stantec field crew visited a previously recorded segment of P-45-002025. From the intersection of P Line and T Line road, traveling approximately 2,400 feet west along P Line road, P-45-002025 railroad grade has been destroyed by modern logging activity within the last 5 years. A berm segment follows the railroad grade and has been heavily disturbed by modern logging, including a recently abandoned logging road. The berm is composed of soil and is partially covered in vegetation. Two metal fragments are associated with the berm. To the south, there is a seasonal stream that seems to be a result of a modern erosion control ditch at the east end of the berm. Other sections of the railroad grade were unobserved and likely completely obliterated.

P-45-002939

This resource consists of the 230-kV Transmission line, including towers and lines. This segment runs from the town of Burney to the Cottonwood Substation in Cottonwood, California. Stantec's field crew revisited this resource during survey efforts. This resource remains unchanged since its original recording in 1999.

P-45-003068

On January 19, 2018, Stantec field crews visited P-45-003068. This resource originally was recorded as a yarder mound measuring 1.5 meters tall, 6 meters wide, and 40 meters long. Road 200T bisects the mound. The resource was relocated and is relatively unchanged.

P-45-003069

On September 23, 2018, Stantec field crews attempted to visit P-45-003069. This resource was originally recorded as a water conveyance system. Specifically, a ditch measuring approximately 0.33 meters deep and 0.66 meters wide. The crew failed to relocate this resource.

Newly Recorded Isolates

A total of 24 isolates were identified. Isolated finds can be prehistoric or historic and consist of one to three artifacts. Less than three artifacts in an area 30 meters or less in diameter with a distance of 30 meters from any other site or artifact constitutes an isolate. Isolates are not considered a prehistoric or historic site because of their inability to provide useful data beyond their identification and documentation. Isolates do not qualify for listing in the California Register of Historical Resources (California Register) according to Public Resources Code Section 21083.2(h); therefore, they are not considered historical resources for the purposes of CEQA. These resources may be considered tribal cultural resources and a component of a tribal cultural landscape as described in the tribal cultural resources section below.

Evaluation of Cultural Resources

Based on the recordation and archival research of the cultural resources identified in the ADI, all of the resources (except the prehistoric component of FW 11, see below) are recommended not eligible for listing in the California Register. Historical information was used to evaluate the resources under California Register Criteria 1, 2 and 3 (described in Section 3.6.1.3, *Regulatory Setting*). The resources included typical features of historic and modern logging operations, refuse deposits, transmission lines, and railroad features, and do not contribute to broad patterns of history in Shasta County, California, or the United States. In addition, the resources generally cannot be associated with a specific person or company, do not have a direct association with a household or workspace, and cannot be associated with a specific group of people. As a result, the resources are recommended as not eligible for listing in the California Register under Criteria 1 or 2. The resources do not represent the distinctive characteristics of a type, time period, or methods of construction; nor do they possess high artistic value or represent significant and distinguishable entities whose components lack individual distinction. The resources are recommended as not eligible for listing in the California Register under Criterion 3. There is no evidence to suggest that the resources would yield information important to history and prehistory, and recording of the resources and archival research has essentially exhausted the data potential for the resources to address research questions. The resources are recommended as not eligible for listing in the California Register under Criterion 4.

Table 3.6-1*, Cultural Resources in the ADI,* provides a summary of the cultural resources and evaluations in the ADI.

Evaluation of Prehistoric Component of FW 11

Stantec conducted an evaluation of FW 11 through a review of ethnographic and ethnohistorical data and through analysis of field investigation. The ethnographic and ethnohistorical data was used to examine the eligibility of the site under California Register Criteria 1, 2 and 3. The field investigation was used to gather data to assess the potential of the site to include buried cultural deposits and its ability to yield data important in prehistory. This prehistoric site consists of a possible flaked stone tool manufacturing site and contains identified flaked stone tools.

TABLE 3.6-1
CULTURAL RESOURCES IN THE AREA OF DIRECT IMPACT

Primary #	Trinomial or Other Identifier	Type	Eligibility[1]	In ADI
P-45-001986	CA-SHA-1986-H	Historic railroad logging camp and railroad grade	Not eligible	Yes
P-45-001988	CA-SHA-1988-H	Railroad logging camp and railroad grade	Not eligible	Yes
P-45-001989	CA-SHA-1989	Historic debris	Not eligible	Yes
P-45-002014	CA-SHA-2014-H	Historic logging camp	Not eligible	Yes
P-45-002025	CA-SHA-2025-H	Historic Terry Mill railroad grade	Not eligible	Yes
P-45-002939	---	Transmission line	Not eligible	Yes
P-45-003068	---	Historic yarder mound	Not eligible	Yes
P-45-003069	---	Water conveyance system	Not eligible	Yes
---	FOU0919-1-1	Historic debris	Not eligible	Yes
---	FOU919-2-14	Yarder mound	Not eligible	Yes
---	FOU0920-2-1	Can scatter	Not eligible	Yes
---	FOU0922-1-1	Historic debris	Not eligible	Yes
---	FOU0923-1-2	Historic debris scatter	Not eligible	Yes
---	FOU1015	Historic logging equipment	Not eligible	Yes
---	FW 3	Historic debris	Not eligible	Yes
---	FW 6	Historic debris and isolated lithic	Not eligible	Yes
---	FW 9	Historic debris	Not eligible	Yes
---	FW 11	Multicomponent lithic scatter / historic debris	Prehistoric component eligible. historic component, not eligible	Yes
---	FW 12	Historic debris	Not eligible	Yes
---	FW 13	Historic debris	Not eligible	Yes

NOTE:
[1] Stantec 2019

Research into the ethnographic use of this area did not result in any information that tied this site to any particular event in the past and there was no indication of the site being associated with any person or group important in the past. Thus, the site is recommended as not eligible for listing in the California Register under Criteria 1 and 2. It does not embody the distinctive characteristic of a type, period or method of construction and does not represent the work of a master (e.g., the artifacts are not temporally sensitive); nor does it possess high artistic value or represent a significant and distinguishable entity whose components lack individual distinction. The site is recommended as not eligible for listing in the California Register under Criterion 3.

To examine the site's California Register eligibility under Criterion 4, the first step is to determine if there are cultural deposits that have depositional integrity. This is the basis for looking at the ability of the data contained within a site to address research questions about the past. Though no archaeological excavation was conducted at this site, the presence of a variety of lithics and tools

indicate that there is a possibility to yield additional information in prehistory beyond the existing documentation of the site. Based on these observations, the site is recommended eligible for listing in the California Register under Criterion 4.

Based on the evaluation presented above, the prehistoric component of FW 11 qualifies for listing in the California Register and is therefore considered a historical resource for the purposes of CEQA. See discussion b) in Section 3.6.3.2 for consideration of impacts and proposed mitigation measures for this historical resource.

Tribal Cultural Resources

Stantec requested a Sacred Lands Search (SLS) for the project from the Native American Heritage Commission (NAHC) on September 17, 2017. The purpose of the search was to ascertain whether there are resources or locations that may be of importance to Native Americans who have traditionally resided in the area encompassing the Project Site. The SLS search was conducted as part as the cultural technical report and is not considered to be consultation pursuant to Assembly Bill 52. On September 19, 2017, NAHC responded, stating that a review of their files yielded positive results for sacred lands located within the Project vicinity. NAHC also provided the contact information for several local tribes who may have additional information. Stantec contacted these tribes by letter on November 29, 2018.

Shasta County sent notification letters to tribes on December 8, 2017; however, no tribe requested Assembly Bill 52 consultation within the 30-day time limit. The Initial Study was published on April 6, 2018, with a paragraph noting that Assembly Bill 52 consultation had not been timely requested.

A response letter from the Greenville Rancheria was received by Stantec on December 31, 2018; the tribe has no comments or objections to the Project. On January 4, 2019, a response letter from the Pit River Tribe was received requesting formal consultation. This letter was included in the final technical report submitted to the County. In 2019, the Applicant reduced the Project size from 100 turbines to 72 turbines. Following this reduction in size, Stantec resubmitted a SLS request to the NAHC on October 29, 2019. NAHC's responded on November 13, 2019, stating that a review of their files yielded positive results. NAHC also provided contact information for several local tribes who may have additional information. On November 15 and November 20, 2019, Stantec sent letters by Certified Mail to the contact list provided by NAHC as well as the contact list provided to the Applicant by the California Department of Forestry and Fire Protection (CAL FIRE). Certified Mail receipts were returned for all mailings. Stantec conducted follow-up telephone calls to all of the listed contacts on December 4, 2019. These tribes included: The Pit River Tribe, Wintun Educational and Cultural Council, Nor-Rel-Muk Wintun Nation, Redding Rancheria, Shasta Nation, Winnemem Wintu Tribe, and Wintu Tribe of Northern California. The Pit River Tribe responded to the follow up phone call on December 4, 2019, stating that they would like to continue to discuss the Project and would like to schedule an in-person meeting. The Nor-Rel-Muk Wintun Nation representative responded to the follow-up phone call and stated that the Project was outside of the organization's traditional territory. The Nor-Rel-Muk Wintun Nation indicated interest in what, if any, artifacts are found, but deferred coordination to the Pit River Tribe. No other tribes responded to the Applicant's outreach efforts.

Coordination with the Pit River Tribe during the Hatchet Ridge Project identified Hatchet Ridge–Bunchgrass Mountain, which is located outside the leasehold area, as a culturally significant site, particularly to the Itsatawi and Madesi bands, and possibly the Atsuge, whose traditional territories are separated by Hatchet Ridge (Tiley, 2007; Appendix C in Shasta County, 2007). Hatchet Ridge–Bunchgrass Mountain figures importantly in the lives of the Pit River Tribe. For example:

- Hatchet Ridge (located outside of the Project Site) served as a major transportation corridor for the Pit River Tribe.
- Bunchgrass Mountain (located outside of the Project Site) is used as basketry collection locality.
- Wildlife that are traditionally important to the Pit River Tribe cross Hatchet Ridge (located outside of the Project Site) or use it as a migration corridor.
- Hatchet Ridge and Bunchgrass Mountain (both located outside of the Project Site) contain power places. Power places are important locations to the Pit River Tribe because it is at power places where people can obtain power for healing, doctoring, and other purposes.
- The Pit River Tribe used the Hatchet Ridge–Bunchgrass Mountain route to travel between portions of the Pit River drainage and Goose Valley. A feature labeled "Indian Trail" is mapped on a historic survey plat as extending from the eastern edge of Hatchet Ridge into Goose Valley (General Land Office, 1879). Because it was a major foot route out of the Pit River Canyon, people were sometimes carried along this way for burial, and may have been buried trailside in the case of inclement weather. This ridge was also traveled to reach a small lake just to the east, where traditional doctors made vision quests. Hatchet Ridge is presently used by Pit River Tribe members to travel to Bunchgrass Mountain to gather basketry materials (e.g., redbud, bear grass, willow) and huckleberries. It is possible that a portion of this trail is located within the Project Site.

Additional coordination with the Pit River Tribe identified several potential tribal cultural resources that may be located within or near the Project Site (Stantec, 2020b). These include:

- Unspecified locations of ethnographic trails and quarries;
- Unspecified locations of ancestral burial grounds;
- Unspecified areas where medicinal herbs were gathered;
- Views of Yet-Tey-Cha-Na (Lassen Peak) and Kohm Yamani (Snow Mountain) from ancestral lands through the Project Site; and
- Wildlife that are traditionally important to the Pit River Tribe may occur throughout the Project site;

In addition, the prehistoric component of FW 11 has been recommended eligible as a tribal cultural resource (see description and evaluation above).

Input from Tribes during the scoping process and during meetings between the Tribes and the Applicant note that natural and cultural resources are indistinguishable from the Pit River Peoples and are a central element of the spirituality, traditional ceremonial practices, religious

expressions, history, and identity of the Tribe and Tribal members. Tribal members explain that the Tribe and its nation have deep ties to the area, which they describe as a place of refuge, ceremony, healing, prayer, fasting, hunting, gathering, and other sacred traditional uses. Tribal members indicate that burial grounds are believed to present in the Project Site. Tribal members expressed concern that the construction, operation, and maintenance of the Project could infringe on the freedom of religion and the cultural practices of the Pit River Tribe and other Indian Tribal Nations in the region and that the Project could adversely affect sacred sites, traditional plants, and the viewshed of mountains held sacred by the Tribe including Yet-Tey-Cha-Na (Lassen Peak) and Kohm Yamani (Snow Mountain). An old ridgetop trail that connects the Pit River to Goose Valley to the Lassen area and has traditionally been, and continues to be, used to reach remote areas during vision quests may be located within the Project Site. The ridge also is identified as a boundary between the Itsatawi, Madesi, and Atsugewi Bands. Birds traditionally important to the Pit River culture (such as eagles and eagle nests, osprey, ducks, and geese) cross the ridge and could be injured or killed by the turbine blades. Deer also migrate across the ridge. Commenters suggest that sounds generated by the Project could disrupt bird and animal patterns, as well as human experiences in the area. Existing conditions identified in comments as contributing to ongoing impacts to tribal cultural resources include burdens from power generating activities associated with the Hatchet Ridge Wind Project, power lines, dams, and PG&E hydroelectric activities (Appendix J).

These resources collectively contribute to a potential tribal cultural landscape. In addition, the resources described above are potential tribal cultural resources for the purposes of the CEQA analysis.

3.6.1.3 Regulatory Setting

Federal

Although federal laws address cultural and tribal cultural considerations (including, but not limited to, the National Historic Preservation Act, Archaeological Resources Protect Act, and Native American Historic Resource Protection Act), there is no federal nexus to this Project. Accordingly, there are no federal regulations that apply to the Project with respect to Cultural or Tribal Cultural Resources.

State

California Register of Historical Resources

The California Register is “an authoritative listing and guide to be used by state and local agencies, private groups, and citizens in identifying the existing historical resources of the state and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change” (Pub. Res. Code §5024.1[a]). Certain resources are determined by the statute to be automatically included in the California Register, including California properties formally determined eligible for, or listed in, the National Register of Historic Places (National Register).

To be eligible for the California Register, a historical resource must be significant at the federal, state, or local level under one or more of the following criteria (Pub. Res. Code §5024.1[c]):

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
2. Is associated with the lives of persons important in our past.
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
4. Has yielded, or may be likely to yield, information important in prehistory or history.

"Integrity" is the authenticity of a historic resource's physical identity as shown by the survival of characteristics that existed during the period of significance. For a resource to be eligible for the California Register, it also must retain enough integrity to be recognizable as a historic resource and to convey the reasons for its significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association. A resource that does not retain sufficient integrity to meet the National Register criteria may still be eligible for listing in the California Register.

California Public Resources Code and Tribal Cultural Resources

In 2014, the California Legislature enacted Assembly Bill (AB) 52, which added provisions to the Public Resources Code regarding the evaluation of impacts on tribal cultural resources under CEQA, and requirements to consult with California Native American tribes as defined in Government Code Section 65352.4. In particular, AB 52 requires lead agencies to analyze project impacts on "tribal cultural resources" separately from archaeological resources (Pub. Res. Code §§21074 and 21083.09). AB 52 defines "tribal cultural resources" in Public Resources Code Section 21074 and requires lead agencies to engage in additional consultation procedures with respect to California Native American tribes (Pub. Res. Code §§21080.3.1, 21080.3.2, and 21082.3).

A "tribal cultural resource" is defined in Public Resources Code Section 21074 as either a site, feature, place, or cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

1. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k); or
2. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in Public Resources Code Section 5024.1(c). In applying the criteria set forth in Section 5024.1(c), the lead agency shall consider the significance of the resource to a California Native American tribe.

California Public Resources Code Sections 5097.98 and 5097.99

Public Resources Code Section 5097.98 (reiterated in CEQA Guidelines §15064.5[e]) identifies steps to follow in the event of the accidental discovery or recognition of any human remains in

any location other than a dedicated cemetery, including notification of the most likely descendent. Section 5097.99 prohibits obtaining or possessing any Native American artifacts or human remains that are taken from a Native American grave or cairn (stone burial mound).

California Health and Safety Code Section 7050.5

Health and Safety Code Section 7050.5 protects human remains by prohibiting the disinterment, disturbance, or removal of human remains from any location other than a dedicated cemetery.

Forest Practice Act of 1973

The Z'Berg-Nejedly Forest Practice Act of 1973 (Pub. Res. Code §§4511–4360.2) and its implementing regulations, the Forest Practice Rules (14 Cal. Code Regs. §895 et seq.), govern the management of privately owned forestlands in California, including with respect to the protection of archaeological and historical resources. See, for example:

- Rule 949 Statement of Purpose (14 Cal. Code Regs. §949)
- Rule 949.2 Protection Measures for Plans and Emergency Notices 3 Acres and Larger (14 Cal. Code Regs. §949.2)
- Rule 949.3 Post Review Site Discovery (14 Cal. Code Regs. §949.3)
- Rule 949.4 Archaeological Training Requirements (14 Cal. Code Regs. §949.4)
- Rule 949.5 Site Recording (14 Cal. Code Regs. §949.5)
- Rule 949.6 Protection of Sites During Timber Operations (14 Cal. Code Regs. §949.6)
- Rule 949.7 Determination of Significance (14 Cal. Code Regs. §949.7)

Local

The Shasta County General Plan includes the Heritage Resources Element as authorized by Section 65303 of the Government Code. This Element is intended to identify and protect sites and structures of architectural, historical, archaeological, or cultural significance.

6.10.3 Objective HER-1: Protection of significant prehistoric and historic cultural resources.

> ***6.10.4 Policy HER-a*:** Development projects in areas of known heritage value shall be designed to minimize degradation of these resources. Where conflicts are unavoidable, mitigation measures which reduce such impacts shall be implemented. Possible mitigation measures may include clustering, buffer or nondisturbance zones, and building siting requirements.

3.6.2 Significance Criteria

CEQA Guidelines Appendix G Section V identifies considerations relating to cultural resources. See Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area*, as it relates to the County's analysis of the potential impacts of this Project to cultural resources considerations suggested in CEQA Guidelines Appendix G. Otherwise, for

purposes of this analysis, a project would result in a significant impact to Cultural Resources or Tribal Cultural Resources if it would:

a) Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5;

b) Disturb any human remains, including those interred outside of formal cemeteries; or

c) Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

    i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k), or

    ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in Public Resources Code Section 5024.1(c). In applying the criteria set forth in Public Resources Code Section 5024.1(c), Shasta County, as the CEQA lead agency, has considered the significance of the resource to a California Native American tribe.

3.6.3 Direct and Indirect Effects

3.6.3.1 Methodology

Historic Architectural Resources

Potential impacts on historic architectural resources are assessed by identifying any activities (during either construction or operations) that could affect resources that have been identified as historical resources for the purposes of CEQA. Once a resource has been identified as a CEQA historical resource, it must be determined whether the project's impacts would "cause a substantial adverse change in the significance" of the resource (14 Cal. Code Regs. §15064.5[b]). A substantial adverse change in the significance of a historical resource means "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the historical resource would be materially impaired" (14 Cal. Code Regs. §15064[b][1]). A historical resource is considered materially impaired through the demolition or alteration of the resource's physical characteristics that convey its historical significance and that justify its inclusion in the California Register (14 Cal. Code Regs. §15064.5[b][2][A]).

Where potential impacts on historical resources are identified, CEQA Guidelines §15126.4(b) states that compliance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* will generally reduce potential impacts to a less-than-significant level. In addition, "in some circumstances, documentation of an historical resource … as mitigation for the effects of demolition of the resource will not mitigate the effects to a point where clearly no significant effect on the environment would occur" (14 Cal. Code Regs. §15126.4[b][2]).

There are no impacts to historic architectural resources from the proposed Project.

Archaeological Resources

Archaeological resources can include historical resources according to CEQA Guidelines Section 15064.5, as well as unique archaeological resources as defined in CEQA Guidelines Section 21083.2(g). The significance of most prehistoric and historic archaeological sites is usually assessed under California Register Criterion 4. This criterion stresses the importance of the information potential contained within the site, rather than its significance as a surviving example of a type or its association with an important person or event. Although less common, archaeological resources may also be assessed under California Register Criteria 1, 2, and/or 3.

Impacts on unique archaeological resources or archaeological resources that qualify as historical resources are assessed pursuant to CEQA Guidelines Section 21083.2, which states that the lead agency shall determine whether the project may have a significant effect on archaeological resources. As with architectural resources above, whether the impacts of the project would "cause a substantial adverse change in the significance" of the resource must be determined (14 Cal. Code Regs. §15064.5[b]).

Treatment for archaeological resources could consist of excavation (or data recovery) of a resource, which is restricted to those parts of the resource that would be damaged or destroyed by a project. Excavation is not required for an archaeological resource if the lead agency determines that already completed testing or studies have adequately recovered the scientifically consequential information from and about the resource.

Human Remains

Human remains, including those buried outside of formal cemeteries, are protected under several state laws, including Public Resources Code Section 5097.98 and Health and Safety Code Section 7050.5. Specifically, CEQA Guidelines Section 15064.5(d) requires a lead agency to work with Native Americans to develop an agreement for treating, with appropriate dignity, human remains and any items associated with the burials. Upon discovery of human remains that the County Coroner determines to be Native American in origin, the Native American Heritage Commission identifies the person or persons it believes to be the most likely descendant from the deceased Native American. This analysis considers impacts on human remains including intentional disturbance, mutilation, or removal of interred human remains.

Tribal Cultural Resources

As defined in Public Resources Code Section 21074, a "tribal cultural resource" is a site feature, place, cultural landscape, sacred place, or object that is of cultural value to a tribe that is either on or eligible for the California Register or a local historic register, or that the lead agency, at its discretion, chooses to treat as a tribal cultural resource. Impacts on tribal cultural resources are assessed in consultation with affiliated Native American tribes in accordance with Public Resources Code Section 21080.3. This analysis considers whether the Project would cause a substantial adverse change in the significance of any tribal cultural resources.

Mitigation for impacts to tribal cultural resources is considered in consultation with the culturally affiliated tribe (or tribes) determined and agreed upon during consultation according to Public Resources Code Section 21083.2(b), and can consist of, but is not limited to:

1) Avoidance and preservation of the resources in place, including, but not limited to, planning and construction to avoid the resources and protect the cultural and natural context, or planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
2) Treating the resource with culturally appropriate dignity taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:

   (A) Protecting the cultural character and integrity of the resource.

   (B) Protecting the traditional use of the resource.

   (C) Protecting the confidentiality of the resource.
3) Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.
4) Protecting the resource.

3.6.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines §15064.5.

Impact 3.6-1: The Project could cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5. (*Less than Significant with Mitigation Incorporated*)

This section discusses archaeological resources, both as historical resources according to Public Resources Code Section 15064.5, as well as unique archaeological resources as defined in Public Resources Code Section 21083.2(g).

Based on the results of the cultural resources analysis completed for the proposed Project (Stantec, 2019), 8 previously recorded cultural resources and 12 newly discovered cultural resources were recorded in the ADI and evaluated for significance as historical resources eligible for listing in the California Register. Based on those evaluations, one cultural resource (the prehistoric component of FW 11) qualifies for listing in the California Register under Criterion 4, for its ability to yield additional information in prehistory. The prehistoric component of FW 11 is therefore considered a historical resource for the purposes of CEQA. Project-related disturbance of a historical resource would be a significant impact and could occur, for example, during grading and excavation associated with construction of turbine foundations, pads, or domestic water wells; trenching for the underground electrical collector lines or other below-ground facilities and infrastructure; or the soil borings that would be collected to an approximately 50-foot depth to ensure that the proposed turbine foundations would be stable.

The potential for such impact would be reduced to a less-than-significant level through implementation of Mitigation Measure 3.6-1 (Archaeological Research Design and Treatment Plan). This measure sets forth protocols and procedures for implementing a data recovery program to the provide for the establishment of Environmentally Sensitive Areas; treatment and recovery of important data contained within the portions of the historical resource located within and adjacent to the ADI; construction worker cultural resources sensitivity training; archaeological and Native American monitoring; inadvertent discovery protocols; and provisions for curation or reburial of recovered materials.

Mitigation Measure 3.6-1: Archaeological Research Design and Treatment Plan.

Prior to receiving a County grading permit for the Project, the applicant shall:

1. Relocate Project components to a location that would not potentially impact the known historical resource.

2. If relocation is documented to the satisfaction of the County as infeasible (where "feasible" means "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors" as defined in CEQA Guidelines Section 15364) and the historical resource would potentially be impacted by the Project, design and implement an Archaeological Research Design and Treatment Plan (ARDTP).

The investigation would be completed under the methods and research design outlined in an ARDTP to be prepared in accordance with the California Resources Agency's Guidelines for Archeological Research Designs (California Resources Agency, 1991). A qualified archaeologist (defined as one meeting the Secretary of the Interior's Professional Qualification Standards for archaeology) shall prepare the ARDTP in consultation with the culturally affiliated Native American tribe(s). The ARDTP shall address, at a minimum, the following: the establishment of Environmentally Sensitive Areas; treatment and recovery of important data contained within the portions of the historical resource located within and adjacent to the Project Site; construction worker cultural resources sensitivity training; compensated archaeological and Native American monitoring; inadvertent discovery protocols; and provisions for curation or reburial of recovered materials.

The ARDTP shall include the specific methods that will be employed (e.g., the length and depth of excavation, the type of equipment utilized, the percent of area investigated). The ARDTP shall identify how the proposed investigation would preserve any significant historical information obtained and identify the scientific/historic research questions applicable to the resource, the data classes the resource is expected to possess, and how the expected data classes would address the applicable research questions. The results of the investigation shall be documented in a technical report that provides a full artifact catalog, analysis of items collected, results of any special studies conducted, and interpretations of the resource within a regional and local context. All technical documents shall be placed on file at the North Central Information Center of the California Historical Resources Information System. The results report shall include recommendations for archaeological and Native American monitoring in Environmentally Sensitive Areas and the protocol to follow should additional cultural materials be identified during construction activities.

Significance after Mitigation: Less than Significant.

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b) Whether the Project would disturb any human remains, including those interred outside of formal cemeteries.

Impact 3.6-2: The Project could disturb human remains, including those interred outside of formal cemeteries. (*Less than Significant with Mitigation Incorporated*)

Prehistoric archaeological sites may contain human burials. Based on the background research and surface survey there are no known locations in the Project Site that have been used for human burial purposes and thus no features of the Project would disturb known human remains. However, given the prehistoric archaeological sensitivity of the Project Site, the possibility of encountering human remains cannot be discounted. Additionally, coordination with the Pit River Tribe identified the potential for ancestral burial grounds within the Project Leasehold Area. Project-related disturbance of human remains would be a significant impact and could occur if, for example, grading, excavation, or soil borings associated with construction of facilities and infrastructure.

The potential for such impact would be reduced to a less-than-significant level through implementation of Mitigation Measure 3.6-2 (Inadvertent Discovery of Human Remains). The measure sets forth protocols for responding in the event that human remains are identified during ground disturbing activities, including halting construction, contacting the County Coroner to assess the find, among other appropriate actions (including contacting the most likely descendant).

Mitigation Measure 3.6-2: Inadvertent Discovery of Human Remains.

In the event human remains are uncovered during ground-disturbing activities (including construction, operations and maintenance, and decommissioning), the Project proponent or its contractor shall immediately halt work within a 100-foot radius, contact the Shasta County Coroner to evaluate the remains within 48 hours, and follow the procedures and protocols pursuant to Section 15064.5(e)(1) of the CEQA Guidelines. Health and Safety Code Section 7050.5 requires that no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to Public Resources Code Section 5097.98. If the remains are determined to be of Native American descent, the coroner has 24 hours to notify the Native American Heritage Commission (NAHC). The NAHC will then identify the person thought to be the most likely descendent of the deceased Native American. The most likely descendent will make recommendations for means of treating, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98.

Significance after Mitigation: Less than Significant

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c) Whether the Project would cause a substantial adverse change in the significance of a tribal cultural resource, defined in Pub. Res. Code §21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is (1) listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Pub. Res. Code §5020.1(k) or (2) determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in Pub. Res. Code §5024.1(c).

Impact 3.6-3: The Project would cause a substantial adverse change in the significance of a tribal cultural resource. (*Significant and Unavoidable*)

CEQA requires the lead agency to consider the effects of a project on tribal cultural resources. As defined in Public Resources Code Section 21074, tribal cultural resources are sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are listed, or determined to be eligible for listing, on the national, state, or local register of historical resources.

Based on the background research described in Section 3.6.1.2, *Environmental Setting*, there is a prehistoric archaeological site in the Project Site. The prehistoric component of FW 11 is recommended as eligible for listing in the California Register and, for the purposes of CEQA, is considered a tribal cultural resource. In addition, Native American tribes have identified tribal cultural resources in the Project Site.

Tribal comments include concerns for the "numerous historical sites that are part of the region's Native American heritage…that should be protected and preserved." In addition, requests included that the "significance of known sites should be determined by the local tribal community." Hatchet Mountain, Bunchgrass Mountain and the surrounding other specific mountains and ridges, specifically views of Kohm Yamani (Snow Mountain) and Yet-Tey-Cha-Na (Lassen Peak) are considered to be of great spiritual significance to the Pit River Tribe, especially the Itsatawi, Madesi, and Atsugewi Bands. Tribal elders consider these locations sacred and continue to use numerous important spiritual and cultural sites within the region. Hatchet Mountain, Bunchgrass Mountain, Snow Mountain, and Lassen Peak do not occur within the Project Site and Project activities are not anticipated to have a direct effect to these features; however, indirect effects as a result of Project construction, operation, or decommissioning activities could occur. Other tribal cultural resources in the Project Site include unspecified locations of ethnographic trails and quarries; unspecified locations of ancestral burial grounds; unspecified areas where medicinal herbs were gathered; and wildlife that are traditionally important to the Pit River Tribe. In addition, the prehistoric component of FW 11 has been recommended eligible as a tribal cultural resource.

In the event that construction activities disturb tribal cultural resources, damage would be considered a significant impact. Implementation of Mitigation Measure 3.6-1 (Archaeological Research Design and Treatment Plan) described above, as well as Mitigation Measure 3.6-3 (Tribal Cultural Resources Interpretive Program) would ensure that impacts to tribal cultural resources are recognized. In consultation with the appropriate Native American representatives,

Mitigation Measure 3.6-3 also would provide for access to the area. However, unless a tribal cultural resource can be avoided and preserved in place according to the provisions set forth by Public Resources Code Section 21084.3, direct and indirect impacts to tribal cultural resources would not be reduced to a less-than-significant level and the impact would remain significant and unavoidable.

Mitigation Measure 3.6-3a: Implement Mitigation Measure 3.6-1: Archaeological Research Design and Treatment Plan (described above)

Mitigation Measure 3.6-3b: Coordination with the Pit River Tribe during Project Development.

Shasta County and the Applicant will facilitate a preconstruction meeting and field visit with the Pit River Tribe through the Tribe's chairperson and the Pit River Tribal Historic Preservation Officer to discuss "tribal cultural resources" as defined in Public Resources Code Section 21074 in the Project Site and identify ways to minimize impacts on these locations during construction. The site visit will focus on viewing the location of the Project facilities, describing Project construction and operation activities, and identifying potential cultural significant features.

Mitigation Measure 3.6-3c: Detailed Recordation of Features Considered Culturally Significant to the Pit River Tribe.

The Applicant shall retain a professional ethnographic consultant to undertake a detailed recordation of any locations considered important to the Pit River Tribe. The recordation will commence prior to construction and will include photographic documentation of pre- and post-construction conditions of any identified culturally sensitive location. The information gathered as a result of field, interview, and research tasks will be compiled into a report that will be transmitted to the Pit River Tribe. Detailed recordation of any ethnographic location in this manner will create a photographic and written record of the cultural resource prior to construction of the Project, resulting in partial compensation for Project impacts.

Mitigation Measure 3.6-3d: Cultural Resources Monitoring Program with the Pit River Tribe during Construction.

The Applicant shall offer and provide the opportunity for cultural resource monitors from the Pit River Tribe to monitor initial ground disturbing construction activities in areas identified by the Tribe as culturally sensitive. Monitors will have the authority to ensure that discrete sacred sites in the Project Site are avoided or that impacts on such localities are mitigated to the extent feasible, including but not limited to, avoidance or data recovery (as outlined in Mitigation Measure 3.6-1. Archaeological Research Design and Treatment Plan). The Pit River Environmental Office should coordinate with the appropriate Achumawi bands (Itsatawi and Madesi) to assign monitors.

If the offer is accepted, the Applicant shall provide compensation commensurate with market rates based on the qualifications and experience of the cultural monitor(s). Prior to tendering an offer to the Tribe the Applicant shall provide a copy of the offer to the County for review, including but not limited to the proposed number of monitors to be employed, proposed construction schedule/hours during which monitors would be present on site, proposed level(s) of compensation, and other relevant details of the proposed cultural monitoring program.

Significance after Mitigation: Significant and Unavoidable.

3.6.3.3 PG&E Interconnection Infrastructure

The Project would include interconnection infrastructure as described in Sections 2.4.2 and 2.4.3. These elements would include both overhead and underground collection system and potentially blasting activity to accommodate rocky terrain. Overhead collector systems (rather than trenched construction) would be implemented for stream and wetland crossings, to avoid steep terrain, and for other sensitive resource avoidance areas. Construction of the substation, switching stations, and interconnection components would include up to 19 acres of temporary disturbance, and 13 acres of permanent disturbance (including the footprints of the collector substation, switching station, graveled parking and maintenance areas). Because there are no known historical resources or unique archaeological resources in the area of permanent disturbance, the PG&E Interconnection Infrastructure would cause no impact relating to these considerations. Impacts to tribal cultural resources would be the same as the Project as a whole: significant and unavoidable with the implementation of Mitigation Measure 3.6-3a (implementation of the Archaeological Research Design and Treatment Plan that would be required by Mitigation Measure 3.6-1) and Mitigation Measure 3.6-3b (Tribal Cultural Resources Interpretive Program).

3.6.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, South of SR 299, no turbines would be erected north of SR 299. Thus, Alternative 1 would avoid all impacts to recorded and unrecorded cultural and tribal cultural resources north of SR 299, if any such resources exist. There would be an overall reduced acreage of temporary and permanent disturbance, limited to a footprint defined in a smaller area with fewer turbines compared to the Project. However, as with the Project, Alternative 1 would require implementation of the same mitigation measures to reduce potential direct and indirect impacts associated with known cultural resources, including the prehistoric component of FW 11, which is considered a historical resource for the purposes of this analysis. Impacts to FW 11 would be significant and potentially reduced to a less-than-significant level with implementation of Mitigation Measure 3.6-1. In addition, impacts to tribal cultural resources would remain significant and unavoidable.

Alternative 2: Increased Setbacks

Under Alternative 2, the Increased Setback Alternative, there would be fewer turbines reducing overall temporary (construction-related) and permanent disturbance. Under the Increased Setback Alternative there would continue to be impacts to the prehistoric component of FW 11 and tribal cultural resources, similar to those described for the Project. The overall quantified disturbance area under Alternative 2 would be decreased compared to the Project. Alternative 2 would require implementation of the same protective measures and mitigation as the Project. Impacts to tribal cultural resources would remain significant and unavoidable.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind turbines or associated infrastructure would be constructed, operated and maintained, or decommissioned on the Project Site, and none of the proposed above- or below-ground disturbance would occur. The proposed overhead and underground electrical collector system and communications lines would not be developed; and the meteorological towers, onsite collector substation, switching station, and operation and maintenance (O&M) facility would not be constructed. Laydown areas would not be cleared, no new access roads would be constructed, and no existing roads would be improved. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to cultural resources and to tribal cultural resources.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect relating to cultural or tribal cultural resources. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.6.4 Cumulative Analysis

The geographic scope for cumulative effects on archaeological resources and human remains includes projects in the Study Area (the Project Site and surrounding area that could be affected by visual or use changes on the Project Site) that would also involve excavation or similar ground disturbance in locations with previously recorded or as yet unknown archaeological resources, potentially with human remains. Similar to the Project as described under Impacts 3.6-2 and 3.6-3, cumulative projects identified in Section 3.1.2.1, *Cumulative Scenario*, in the project vicinity could have a significant impact on both recorded and unrecorded archaeological resources (including the prehistoric component of FW 11), including human remains interred outside of formal cemeteries, given the amount of construction-related ground disturbance that could occur for many of the cumulative projects. The potential impacts of the Project when considered together with similar impacts from other probable future projects in the vicinity could result in a significant cumulative impact on archaeological resources and human remains. The proposed Project's contribution to this impact could be cumulatively considerable, as documented above under Impacts 3.6-2 and 3.6-3. Mitigation Measures 3.6-1 and 3.6-2 would require implementation of legally required appropriate treatment of human remains as well as archaeological research and treatment to preserve the scientific value of an archaeological resource. Therefore, with implementation of **Mitigation Measures 3.6-1** and **3.6-2**, the proposed Project's contribution to cumulative impacts to archaeological resources and human remains would not be considerable, and the impact would be *less than significant with mitigation*.

The geographic scope for cumulative effects on tribal cultural resources includes the disturbance areas of past, other present, and reasonably foreseeable future projects within the Tribe's culturally affiliated area (Figure 3.6-1, *Pit River Tribe Ancestral Boundary*). Such projects include, for example, the existing Hatchet Ridge Wind Project, existing utility lines, timber harvest plans, active mining and reclamation projects, and any other projects that could detract from the character-defining qualities of tribal cultural resources that are traditionally important to the Pit River Tribe. Each of these project's incremental impacts would contribute to a significant adverse cumulative impact for purposes of this analysis. The Project's incremental Significant and Unavoidable impact, even with the implementation of Mitigation Measure 3.6-1 (Archaeological Research Design and Treatment Plan) and Mitigation Measure 3.6-3b (Tribal Cultural Resources Interpretive Program), would be cumulatively considerable.

3.6.5 References

California Resources Agency, Department of Parks and Recreation, Office of Historic Preservation (California Resources Agency), 1991. Preservation Planning Bulletin No. 5: Guidelines for Archaeological Research Designs. February 1991.

General Land Office, 1879. Plat map of Township 35 North, Range 2 East. Mount Diablo Meridian.

McDaniels, Brandy, 2018. Letter of Brandy McDaniels, Madesi Band Cultural Representative for the Pit River Tribe, to Bill Walker. February 10, 2018.

Northeast Information Center, California Historical Resources Information System (NEIC), 2017. NEIC File No. D17-150. September 13, 2017.

Shasta County Department of Resource Management (Shasta County), 2007. *Section 3.5, Cultural Resources, of the Draft Environmental Impact Report for the Hatchet Ridge Wind Project.* December 2007.

Stantec Consulting Services (Stantec), 2019. *Fountain Wind Energy Project Cultural Resources Phase 1 Inventory of 4,463 Acres, Shasta County, California.* Prepared for Fountain Wind LLC. December 2019.

Stantec, 2020a. *Addendum 1: Update to The Fountain Wind Energy Project Cultural Resources Phase 1 Inventory of 4,463 Acres, Shasta County, California.* Prepared for Fountain Wind LLC. March 18, 2020.

Stantec, 2020b. *Addendum 2: Updated Cultural Resources Inventory Report: Tribal Coordination and Correspondence.* Prepared for Fountain Wind LLC. March 23, 2020.

Tiley, Shelly, Ph.D., 2007. Consultations with the Pit River Tribe [for the] Hatchet Ridge Wind Project. July 2007.

3.7 Energy

This section identifies and evaluates issues related to Energy in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. The information presented in this analysis is based in part on the modeling results provided in **Appendix B**, *Air Quality and Greenhouse Gas Emissions*.

In response to its notice of intention to prepare this Draft EIR, the County received scoping input about energy efficiency and existing hydropower generation facilities (e.g., Pit #1 through Pit #7; hydropower plants located at Shasta Dam, the Spring Creek Power plant, Judge Francis Carr Powerhouse, Trinity Dam and Keswick Dam; and privately-owned hydropower plants including Balta on Battle Creek, Kilarc on Cow Creek, Hat Creek, Roaring Creek and Haynes Burney Creek). Scoping input also noted the existing Wheelabrator and cogeneration power plant facilities in Shasta County. Scoping commenters requested that the EIR consider fuel use for construction equipment, backup power generation, construction vehicles, and worker transportation to/from the Project Site as well as for vehicles idling on SR 299 during materials delivery and as required to start/re-start a turbine. Other comments requested disclosure of the difference between estimated and actual power generation from the turbines, including an explanation of the existing sources of energy that would be replaced by this Project; and consideration of whether water diverted for Project use would reduce the water going through existing hydropower plants and of the power loss that occurs when power is transmitted over long distances. All scoping input received, including regarding Energy, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

The Project would not involve the use of natural gas; therefore, natural gas is not discussed in this section.

3.7.1 Setting

3.7.1.1 Study Area

The study area for Project impacts related to energy includes the State, the Pacific Gas & Electric Company (PG&E) service area, the County, and the areas surrounding the Project Site as relates to energy generation, energy consumption, and fuel consumption.

3.7.1.2 Environmental Setting

State Energy Setting

Total energy usage in California was 7,881 trillion British Thermal Units (Btus) in 2017 (the most recent year for which specific data are available), which equates to an average of 200 million Btu per capita. These figures place California second among the nation's 50 states in total energy use and 48th in per capita consumption (EIA, 2020a).

Electricity

In 2018, total system electric generation for California was 285,488 gigawatt-hours (GWh), down two percent from 2017's total generation of 292,037 GWh. Approximately 71 percent of the electrical power needed to meet California's demand is produced in the state; the balance, approximately 29 percent, is imported from the Pacific Northwest and the Southwest. In 2018, California's in-state electricity use was derived from natural gas (35 percent); coal (3 percent); large hydroelectric resources (11 percent); nuclear sources (9 percent); renewable resources that include geothermal, biomass, small hydroelectric resources, wind, and solar (31 percent); and unspecified sources (11 percent). Of the approximately 63,028 GWh generated from renewable sources in the state, solar-generated electricity made up the highest proportion (43 percent), followed by wind (22 percent), geothermal (18 percent), biomass (9 percent), and small hydroelectric (7 percent) (CEC, 2020a).

Wind-Generated Electricity

In 2018, California was the fifth-largest producer of wind energy in the U.S. California's wind power potential is widespread, especially along the state's many mountain crests, as well as in northern California coastal areas both onshore and offshore (EIA, 2020a). Six major wind resource areas, or particular areas in California containing a concentration of wind generation projects, and many smaller wind sites have been identified in the state. The Project Site is not located in one of these wind resource areas, but is located in close proximity to the Hatchet Ridge Wind Project also located in Shasta County, one of the smaller wind sites in the state (CEC, 2019). By the end of the third quarter of 2019, California had more than 5,800 megawatts (MW) of installed wind capacity (EIA, 2020a). The most recently reported wind generation peak of 5,309 MW was set in May 8, 2019, and a new overall renewable generation penetration peak was recorded on May 15, 2019, with approximately 80 percent of load served by all renewables (CAISO, 2019).

Transportation Fuels

Gasoline and diesel, both derived from petroleum (also known as crude oil), are the two most common fuels used for vehicular travel. Aviation gasoline, a specialized type of fuel used to power aircraft, also is derived from petroleum. According to the California Energy Commission (CEC), the state relies on petroleum-based fuels for 95 percent of its transportation needs (EIA, 2018). In 2019, approximately 30 percent of California's crude oil was produced within the state, about 12 percent was produced in Alaska, and the remaining 58 percent was produced in foreign lands (CEC, 2020b).

In 2019, taxable gasoline sales (including aviation gasoline) in California accounted for approximately 15.4 billion gallons of gasoline (CDTFA, 2020a), and taxable diesel fuel sales accounted for approximately 3.1 billion gallons of diesel fuel (CDTFA, 2020b). Statewide, there was an overall decrease in gasoline and diesel consumption from 2007 to 2011 due to the economic recession, but consumption has increased since then. The corona virus outbreak also is expected to decrease gasoline and diesel consumption throughout 2020.

California is nearly self-sufficient with regard to the gasoline, diesel, and aviation gasoline fuel supply, obtaining almost all of the supply to meet local demand from the California refineries

(CEC, 2014). Refineries in California often operate at or near maximum capacity because of the high demand for petroleum products. When unplanned refinery outages occur, replacement supplies must be brought in by marine tanker from refineries in the state of Washington or on the U.S. Gulf Coast. California requires that all motorists use, at a minimum, a specific blend of motor gasoline called CaRFG (California Reformulated Gasoline) as part of an overall program to reduce emissions from motor vehicles. Refineries in several other countries can also supply CaRFG, although it can take several weeks to locate and transport replacement motor gasoline that conforms to California's strict fuel specifications (EIA, 2020a). As a result, unplanned outages often result in a reduction in supply that causes prices to increase, sometimes dramatically. The severity and duration of these price spikes depend on how quickly the refinery issue can be resolved and how soon supply from alternative sources can reach the affected market (EIA, 2015).

Most petroleum supply disruptions or shortage events are resolved by the energy industry before they become significant. However, there are instances where the severity and scope of disasters require additional actions by the government to help facilitate and coordinate response and recovery efforts (NASEO, 2018).

Regional and Local Setting

PG&E is an investor-owned utility company that provides electricity supplies and services throughout a 70,000 square-mile service area that extends from Eureka in the north, to Bakersfield in the south, and from the Pacific Ocean in the west, to the Sierra Nevada mountains in the east. Shasta County is within PG&E's service area for electricity. Operating characteristics of PG&E's electricity supply and distribution systems are provided below. Also discussed is the regional consumption of transportation fuels.

PG&E Electric Utility Operations

PG&E provides "bundled" services (i.e., electricity, transmission and distribution services) to most of the six million customers in its service territory, including residential, commercial, industrial, and agricultural consumers. In recent years, PG&E has improved its electric transmission and distribution systems to accommodate the integration of new renewable energy resources, distributed generation resources, and energy storage facilities, and to help create a platform for the development of new Smart Grid technologies (PG&E, 2019).

In 2018, PG&E generated and/or procured a total of 48,832 gigawatt hours (GWh) of electricity.[1] Of this total, PG&E owns approximately 7,686 MW of generating capacity, itemized below (see **Table 3.7-1**). The remaining electrical power is purchased from other sources in and outside of California.

[1] This amount excludes electricity provided to direct access customers and Community Choice Aggregation (CCA) entities who procure their own supplies of electricity.

TABLE 3.7-1
PG&E-OWNED ELECTRICITY GENERATING SOURCES (2018)

Source	Generating Capacity (MW)
Nuclear (Diablo Canyon-2 reactors)	2,240
Hydroelectric	3,891
Fossil Fuel-Fired	1,400
Fuel Cell	3
Solar Photovoltaic (13 units;12 in Fresno County, 1 in Kings County)	152
Total	7,686

SOURCE: PG&E, 2019

Renewable Energy Resources

California law requires load-serving entities, such as PG&E, to gradually increase the amount of renewable energy they deliver to their customers to at least 33 percent of their total annual retail sales by 2020. This program, known as the Renewables Portfolio Standard (RPS) program, became effective in December 2011, and established three multi-year compliance periods that have gradually increasing RPS targets: 2011 through 2013, 2014 through 2016, and 2017 through 2020. After 2020, the RPS compliance periods will be annual.

Renewable generation resources, for purposes of the RPS program, include bioenergy such as biogas and biomass, certain hydroelectric facilities (30 MW or less), wind, solar, and geothermal energy. As shown in **Table 3.7-2**, during 2018, 38.9 percent of PG&E's energy deliveries were from renewable energy sources, exceeding the annual RPS target of 28.0 percent (PG&E, 2019).

TABLE 3.7-2
PG&E 2018 RENEWABLE ENERGY SOURCES

Source	Percent of Total Energy Portfolio
Bioenergy	4.4
Geothermal	3.7
Wind	10.0
RPS-Eligible Hydroelectric	2.7
Solar	18.1
Total	**38.9**

SOURCE: PG&E, 2019

Electricity Consumption

Table 3.7-3 shows electricity consumption by sector in the PG&E service area based on the latest available data from the CEC. As shown in the table, PG&E delivered approximately 80 billion kilowatt-hours (kWh) in 2018, of which approximately 30 billion kWh were consumed by commercial building uses.

TABLE 3.7-3
ELECTRICITY CONSUMPTION IN PG&E SERVICE AREA (2018)

Agricultural and Water Pump	Commercial Building	Commercial Other	Industry	Mining and Construction	Residential	Streetlight	Total Usage
All Usage Expressed in Millions of kWh (GWh)							
5,832	30,148	4,266	10,519	1,594	27,700	311	80,369

SOURCE: CEC, 2020c

In Shasta County, approximately 1.6 billion kWh of electricity was consumed in 2018, with approximately 821 million kWh consumed by non-residential uses (CEC, 2020c).

Local Energy Infrastructure

Existing electrical infrastructure in the Project vicinity includes transmission lines and PG&E's 500 kV Round Mountain Substation, which is located along Highway 299 approximately 2.7 miles west of the Project Site. The Round Mountain Substation is part of the Pacific Intertie, which is a vital transmission route between the Northwest and California. The Round Mountain Substation has an abundant amount of hydroelectric generation connected at the substation (PG&E, 2018). PG&E north-south direction 500 kV Transmission lines (Path 66 and a set of connecting wires to Path 15) run through the Round Mountain Substation. Other 220 kV to 287 kV PG&E transmission lines in the Project vicinity also run generally northeast from Round Mountain to Burney, including one that bisects the Project Site (PG&E, 2020).

As discussed above, there are multiple municipal hydropower plants in the Project area (Pit #1 through Pit #7) with additional hydropower plants throughout the County, including Spring Creek Power plant and Judge Francis Carr Powerhouse, and at Shasta Dam, Trinity Dam, and Keswick Dam; as well as privately owned hydropower, including Balta on Battle Creek, Kilarc on Cow Creek, Hat Creek, Roaring Creek, and Haynes Burney Creek. Wheelabrator, a biomass plant, and cogeneration power plant facilities are also located in Shasta County. The Hatchet Ridge Wind project is located within approximately 1 mile of the Project Site. These facilities include substations, transmission lines, and other infrastructure to connect to the energy grid.

Gasoline and Diesel

The CEC estimates that 87 million gallons of gasoline and approximately 50 million gallons of diesel were sold in 2018 in Shasta County and that there are 136 gasoline stations in the County (CEC, 2019).

3.7.1.3 Regulatory Setting

Federal

National Energy Conservation Policy Act

The National Energy Conservation Policy Act (NECPA, 42 USC §8201 et seq.) serves as the underlying authority for federal energy management goals and requirements and is the foundation of most federal energy requirements. NECPA established energy-efficiency standards for consumer projects and includes, among other things, energy-efficiency standards for new construction.

National Energy Policy Act of 2005

The National Energy Policy Act of 2005 (42 USC §13201 et seq.) sets equipment energy efficiency standards and seeks to reduce reliance on nonrenewable energy resources and provide incentives to reduce current demand on these resources. For example, under the act, consumers and businesses can attain federal tax credits for purchasing fuel-efficient appliances and products, including hybrid vehicles; and constructing energy-efficient buildings. Additionally, the act includes incentives for renewable energy production, including wind power.

Energy and Independence Security Act of 2007

The Energy and Independence Security Act of 2007 (42 USC §17001) sets federal energy management requirements in several areas, including energy reduction goals for federal buildings, facility management and benchmarking, performance and standards for new buildings and major renovations, high-performance buildings, energy savings performance contracts, metering, energy-efficient product procurement, and reduction in petroleum use, including by setting automobile efficiency standards, and increase in alternative fuel use. This act also amends portions of the National Energy Policy Conservation Act, described above.

Corporate Average Fuel Economy Standards

Section 3.10, *Greenhouse Gas Emissions*, details federally established fuel economy standards by the U.S. Environmental Protection Agency (USEPA) and National Highway Traffic Safety Administration (NHTSA). NHTSA's Corporate Average Fuel Economy (CAFE) standards regulate how far vehicles must travel on a gallon of fuel. NHTSA sets CAFE standards for passenger cars and for light trucks (collectively, “light-duty vehicles”), and separately sets fuel consumption standards for medium- and heavy-duty trucks and engines. In the course of more than 30 years, this regulatory program has resulted in improved fuel economy throughout the United States’ vehicle fleet (NHTSA, 2014, 2019).

State

Warren-Alquist Act

The 1975 Warren-Alquist Act (Pub. Res. Code §25000 et seq.) established the California Energy Resources Conservation and Development Commission, now known as the CEC. The Act established a State policy to reduce wasteful, uneconomical, and unnecessary uses of energy by

employing a range of measures. The Act also was the driving force behind the creation of Appendix F to the CEQA Guidelines.

State of California Integrated Energy Policy

Public Resources Code Section 25301(a) requires the CEC to develop an integrated energy plan at least every 2 years for electricity, natural gas, and transportation fuels. The plan calls for the State to assist in the transformation of the transportation system to improve air quality, reduce congestion, and increase the efficient use of fuel supplies with the least environmental and energy costs. An overarching goal of the resulting Integrated Energy Policy Report (IEPR) is to achieve the statewide greenhouse gas (GHG) emission reduction targets, while improving overall energy efficiency. See, for example, the CEC's 2019 Integrated Energy Policy Report Update, which includes integrating renewable energy, including wind, as a key component (CEC, 2020d).

Renewables Portfolio Standard

The State of California adopted standards to increase the percentage that retail sellers of electricity, including investor-owned utilities and community choice aggregators, must provide from renewable resources. The standards are referred to as the RPS. Qualifying renewables under the RPS include bioenergy such as biogas and biomass, small hydroelectric facilities (30 MW or less), wind, solar, and geothermal energy. The California Public Utilities Commission (CPUC) and the CEC jointly implement the RPS program. The CPUC's responsibilities include: (1) determining annual procurement targets and enforcing compliance; (2) reviewing and approving each investor-owned utility's renewable energy procurement plan; (3) reviewing contracts for RPS-eligible energy; and (4) establishing the standard terms and conditions used in contracts for eligible renewable energy (CPUC, 2020).

Executive Orders S-14-08 and S-21-09

In November 2008, Governor Schwarzenegger signed Executive Order S-14-08, which expanded the State's RPS to 33 percent renewable power by 2020. In September 2009, Governor Schwarzenegger continued California's commitment to the RPS by signing Executive Order S-21-09, which directed the California Air Resources Board under its Assembly Bill (AB) 32 authority to enact regulations to help the State meet its RPS goal of 33 percent renewable energy by 2020.

Senate Bill 350 – Clean Energy and Pollution Reduction Act of 2015

Senate Bill (SB) 350, known as the Clean Energy and Pollution Reduction Act of 2015, was enacted on October 7, 2015. It provides a new set of objectives in clean energy, clean air, and pollution reduction by 2030. The objectives include the following:

1. To increase from 33 percent to 50 percent by December 31, 2030, the procurement of electricity from renewable sources.
2. To double the energy efficiency savings in electricity and natural gas final end uses of retail customers through energy efficiency and conservation.

Senate Bill 100 and Executive Order B-55-18

On September 10, 2018, Governor Brown signed SB 100, establishing that 100 percent of all electricity in California must be obtained from renewable and zero-carbon energy resources by December 31, 2045. SB 100 also created new standards for the RPS goals that were established by SB 350 in 2015. Specifically, the bill increases required energy from renewable sources for both investor-owned and publicly-owned utilities from 50 percent to 60 percent by 2030. Incrementally, these energy providers are also required to have a renewable energy supply of 33 percent by 2020, 44 percent by 2024, and 52 percent by 2027. The updated RPS goals are considered achievable, since many California energy providers are already meeting or exceeding the RPS goals established by SB 350.

On the same day that SB 100 was signed, Governor Brown signed Executive Order B-55-18 with a new statewide goal to achieve carbon neutrality (zero-net GHG emissions) by 2045 and to maintain net negative emissions thereafter.

Energy-efficient Building Standards

The Energy Efficiency Standards for Residential and Nonresidential Buildings specified in Title 24, Part 6 of the California Code of Regulations include requirements for non-residential building lighting, insulation, ventilation, and mechanical systems (CEC, 2018). Its provisions would be relevant to the Project's proposed O&M building.

The California Green Building Standards Code (CALGreen, Title 24 Part 11) is a statewide regulatory code for all buildings. CALGreen is intended to encourage more sustainable and environmentally friendly building practices, require use of low-pollution emitting substances that cause less harm to the environment, conserve natural resources, and promote the use of energy-efficient materials and equipment (CBSC, 2019).

Local

Shasta County General Plan

The Energy Element of the Shasta County General Plan identifies the potential for development of wind as an alternative source of energy production in the County. The objectives and policy that would apply to the Project related to energy are provided below (Shasta County, 2004).

> **Objective E-2:** Increase utilization of renewable energy resources by encouraging development of solar, hydroelectric, biomass, waste-to-energy, and cogeneration sources.
>
> **Objective E-4:** Conserve nonrenewable energy resources, specifically raw materials, transportation fuels, and resource land area.
>
> **Policy E-c:** The County should develop energy thresholds and standards which assist applicants for development projects in designing conservation features into their proposals. Energy threshold standards could also be used to assist in the evaluation of potential energy consumption impacts which may be environmentally significant.

3.7.2 Significance Criteria

CEQA Guidelines Appendix G Section VI identifies considerations relating to energy. See Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area*, as it relates to the County's analysis of the potential impacts of this Project relating to the energy considerations suggested in CEQA Guidelines Appendix G. Otherwise, for purposes of this analysis, a project would result in a significant impact to energy if it would:

a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction, operation and maintenance, or decommissioning.

3.7.3 Direct and Indirect Effects

3.7.3.1 Methodology

This impact analysis evaluates the potential for the Project to result in a substantial increase in energy demand, consistent with Public Resources Code Section 21100(b)(3), and/or wasteful use of energy during Project construction and operation. The impact analysis is informed by CEQA Guidelines Appendix F. Though the analysis provides construction, operational, and decommissioning energy use estimates for the Project, the impacts are analyzed based on an evaluation of whether this energy use would be considered excessive, wasteful, or inefficient taking into account required compliance with applicable standards and policies aimed to reduce energy consumption. Energy emissions detail supporting the Project estimates presented in this section are also presented in Section 3.10, *Greenhouse Gas Emissions*.

3.7.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction, operation and maintenance, or decommissioning.

Impact 3.7-1: Project construction, operation and maintenance, and decommissioning and site reclamation could result in the wasteful, inefficient, or unnecessary consumption or use of energy. (*Less-than-Significant Impact*)

Construction, Decommissioning, and Site Reclamation

The analysis in this section utilizes the assumptions identified in Appendix B, *Air Quality and Greenhouse Gas Emissions*. Because the California Emissions Estimator Model (CalEEMod) program and other sources used in this technical analysis does not display the amount and fuel type for construction-related sources, additional calculations were conducted and are summarized in **Tables 3.7-4** and **3.7-5** below and provided in **Appendix E**, *Energy: Fuel Use Calculations*.

TABLE 3.7-4
PROJECT ENERGY CONSUMPTION DURING CONSTRUCTION

Type (use)	Quantity	Units	Energy (MBtu)[a]
Diesel (construction equipment and trucks)	876,933	gallons	120,474
Gasoline (worker vehicles)	87,253	gallons	10,495
Aviation gasoline (construction helicopter use)	15,380	gallons	1,849
Electricity (water-related)	55,883	kWh	191
Total	**-**	**-**	**133,009**

NOTES:
MBtu = million British thermal unit
kWh = kilowatt-hours

[a] Based on U.S. Energy Information Administration (EIA) conversion factors.

SOURCE: Data compiled by Environmental Science Associates in 2020 (Appendix E); EIA, 2020b.

TABLE 3.7-5
PROJECT ENERGY CONSUMPTION DURING OPERATION

Type (use)	Quantity	Units	Energy (MBtu)[a]
Electricity			
O&M building	48,157	kWh/year	164
Diesel			
Maintenance equipment and crane trucks, Emergency Generator	10,402	gallons/year	1,429
Gasoline			
O&M employee vehicles	15,542	gallons/year	1,869
Propane			
O&M building heating	1,000–2,000	gallons/year	183
Total	**-**	**-**	**3,646**

NOTES:
MBtu = million British thermal unit
kWh = kilowatt-hours

[a] Based on U.S. Energy Information Administration (EIA) conversion factors.

SOURCE: Data compiled by Environmental Science Associates in 2020 (Appendix E); EIA, 2020b.

Project construction activities include timber removal and grubbing, grading and access road work, temporary concrete batch plant construction, foundation work, turbine and transformer installation, substation and O&M building installation, underground and overhead connector system work, transmission line connection, and substation aggregate and security fence installation. Construction of the Project would occur over an up-to 24-month period and would result in fuel consumption from the use of construction tools and equipment (e.g., graders, excavators, scrappers), from haul truck trips required to deliver materials and equipment to the site, potentially from helicopter use during the overhead collection system and transmission line connection phases, and from vehicle trips generated from construction workers traveling to and

from the site. Vehicle emissions used to derive fuel use include running, startup, and idling emissions. Project construction is expected to consume a total of approximately 876,933 gallons of diesel fuel from construction equipment and haul truck trips, approximately 87,253 gallons of gasoline from construction worker vehicle trips, and approximately 15,380 gallons of aviation gasoline from helicopter use. Project fuel use during construction would represent approximately 0.1 percent of gasoline and 1.6 percent of diesel sold in Shasta County in 2018 (CEC, 2019). Project gasoline and aviation gasoline use would represent approximately 0.0007 percent of taxable gasoline sales (including aviation gasoline) in California in 2019 (CDTFA, 2020a). Aviation gasoline use would be minimal considering the limited duration of activity, which was assumed to last approximately six working days during conductor installation. Gasoline would be obtained by workers from among the 136 gas stations in the County. Diesel for haul truck trips required to deliver materials and equipment to the site would be obtained by truck drivers along their transport routes, including Shasta County and other jurisdictions along the route from the Port of Stockton, as necessary. Diesel for construction and transportation equipment during construction would be stored on-site in aboveground tanks, and would be replenished by commercial vendors as necessary. Aviation gasoline would be procured at the airport from which the helicopter takes-off and lands, which likely would be the Redding Municipal Airport or Fall River Mills Airport.

Construction activities and the corresponding fuel energy consumption would be temporary and localized, as this level of diesel fuel and gasoline use would not be a typical condition of the Project. In addition, there are no unusual Project characteristics that would cause the use of construction equipment that would be less energy efficient compared with other similar construction sites in other parts of the state.[2] Helicopters also often are used during construction to string overhead power lines. Therefore, construction-related fuel consumption by the Project would not result in inefficient, wasteful, or unnecessary energy use compared with other, similar construction in the region.

As discussed in Section 3.12, *Hydrology and Water Quality*, water use during construction would amount to a total of up to 49 acre-feet and would likely be obtained from groundwater resources, either sourced from wells on-site or purchased and delivered to the Project Site. Electricity associated with the supply, distribution, and treatment of water used for construction would be approximately 55,883 kWh over the 2-year construction period.[3] This energy consumption would be approximately 0.004 percent of the electricity consumption for the mining and construction sector in PG&E's service area in 2018 (CEC, 2020c). Additionally, as shown in Table 3.7-1, the total energy consumption during the two-year construction period would be approximately 133,009 MBtu, which is less than 0.01 percent of statewide energy use as of 2017. Therefore, construction-related indirect electricity consumption by the Project would not result in inefficient, wasteful, or unnecessary energy use.

[2] Since energy consumption is directly proportional to GHG emissions generation, the Project's construction-related GHG were compared to the Humboldt Wind Energy Project's GHG emissions (Humboldt County, 2019) because the Humboldt Wind project provides the most current, relevant estimate known of a wind project construction site elsewhere in the state.

[3] Based on the CalEEMod energy intensity of 0.0035 kWh per gallon for supply, distribution, and treatment of water for Shasta County.

Operation and Maintenance

The Project would receive service power from PG&E, and would have an emergency generator available on-site. A small amount of electricity would be consumed by the Project to operate lights, telecommunications devices associated with the Supervisory Control and Data Acquisition (SCADA) system, which provides communication capabilities between turbine locations, substation, and operations and maintenance facilities, and other electronic equipment. For operational activities, annual electricity consumption was calculated using demand factors for a general heavy industry type building, because CalEEMod does not provide demand factors specifically for wind O&M facilities, as shown in the CalEEMod output in Appendix B. The Project's energy consumption was estimated to be approximately 48,157 kWh of electricity per year. This energy consumption would be less than 0.001 percent of the electricity consumption for the industrial sector in PG&E's service area in 2018 (CEC, 2020c). Using the Project's total nameplate generating capacity of up to 216 MW and conservatively assuming an average capacity factor of 32 percent,[4] the Project would be anticipated to generate up to approximately 605,491,200 kWh per year.[5] Thus, the minimal amount of electricity required during Project operation would be greatly offset by the generation of electricity from the Project, and the Project's electricity demand would not constitute a wasteful, inefficient, or unnecessary use of energy.

Operation and maintenance would require the use of utility vehicles, cranes, and other maintenance-related equipment. No other heavy equipment would be used during normal Project operation. Non-routine maintenance such as repair or replacement of rotors or other major components, if needed, could involve use of one or more cranes and equipment transport vehicles. Cranes for maintenance would not be as large as the track-mounted cranes needed to erect the turbine towers. Additionally, permanent access roads would be graded and compacted periodically to minimize erosion. Crane trucks and other maintenance equipment (i.e., mowers) may require the use of diesel fuel. Project diesel use from equipment is estimated to be 10,402 gallons per year, and would represent approximately 0.02 percent of diesel sold in Shasta County in 2018 (CEC, 2019). As outlined in Chapter 2, *Description of Project and Alternatives*, the Applicant would develop an O&M protocol to be implemented throughout Project operation. This protocol would specify routine turbine maintenance and operation in accordance with the maintenance requirements prescribed by the turbine manufacturer. Thus, the amount of diesel fuel consumed during Project operation would be relatively minimal and would not constitute a wasteful, inefficient, or unnecessary use of energy.

The Project would require approximately 12 full-time personnel on-site for operation and maintenance. While performing most routine maintenance activities, O&M staff would travel via pickup or other light-duty trucks using gasoline. Gasoline also would be required by Project workers commuting to and from the Project Site. The total mobile emissions rates (Appendix B) during operation yield a conservative estimate of 15,542 gallons of gasoline required annually

4 Conservatively based on a 32 percent average capacity factor. Note that the average 2018 capacity factor among projects built from 2014 to 2017 was 41.9 percent, compared to an average of 30.8 percent among all projects built from 2004 to 2011, and 23.8 percent among all projects built from 1998 to 2001 (U.S. Department of Energy, 2018).

5 Note that electricity transmission and distribution losses averaged about 5 percent of the electricity that was transmitted and distributed in 2018 in California (EIA, 2019). With these losses taken into consideration, the Project would supply up to approximately 575,216,640 kWh per year.

during Project operation. The gasoline consumption by Project workers would be approximately 0.02 percent of gasoline consumed in Shasta County in 2018 (CEC, 2019). Therefore, the gasoline use during Project operation would not constitute a wasteful, inefficient, or unnecessary use of energy.

Additionally, the emergency generator for the O&M building would require diesel fuel during operation. Assuming 100 hours of operational use per year, the Project would use approximately 100 gallons of diesel fuel during operation. The O&M building would also use propane for ambient heating. Approximately 500 to 1,000 gallons would be stored in an aboveground propane storage vessel. Assuming the propane tank would need to be refilled twice per year, the Project would use approximately 1,000 to 2,000 gallons of propane per year during operation. Diesel fuel and propane use during operation would be minimal, and fuel levels would be replenished on-site by commercial vendors as necessary. Therefore, the diesel and propane fuel use during Project operation would not constitute a wasteful, inefficient, or unnecessary use of energy.

Additionally, as shown in Table 3.7-2, the Project's total annual energy consumption would be approximately 3,646 MBtu, which is less than 0.0001 percent of statewide energy use in 2017. The Project would also be anticipated to generate up to approximately 605,491,200 kWh per year, or 2,065,936 MBtu, which represents 0.03 percent of statewide energy use in 2017. Therefore, the energy use during Project operation would not constitute a wasteful, inefficient, or unnecessary use of energy. This impact would be less than significant.

Decommissioning and Site Restoration

The Project is anticipated to be in commercial operation for approximately 40 years from the commencement of operation as would be allowed under the requested terms of the use permit, although upgrading and replacing equipment could extend the operating life of the wind energy facility indefinitely. Proposed decommissioning of existing facilities and infrastructure and reclamation of the Project Site would require approximately 18 to 24 months. The types of equipment, vehicles, and workforce necessary for decommissioning and reclamation activities at the Project Site would be similar to the requirements for construction, except considerably less intensive in that no concrete batch plant(s), cable delivery, or concrete trucks would be required, and no cable trenching or similar work would occur. Moreover, existing service roads would be used; no new access roads or road widening would be required. Decommissioning and site reclamation activities and corresponding fuel energy consumption would be temporary and would be comparable to the construction-related fuel demand. Decommissioning- and site reclamation-related fuel use would also not represent a substantial demand on energy resources. Thus, decommissioning-related fuel consumption by the Project would not result in inefficient, wasteful, or unnecessary energy use compared with other construction sites in the region.[6] This impact would be less than significant.

Mitigation: None required.

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6 See Footnote 2.

3.7.3.3 PG&E Interconnection Infrastructure

Upgrades to PG&E facilities to facilitate the interconnection between the Project's electricity and the PG&E transmission lines are anticipated to include construction and/or reconfiguration of utility line structures and transmission line circuits involving four to six new transmission poles. If required, these new poles would be located adjacent to the proposed substation and switching station. The construction equipment, workers, vehicle trips, and fuel required for upgrades to these facilities would be minimal compared to overall Project construction activities, and are captured by the Project's calculations. Therefore, activities associated with the PG&E interconnection infrastructure would result in a less-than-significant impact relating to energy.

3.7.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, the Project would be constructed, operated and maintained, and ultimately decommissioned as proposed south of SR 299, and none of the up to seven turbines proposed to the north of SR 299 (turbine numbers A01 through A07) or related infrastructure would be developed. Alternative 1 would have a total nameplate generating capacity of up to 195 MW, which equates to approximately 21 MW less nameplate generating capacity as compared to the Project. The number of workers and durations of construction, operation and maintenance, and decommissioning and site reclamation would be substantially the same as for the Project, resulting in similar fuel and electricity use which would continue to be offset by the Project's energy generation. Alternative 1 would continue to provide a new source of renewable energy supporting SB 100 and the State's energy goals, although with less overall capacity than the Project. Overall, Alternative 1 would result in no significant impacts to energy; impact conclusions would be the same as those identified for the Project.

Alternative 2: Increased Setbacks

Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within three times the height of the turbine (i.e., within 2,037 feet) of a residential property line and within 1.5 times the height of the turbine (i.e., within 1,018.5 feet) of State Route 299, any other publicly-maintained public highway or street, and of Supan Road or Terry Mill Road. This would remove four wind turbines, as compared to the Project, resulting in the loss of approximately 12 MW to 22.8 MW of generating capacity based on generation potential per turbine. Under Alternative 2, the number of workers and durations of construction, operation and maintenance, and decommissioning and site restoration would be substantially the same as for the Project, resulting in similar fuel and electricity use, which would continue to be offset by the Project's energy generation. Alternative 2 would continue to provide a new source of renewable energy supporting SB 100 and the State's energy goals, although with less overall capacity than the Project. Overall, Alternative 2 would result in no significant impacts to energy; impact conclusions would be the same as those identified for the Project.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind project infrastructure would be delivered to the Project Site, and there would be no Project-related construction, operation and maintenance, or decommissioning there. No construction-related equipment or additional vehicle trips would be made to, from, or within the Project Site relative to baseline conditions for a wind project purpose. Fuel and electricity use associated with the Project would not occur. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to energy. However, under the No Project Alternative, a new source of renewable energy supporting SB 100 and the State's energy goals would not be provided.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect relating to energy. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.7.4 Cumulative Analysis

The geographic context for potential cumulative impacts related to electricity is within PG&E's service area and for equipment and vehicle fuel use is within the Project's construction workers' commute radius (assumed to be approximately 50 miles) and jurisdictions along the route from the Port of Stockton (assumed to be approximately 270 miles), where major Project components would likely be delivered and transported to the Project Site from, since these are the areas within which energy resources would be demanded and supplied for the Project. The Project would use energy resources during initial construction, operation and maintenance, and decommissioning/ reclamation; therefore, it could contribute to potential cumulative impacts during any of these phases.

Regarding electricity, there is no existing significant adverse condition that would be worsened or intensified by the Project or an alternative. To the contrary, both the Project and Alternatives 1 and 2 would provide an additional source of renewable energy that could serve the cumulative demand. No significant adverse cumulative effect would result relating to electricity use; instead, a beneficial cumulative impact on energy resources would result.

Similarly regarding the efficiency of fuel use, there is no existing significant adverse condition (such as a shortage) that would be worsened or intensified by the Project or an alternative. Past, present, and reasonably foreseeable future projects within approximately 50 miles of the Project

Site could require gasoline and within approximately 270 miles of the Project Site could require diesel, but would not combine with the fuel demands of the Project to cause a significant adverse cumulative impact relating to the wasteful, inefficient, or unnecessary consumption or use of fuel. In the event of a future shortage, higher prices at the pump would curtail unnecessary trips that could be termed "wasteful" and would moderate choices regarding vehicles, equipment, and fuel efficiency. Under these conditions, the Project's less-than-significant impacts relating to wasteful, inefficient, or unnecessary consumption or use of fuel would not cause a significant cumulative impact.

3.7.5 References

California Building Standards Commission (CBSC), 2019. 2019 California Green Building Standards Code Nonresidential Mandatory Measures, July 2019. Available online: https://www.dgs.ca.gov/BSC/Resources/Page-Content/Building-Standards-Commission-Resources-List-Folder/CALGreen#@ViewBag.JumpTo. Accessed March 22, 2020.

California Department of Tax and Fee Administration (CDTFA), 2020a. Net Taxable Gasoline Gallons, Including Aviation Gasoline. Available online: https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts.htm. Accessed March 28, 2020.

CDTFA, 2020b. Taxable Diesel Gallons 10 Year Report. Available online: https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts.htm. Accessed March 28, 2020.

California Energy Commission (CEC), 2014. State of California Energy Assurance Plan. June 2014. Prepared by Aanko Technologies, Inc. Available online: http://www.energy.ca.gov/2014publications/CEC-600-2014-006/CEC-600-2014-006.pdf. Accessed March 24, 2020.

CEC, 2018. 2019 Nonresidential Compliance Manual for the 2019 Building Energy Efficiency Standards, Title 24, Part 6, and Associated Administrative Regulations in Part 1, December 2018. Available online: https://ww2.energy.ca.gov/2018publications/CEC-400-2018-018/Compliance_Manual-Complete_without_forms.pdf. Accessed March 22, 2020.

CEC, 2019. 2018 California Annual Retail Fuel Outlet Report Results (CEC-A15), July 1, 2019. Available online: https://ww2.energy.ca.gov/almanac/transportation_data/gasoline/piira_retail_survey.html. Accessed March 23, 2020.

CEC, 2020a. 2018 Total System Electric Generation in Gigawatt Hours. Available online: https://ww2.energy.ca.gov/almanac/electricity_data/total_system_power.html. Accessed March 23, 2020.

CEC, 2020b. Oil Supply Sources to California Refineries. Available online: https://ww2.energy.ca.gov/almanac/petroleum_data/statistics/crude_oil_receipts.html. Accessed March 23, 2020.

CEC, 2020c. California Energy Consumption Database. Available online: https://ecdms.energy.ca.gov/. Accessed March 23, 2020.

CEC, 2020d. Final 2019 Integrated Energy Policy Report, January 31, 2020. Available online: https://ww2.energy.ca.gov/2019_energypolicy/. Accessed March 22, 2020.

California Independent System Operator Corporation (CAISO), 2019. CEO Report, July 17, 2019. Available online: http://www.caiso.com/Documents/CEOReport-Jul2019.pdf. Accessed March 22, 2020.

California Public Utilities Commission (CPUC), 2020. RPS Program Overview. Available online: https://www.cpuc.ca.gov/RPS_Overview/. Accessed March 22, 2020.

Humboldt County, 2019. Humboldt Wind Energy Project Draft Environmental Impact Report, Section 3.8, Greenhouse Gas Emissions. April 2019.

National Association of State Energy Officials (NASEO), 2018. Guidance for State on Petroleum Shortage Response Planning. February 2018. Available online: http://www.naseo.org/Data/Sites/1/petroleum-guidance/final-naseo-petroleum-guidance-feb-2018.pdf. Accessed March 24, 2020.

National Highway Traffic Safety Administration (NHTSA), 2014. Summary of Fuel Economy Performance, December 15, 2014. Available online: https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/performance-summary-report-12152014-v2.pdf. Accessed March 22, 2020.

NHTSA, 2019. Corporate Average Fuel Economy (CAFÉ) Public Information Center, Fleet Fuel Economy Performance Report. Available online: https://one.nhtsa.gov/cafe_pic/CAFE_PIC_fleet_LIVE.html. Updated as of October 15, 2019.

Pacific Gas & Electric (PG&E), 2018. PG&E's 2018 Request Window Proposals, CAISO 2018-2019 Transmission Planning Process, September 21, 2018. Available online: http://www.caiso.com/Documents/Day2-Presentation_PGaE_2018RequestWindowProposal-2018-2019TPPMtg-Sep20-21-2018.pdf. Accessed March 23, 2020.

PG&E, 2019. 2018 Joint Annual Report to Shareholders, April 24, 2019. Available online: http://s1.q4cdn.com/880135780/files/doc_financials/2018/2018-Annual-Report-FINAL-web-ready-version-4-24-19.pdf. Accessed March 23, 2020.

PG&E, 2020. Economic Development Site Tool, Electric Transmission Lines Map. Available online: https://www.pge.com/en_US/large-business/services/economic-development/opportunities/sitetool.page. Accessed March 23, 2020.

Shasta County, 2004. Shasta County General Plan Energy Element, as amended through September 2004. Available online: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/64energy.pdf?sfvrsn=e385c737_0. Accessed March 21, 2020.

U.S. Energy Information Administration (EIA), 2015. This Week in Petroleum: Potential market implications of outage at ExxonMobil's Torrance, California refinery, February 25, 2015. Available online: https://www.eia.gov/petroleum/weekly/archive/2015/150225/includes/analysis_print.php. Accessed March 24, 2020.

EIA, 2018. Motor gasoline consumption, price, and expenditure estimates 2018. Updated as of October 15, 2019. https://www.eia.gov/state/seds/sep_fuel/html/fuel_mg.html. Accessed March 23, 2020.

EIA, 2019. California Electricity Profile 2018, December 31, 2019. Available online: https://www.eia.gov/electricity/state/california/. Accessed March 24, 2020.

EIA, 2020a. California Profile Analysis, January 16, 2020. Available online: https://www.eia.gov/state/analysis.php?sid=CA. Accessed March 24, 2020.

EIA, 2020b. Units and calculators explained, British thermal units (Btu), June 4, 2020. Available online: https://www.eia.gov/energyexplained/units-and-calculators/british-thermal-units.php. Accessed June 26, 2020.

U.S. Department of Energy, 2018. 2018 Wind Technologies Market Report. Available online: https://www.energy.gov/sites/prod/files/2019/08/f65/2018%20Wind%20Technologies%20Market%20Report%20FINAL.pdf. Accessed March 24, 2020.

3.8 Forestry Resources

This section identifies and evaluates issues related to Forestry Resources in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. Information about Agricultural Resources is presented in Section 3.1.3, *Environmental Topics Removed from Consideration*.

In response to its notice of intention to prepare this Draft EIR, the County received scoping input noting that the site is subject to herbicide use and thinning under existing (baseline) conditions. Scoping comments also expressed concern that the development of a wind project on the proposed site would result in: (1) tree removal on a much greater scale than if commercial timber harvesting were to continue, and (2) conversion to non-timber-producing use, where the forest conversion could lead to loss of nutrient-rich topsoils, disrupted nutrient cycling, and increased erosion. These issues are addressed in Section 3.8.3, *Direct and Indirect Effects*. All scoping input received, including regarding Forestry Resources, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

3.8.1 Setting

3.8.1.1 Study Area

The study area for the purposes of this analysis of potential impacts to Forestry Resources includes all lands within the Project Site, as defined in Chapter 2, that may be subject to temporary and permanent disturbance.

3.8.1.2 Environmental Setting

The Shasta County General Plan designates the Project Site as Timber (T); the zoning designations are Timber Production (TP) (approximately 4,457 acres) and Unclassified (U) (approximately 6 acres). Existing land uses within the Project Site consist exclusively of managed forest lands. Unpaved logging roads and transmission lines cross the Project Site. Little Cow Creek and the south fork of Montgomery Creek cross the Project Site from east to west. The Lassen National Forest lies to the southeast, and the Shasta-Trinity National Forest is to the north. Other surrounding lands are privately owned; many are used for timber harvesting purposes. Additional information on Project Site-specific ecology and vegetation composition can be found in Section 3.4 *Biological Resources*.

3.8.1.3 Regulatory Setting

Federal

No federal regulations govern Forestry Resources in the study area.

State

The Z'Berg-Nejedly Forest Practice Act of 1973 (Pub. Res. Code §§4511–4360.2) and its implementing regulations, the Forest Practice Rules (14 Cal. Code Regs. §895 et seq.), govern the management of privately owned forestlands in California. Section 4526 of the Z'Berg-Nejedly Forest Practice Act defines "timberland" as "land, other than land owned by the federal government and land designated by the board as experimental forest land, which is available for, and capable of, growing a crop of trees of a commercial species used to produce lumber and other forest products, including Christmas trees. Commercial species shall be determined by the board on a district basis." Under the Forest Practice Rules, landowners who wish to harvest and then sell their trees must submit and comply with an approved state-issued timber harvesting permit. The most common permit for the harvest and eventual sale of trees is a Timber Harvesting Plan (THP), which describes the scope, yield, harvesting methods, and mitigation measures that a timber harvester intends to perform within a specified geographical area over a period of five years (Taylor, 2018).

Local

Shasta County General Plan

The Timberlands Element of the Shasta County General Plan contains the following objectives pertaining to forest resource management (Shasta County, 2004):

> **T-1:** Preservation of timberlands suitable for forest management and production to allow for the continuation of such uses or to provide opportunities for the future establishment of such uses.
>
> **T-2:** Protection of timberlands from incompatible adjacent land uses which adversely impact forest management activities.

Shasta County Zoning Ordinance

Chapter 17.08, Timber Production District, in the Shasta County Zoning Ordinance (Shasta County, 2020) lists the uses permitted in the TP district if a use permit is issued, including "the erection, construction or alteration of a gas, electrical, water or communication facility, or other public improvements, in accordance with Government Code §51152."

3.8.2 Significance Criteria

CEQA Guidelines Appendix G Section II identifies considerations relating to Agriculture and Forestry Resources. See Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area*, as it relates to the County's analysis of the potential impacts of this Project to the considerations suggested in CEQA Guidelines Appendix G Section II. Otherwise, for purposes of this analysis, a project would result in a significant impact to Forestry Resources, including timberland, if it would:

a) Result in the loss of forest land or conversion of forest land to non-forest use.

In determining whether the Project would result in a significant environmental impact to Forestry Resources, Shasta County has considered information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land.

3.8.3 Direct and Indirect Effects

3.8.3.1 Methodology

The evaluation of potential impacts of the Project on Forestry Resources was based on a review of field conditions, aerial photographs, and policy guidance from the Shasta County General Plan and the Shasta County Zoning Code. For purposes of this analysis, permanent disturbance (and impacts) would occur in those areas that would remain cleared and in use throughout Project operations, regardless of whether they are returned to original use after decommissioning. Temporary disturbance would occur during construction in areas that would be restored to their pre-disturbance condition following construction and would remain undisturbed throughout the operation and maintenance phase of the Project. Temporary disturbance could occur again during decommissioning in advance of site restoration. In this analysis, "conversion" of timberland equates to permanent disturbance. While Project-related timber conversion would be considered permanent, the Project Site is expected to be returned to timberland use following the conclusion of the Use Permit term.

The impacts of timber removal, whether temporary or permanent, are analyzed on a resource-by-resource basis throughout this EIR as an aspect of the site preparation and construction phase. Existing commercial and pre-commercial timber would be harvested, treated, and/or removed from the Project Site to allow development of the Project during this first phase of Project implementation. Areas that would be removed from timber production as a result of the Project would be harvested in accordance with TCP and THP authorization from CAL FIRE. The THP would be drafted in accordance with requirements set forth in the Forest Practice Act (Pub. Res. Code §4582) and the Forest Practice Rules (CAL FIRE, 2019), would be prepared by a Registered Professional Forester, and would be carried out by licensed timber operators. The THP would specify the location of timber to be harvested, how it would be harvested, and environmental Best Management Practices (BMPs) that would be implemented during harvesting. The Applicant would provide the County with written documentation of CAL FIRE's approval of the THP prior to the commencement of onsite activities.

3.8.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would result in the loss of forest land or conversion of forest land to non-forest use.

Impact 3.8-1: The Project could result in the loss of forest land or conversion of forest land to non-forest use. (*Less-than-Significant Impact*)

Although BMPs would be implemented as part of the Project, Project implementation nonetheless would result in the temporary disturbance of up to 1,384 acres of timberland during construction and the permanent conversion of up to 713 acres of timberland as reported in Table 2-1, *Project*

Components and Disturbance Areas. Existing commercial and pre-commercial timber would be harvested, treated, and/or removed from the Project Site to allow development of the Project. Areas that would be removed from timber production as a result of the Project would be harvested in accordance with a Timberland Conversion Permit (TCP) and THP authorization from the California Department of Forestry and Fire Protection (CAL FIRE).

Trees would be replanted within temporary disturbance areas following the completion of construction. Further, as described in Section 2.4.7, *Decommissioning and Site Restoration*, the Applicant proposes to recontour and revegetate the Project Site upon completion of the Project's operational life to be as similar to preconstruction conditions as possible, including, in coordination with the land owner, replanting disturbed areas with trees or other vegetative cover consistent with the landowner's current and future land use practices.

Of the 2,428,000 total acres that comprise Shasta County (Shasta County, 2004), 59 percent or 1,454,6800 acres are dedicated to commercial forest uses (Shasta County Planning Division, 2020). Removal of up to 713 acres of forest lands would result in a reduction of less than 0.05 percent of the commercial forest lands in Shasta County. Additionally, the timber harvest within the Project Site would overlap five active or completed THPs, which could result in fewer acres of conversion by the Project than projected for purposes of this analysis (ConnectGen, 2019). Given the Project's minimal contribution to net forest loss during and after construction of the Project, the impact would be less than significant. No mitigation is required.

Mitigation: None required.

3.8.3.3 PG&E Interconnection Infrastructure

Construction of the substation, switching station, and interconnection facilities would temporarily disturb up to approximately 19 acres of the Project Site; the permanent area of disturbance would be approximately 5 acres for the collector substation and 8 acres for the switching station. This acreage is accounted for in the Project Site acreage. Construction, operation, management, and site decommissioning and restoration associated with the PG&E interconnection infrastructure would result in a less than significant impact relating to the loss of forest land or conversion of forest land to non-forest use.

3.8.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, the South of SR 299 Alternative, the approximately 4,086 acres located south of SR 299, would be utilized for the Project, while approximately 378 acres of the Project Site located north of SR 299 would continue to be managed for timber production. Alternative 1 would result in similar, but slightly reduced, direct and indirect impacts as the Project. Due to the elimination of 378 acres of the Project Site from development, Alternative 1 would reduce temporary impacts to commercial forest lands by 9 percent, from 1,384 acres to 1,259 acres.

Permanent impacts would be reduced by 8 percent, from 713 acres to 652.5 acres. Therefore, although the impacts of Alternative 1 would be slightly reduced relative to the Project, the impact conclusion would remain the same: less than significant.

Alternative 2: Increased Setbacks

Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within three times the height of the turbine (i.e., within 2,037 feet) of a residential property line and within 1.5 times the height of the turbine (i.e., within 1,018.5 feet) of State Route 299, any other publicly maintained public highway or street, and of Supan Road or Terry Mill Road. The remaining turbines, infrastructure and other improvements would be the same as proposed for the Project. Due to the increase in setbacks, Alternative 2 would reduce temporary impacts to commercial forest lands by 9 percent, from 1,384 acres to 1,282 acres. Permanent impacts would be reduced by 8 percent, from 713 acres to 664 acres. Therefore, Alternative 2, would result in a slightly reduced impact to Forestry Resources compared to the Project, but the impact conclusion would remain the same: less than significant.

No Project Alternative

If the No Project Alternative is implemented, the Project Site would not be cleared, Project infrastructure would not be constructed and the Project Site would continue to be operated as managed forest timberlands. Harvesting practices and the associated noise, dust, erosion, and traffic that can occur as a result of forest management would continue to occur. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to Forestry Resources.

3.8.4 Cumulative Analysis

The geographic scope considered for the evaluation of cumulative impacts on Forestry Resources is Shasta County. Construction, operation and decommissioning activities are the only phases of the Project expected to impact Forestry Resources. As described in General Plan Section 6.2.2, “[o]ne of Shasta County's most valuable resources is its timberland.” Of the County's 2,428,000 total acres (Shasta County, 2004), 59 percent or 1,454,680 acres are dedicated to commercial forest uses (Shasta County Planning Commission, 2020). From a land use planning perspective, the County’s timberland supply is negatively affected by the conversion of timberland to other land uses that are incompatible with timber operations and management, such as rural residential uses and parcelization into lot sizes that are inefficient for economic timber production (Shasta County, 2004).

The Project would temporarily impact up to 1,384 acres of commercial forest land, harvesting the trees to allow for construction activities. Permanent impacts due to tree removal would be minimal and further reduced due to the proposed plan to replant trees after construction and restore the site as part of decommissioning in coordination with the landowner and in accordance with requirements of the Z’Berg-Nejedly Forest Practice Act, the Forest Practice Rules, and CAL

FIRE's requirements for timber harvesting. Additionally, timber harvesting that would occur within the Project Site for purposes of site preparation and construction would overlap five active or completed THPs, which could result in fewer acres of conversion by the Project than projected for purposes of this analysis (ConnectGen, 2019). The Project would have a relatively small permanent footprint, permanently converting less than 0.06 percent of commercial forest lands or less than 0.03 percent of total timberland Countywide. The Project would not significantly encroach upon forested areas or interfere with the long-term management of resources surrounding the Project Site for the growing and harvesting of timber. The Project would not involve any actions that would directly affect the forestry industry.

Shasta County Code Section 17.08.030(D) allows the construction of "gas, electrical, water, or communication transmission facility, or other public improvements, in accordance with Government Code Section 51152" with the approval of a Use Permit. In accordance with County Code Section 17.64.040, a wind energy system is allowed with approval of a use permit in the Unclassified (U) zoning district as long as it is not otherwise prohibited by law and not inconsistent with the General Plan. The site would be restored during decommissioning and, while Project-related timber conversion would be considered permanent as defined above, the Project Site is expected to be returned to timberland use following the conclusion of the Use Permit term.

Despite past and ongoing conversion of land within Shasta County to uses that are incompatible with timber operations and management, the Project would not significantly contribute to the condition of Forestry Resources. The less-than-significant impact of the Project, considered together with the incremental impacts of other development detailed in Section 3.1.3.1, *Cumulative Scenario*, would not result in a significant impact to Forestry Resources. For example, while development projects potentially including the eleven lot subdivision identified as project #3 in Table 3.1-4, *Potentially Cumulative County Projects*, could result in permanent impacts on Forestry Resources within Shasta County, other projects identified in Table 3.1-4 and Table 3.1-5, *Other Potentially Cumulative Projects within Shasta County*, are sited on land that currently is used for residential, commercial, or other developed purposes and so would not cause or contribute to any significant cumulative effect on Forestry Resources. See, e.g., the amendment to an existing use permit (project #1, Table 3.1-4), and Dignity Health North State Pavilion Project (project #1, Table 3.1-5). Even if the cumulative impacts of all potential projects in the County were significant, the Project's contribution would not be cumulatively considerable due to its *de minimis* contribution to conversion (i.e., permanently converting less than 0.06 percent of commercial forest lands and less than 0.03 percent of total Shasta County timberland).

3.8.5 References

California Department of Forestry and Fire Protection (CAL FIRE), 2019. California Forest Practice Rules 2019. Available online at: http://calfire.ca.gov/resource_mgt/downloads/2019%20Forest%20Practice%20Rules%20and%20Act_FINAL.pdf. February 2019.

ConnectGen, 2019. Email from J. Kuba to L. Salazar and J. Scott. Fountain Wind - LandVest THPs. October 24, 2019.

Shasta County, 2004. Section 6.2 of the Shasta County General Plan, as amended through September 2004. Available online at: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/62timber.pdf?sfvrsn=95dea1b0_0. Accessed January 28, 2019.

Shasta County, 2020. Title 17 – Zoning. Chapter 17.08 of the Shasta County Code of Ordinances, as amended through October 1, 2019. Available online at: https://library.municode.com/ca/shasta_county/codes/code_of_ordinances?nodeId=CD_ORD_TIT17ZO. Accessed March 17, 2020.

Shasta County Planning Commission, 2020. GIS query of Mapping Specialist, Kirk Kirby, for TP Zoning. April 10, 2020.

Taylor, M. 2018. Report of the Legislative Analyst's Office: Improving California's Forest and Watershed Management. Available online at: https://lao.ca.gov/reports/2018/3798/forest-watershed-management-040418.pdf. April 2018.

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3.9 Geology and Soils

This section identifies and evaluates issues related to Geology, Soils, and Paleontological Resources in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. Paleontological resources would not be impacted by the Project, as described in Section 3.1.4.6 and are therefore not described in this section.

In response to its notice of intention to prepare this Draft EIR, the County received scoping input that landslides and road collapses are not uncommon in the area. Scoping input also identified the presence of Montgomery Creek formations, which are described as "extremely permeable" primarily alluvial fan deposits of sand and mixed rocks, and questioned whether such deposits are suited for the proposed foundations. Comments also suggested that the compaction needed to provide road access throughout the Project Site could alter the current underground water flows to Class 1 streams. Scoping input requested a "full geological investigation" to address the movement of water throughout the geology. Additional comments concerning natural deposits of arsenic that may be present in Project Site soils were also raised; however, no sources of information to support the presence of arsenic were provided and none were identified during follow-up research conducted by the EIR preparers (identified in Chapter 5, *Report Preparation*). All scoping input received, including regarding geology and soils, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J***, Scoping Report*. No scoping input was received regarding paleontological resources.

3.9.1 Setting

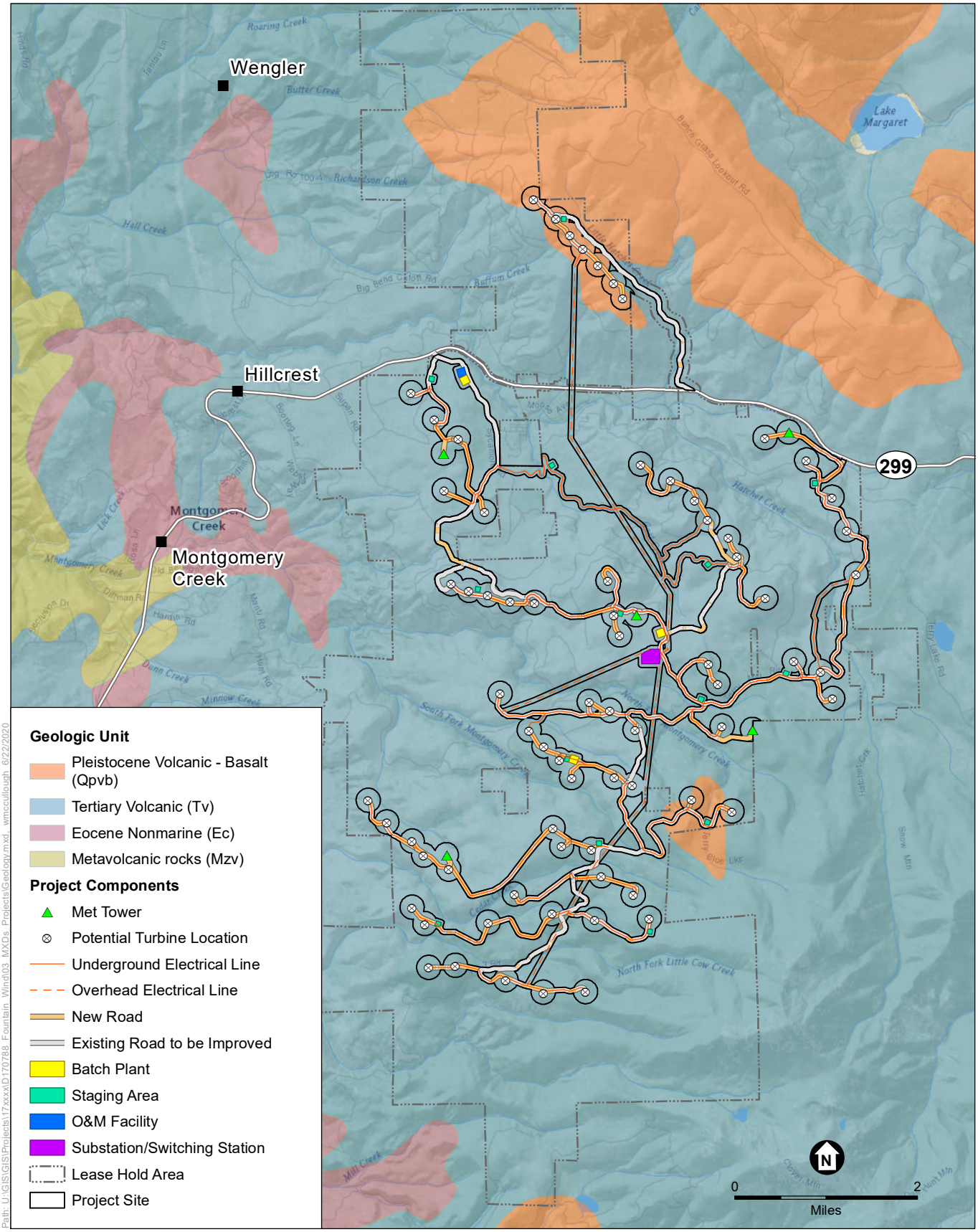
3.9.1.1 Environmental Setting

Regional Geology

The Project Site is located within the Cascade Range Geomorphic Province in eastern Shasta County. The Cascade Range is a chain of volcanic cones extending from Washington to Oregon and into California. Mount Shasta is approximately 35 miles to the northwest of the northern portion of Project Site boundary, and Lassen Peak is approximately 20 miles southeast of the southern portion of the Project Site boundary.

Local Geology

Geologic mapping (depicted in **Figure 3.9-1**, below) by Dupras indicates the Project Site is almost entirely underlain by Pliocene and Pleistocene-age andesitic and basaltic volcanic rocks (Dupras, 1997), originating from volcanic eruptions from Lassen Peak and other volcanic centers of the Cascade Volcanic Arc (Clynne and Muffler, 2017). Mapping by Dupras also indicates outcrops of Eocene-age Montgomery Creek Formation near the central western border of the Project Site boundary.



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SOURCE: CGS, 2010

Fountain Wind Project

Figure 3.9-1
Geologic Units

3.9.1.2 Study Area

The study area considered for analysis of geology and soil resources includes the Project Site, which encompasses the temporary and permanent disturbance areas.

Soils

Expansive Soils

Expansive soils are soils that possess a "shrink-swell" characteristic, also referred to as linear extensibility. Shrink-swell is the cyclic change in volume (expansion and contraction) that occurs in fine-grained clay sediments from the process of wetting and drying; the volume change is reported as a percent change for the whole soil. Changes in soil moisture can result from rainfall, landscape irrigation, utility leakage, roof drainage, or perched groundwater.[1] Expansive soils are typically very fine-grained and have a high to very high percentage of clay. Structural damage may occur incrementally over a long period of time, usually as a result of inadequate soil and foundation engineering or the placement of structures directly on expansive soils. Linear extensibility is a geotechnical term used to describe the shrink-swell potential of soils. If the linear extensibility is more than 3 percent, shrinking and swelling may cause damage to building, roads, and other structures. (NRCS, 2018). A majority of the Project Site is underlain by soils with a low expansion potential, with some minor patches of soils with a moderate expansion potential (NRCS, 2019a).

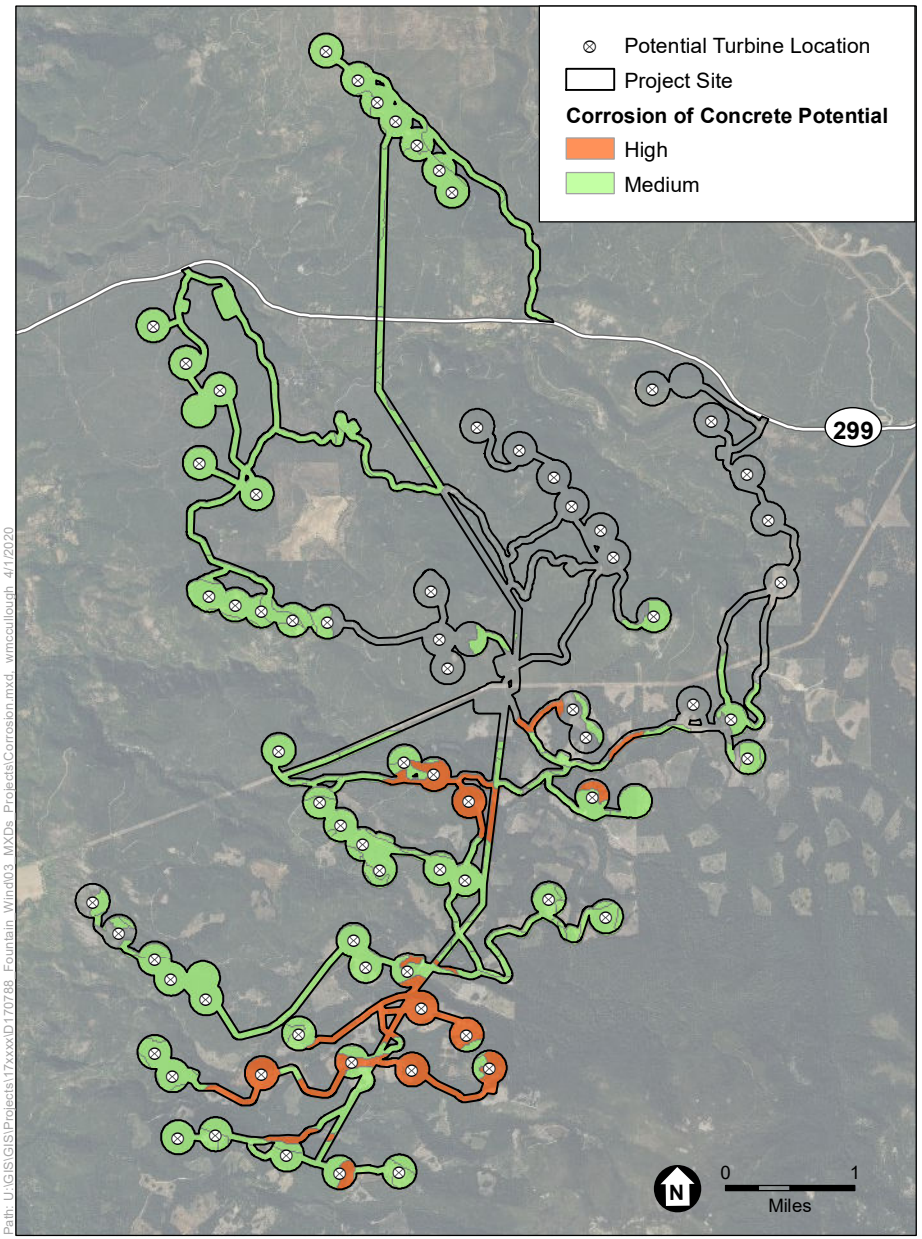
Corrosive Soils

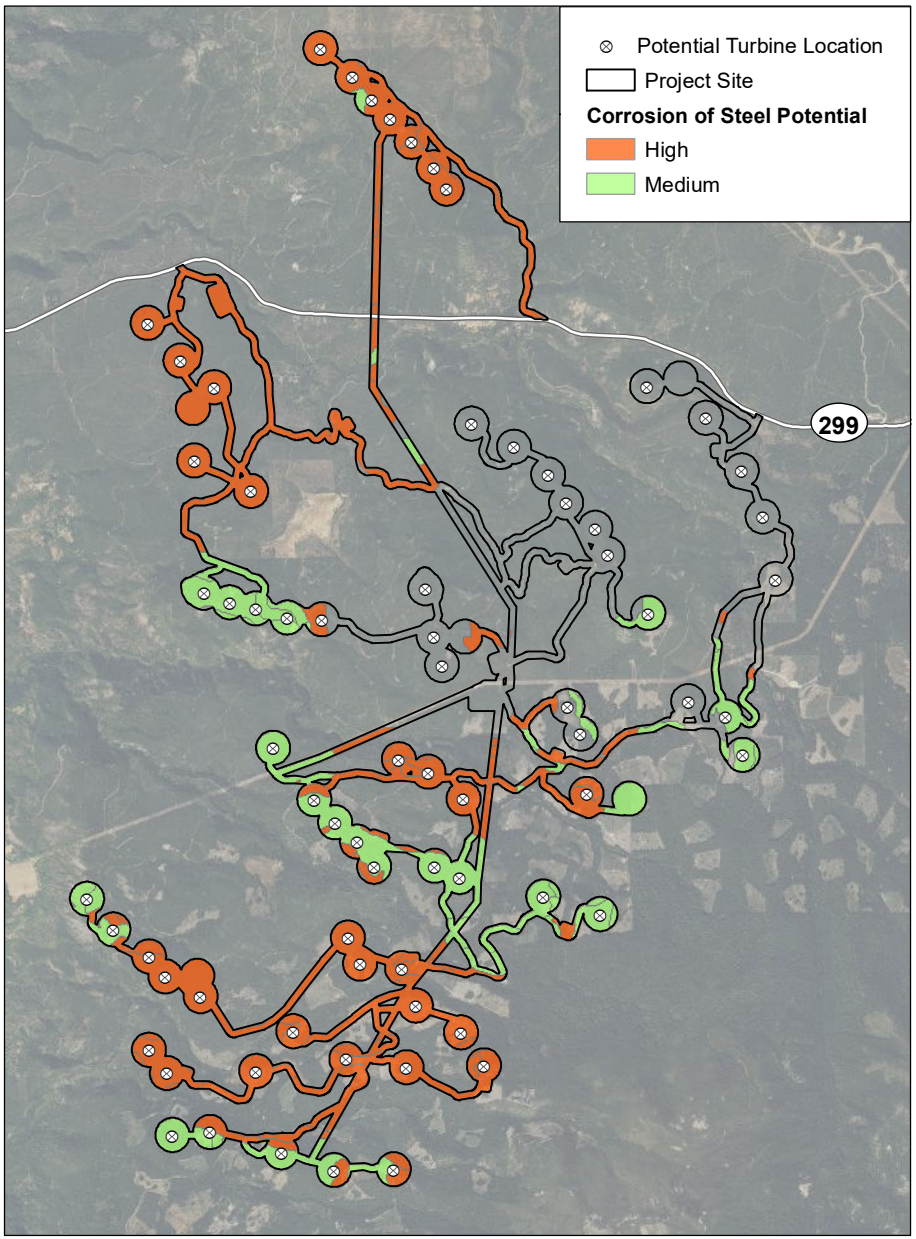
The corrosivity of soils pertains to the potential for certain soils to cause an electrochemical or chemical reaction that can corrode or weaken uncoated steel or concrete. The rate at which these materials corrode is dependent on a number of variables, including but not limited to: soil moisture, texture, mineral content, and acidity. The rate of corrosion of steel is based on soil moisture, particle-size distribution, acidity, and electrical conductivity. Corrosion of concrete is based on the sulfate and sodium content, texture, moisture and acidity of the soil. The risk of corrosion typically is expressed as low, moderate, or high. The NRCS Web Soil Survey provides data assessing the corrosivity of soils, specifically the corrosion of steel and concrete. According to NRCS Web Soil Survey data, the Project Site is underlain by soils that have a range of low, moderate, and high potential to corrode both concrete and steel, depending on the location within the Project Site, as depicted in **Figure 3.9-2**, *Corrosion of Concrete and Steel* (NRCS, 2019b, 2019c). The proposed concrete foundations and steel support structures could be exposed to corrosive soils.

Soils Capable of Supporting the Use of Septic Tanks

Septic tank absorption fields are areas in which effluent from a septic tank system is discharged into the soil through subsurface tiles or perforated pipe. The NRCS Web Soil Survey provides generalized data in terms of a rating class, which indicates the extent to which soils could be limited according to soil series classification. The ratings are based on the soil properties that may affect absorption of the effluent, construction and maintenance of the system, and public

[1] Perched groundwater is a local saturated zone above the water table that typically exists above an impervious layer (such as clay) of limited extent.





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Corrosion of Concrete

Corrosion of Steel

Fountain Wind Project

Figure 3.9-2

Corrosion of Concrete and Steel

ESA

SOURCE: NRCS, 2020

health. Saturated hydraulic conductivity, depth to water table, ponding, depth to bedrock, and flooding affect the absorption of the effluent. Subsidence and excessive slope could also affect septic tank use (NRCS, 2019d).

Soils may be rated either "Not limited," "Somewhat limited," or "Very limited." According to Web Soil Survey data, the soils within the Project Site are considered "Very limited," indicating that the soils have one or more features that are unfavorable for septic tank use (NRCS, 2019d).

Geologic Hazards

Faulting and Seismicity

Regional Faults

The Project Site is not within nor does it intersect an established Alquist-Priolo Earthquake Fault Zone, as mapped by the State Geologist (CGS, 2010). There are no known Holocene-active[2] faults or pre-Holocene[3] faults within the Project Site (CGS, 2010). However, there are a number of fault systems in the region, outside of the Project Site (CGS, 2010). The most significant of these fault systems, considering the proximity to the Project Site, are the Hatchet Ridge Fault Zone, the Rocky Ledge Fault Zone and the Hat Creek Fault Zone. Of these, the Rocky Ledge and Hat Creek fault zones have been designated "Earthquake Fault Zones" by the State Geologist, meaning there is evidence of displacement sometime in the last 11,700 years and they are considered active (CGS, 1990, 1991). The Rocky Ledge Fault Zone and the Hat Creek Fault Zone are located approximately 8.5 miles and 15 miles to the northeast of eastern border of the Project Site boundary, respectively. The Hatchet Ridge Fault Zone, although not considered active (because there is no evidence for displacement in the last 11,700 years), is the nearest fault zone to the Project Site. It is located approximately 2 miles to the east of the eastern most border of the Project Site boundary. See **Figure 3.9-3**, *Regional Faults.*

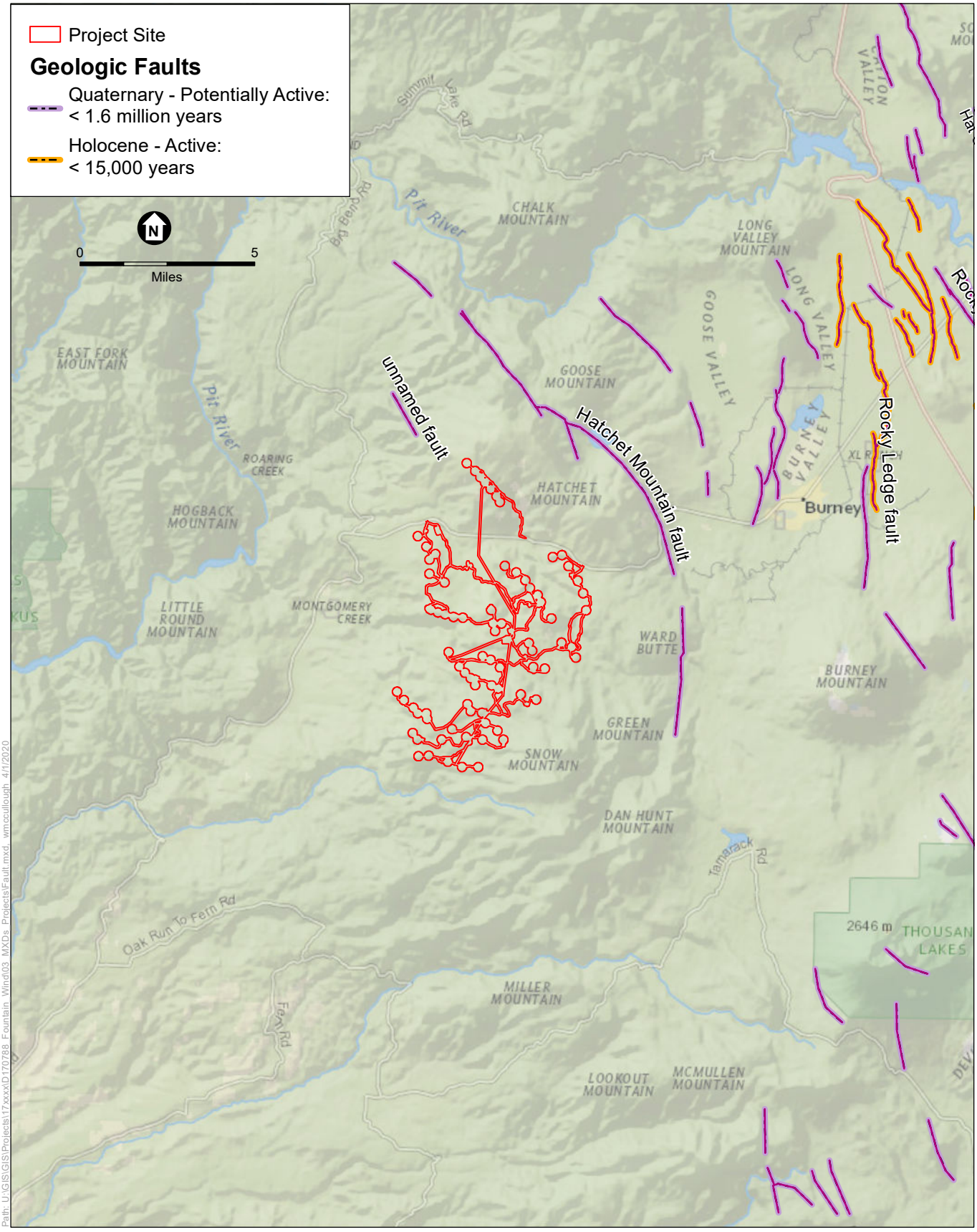
Seismic Ground Shaking

Ground shaking occurs due to a seismic event and can cause extensive damage to life and property, and may affect areas hundreds of miles away from the earthquake's epicenter. The extent of the damage varies by event and is determined by several factors, including (but not limited to): magnitude and depth of the earthquake, distance from epicenter, duration and intensity of the shaking, underlying soil and rock types, and integrity of structures.

While Shasta County has a low level of historic seismic activity (Shasta County, 2018), the entire Northern California region, including the Project Site, could be subject to strong ground shaking during earthquakes. The 2014 Working Group on California Earthquake Probabilities concluded that there is a 95 percent probability that a magnitude (M_W) 6.7 earthquake or higher will strike somewhere in Northern California by the year 2045 (Field et al., 2015).

[2] Faults that have evidence of displacement within the Holocene Epoch, or the last 11,700 years are considered active (CGS, 2018).

[3] Faults that have **not** shown evidence of displacement in the last 11,700 years (CGS, 2018).



SOURCE: USGS, 2010

Oakland Waterfront Ballpark District Project

Figure 3.9-3
Regional Faults

ShakeMap is a product of the USGS Earthquake Hazards Program; ShakeMap earthquake scenarios represent one realization of a potential future earthquake by assuming a particular magnitude and location (USGS, 2020). According to the ShakeMap that corresponds with an earthquake planning scenario generated by an estimated 7.2 M_W earthquake on the Hat Creek Fault Zone, the Project Site would be subjected to moderate to strong seismic ground shaking (USGS, 2016). While there is no ShakeMap earthquake scenario generated for the Rocky Ledge Fault Zone, it is assumed that an earthquake of equal or greater magnitude to the Hat Creek Fault Zone scenario would produce groundshaking of equal or greater magnitude.

Seismicity Related to Volcanic Activity Associated with Lassen Peak

Lassen Peak is considered an active volcano in the Cascade Range with historic activity, and is included as part of the Lassen Volcanic Center. Lassen Volcanic Center last erupted during 1914 through 1917, with the largest event occurring in May of 1915 (CGS, 2018). There are seven volcanoes in California that are considered by the USGS and CGS as having a high to very high threat potential.

There is currently no method for predicting when volcanic eruptions will occur, though increased seismicity and ground deformation are often the first indication of a potential eruption in volcanically active areas. Increased seismicity may provide the earliest indication that a volcanic system is being recharged, and that the system could be evolving toward an eruption (Clynne et al., 2012).

While volcanic eruptions are not analyzed under CEQA, the increased seismicity that is associated with Lassen Volcanic Center could contribute to strong seismic groundshaking at the Project Site, as well as other geologic hazards that can occur as a result of seismic groundshaking (i.e., liquefaction and landslides).

Liquefaction

Liquefaction is a phenomenon in which unconsolidated, water saturated sediments become unstable due to the effects of strong seismic shaking. During an earthquake, these sediments can behave like a liquid, potentially causing severe damage to overlying structures. Lateral spreading is a variety of minor landslide that occurs when unconsolidated liquefiable material breaks and spreads due to the effects of gravity, usually down gentle slopes. Liquefaction-induced lateral spreading is defined as the finite, lateral displacement of gently sloping ground as a result of pore-pressure buildup or liquefaction in a shallow underlying deposit during an earthquake. The occurrence of this phenomenon is dependent on many complex factors, including the intensity and duration of ground shaking, particle-size distribution, and density of the soil.

The potential damaging effects of liquefaction include differential settlement, loss of ground support for foundations, ground cracking, heaving and cracking of structure slabs due to sand boiling, and buckling of deep foundations due to ground settlement. Dynamic settlement (i.e., pronounced consolidation and settlement from seismic shaking) may also occur in loose, dry sands above the water table, resulting in settlement of and possible damage to overlying structures. In general, a relatively high potential for liquefaction exists in loose, sandy soils that are within 50 feet

of the ground surface and are saturated (below the groundwater table). Lateral spreading can move blocks of soil, placing strain on buried pipelines that can lead to leaks or pipe failure.

The Shasta County General Plan identifies the South Central Region of Shasta County as an area of potential liquefaction (Shasta County, 2018). The Project Site would not be located in the South Central Region on the County. As discussed above, the underlying geology within the Project Site is entirely volcanic and not composed of loose, sandy deposits. According to the Water Supply Assessment by Stantec (see **Appendix I**), the depth to groundwater in 29 of the 33 wells located within 1 mile of SR 299 is highly variable and ranges between 5 and 238.5 feet below ground surface.

Landslides

Landslides are one of the various types of downslope movements in which rock, soil, and other debris are displaced due to the effects of gravity. The potential for material to detach and move down slope depends on a variety of factors including the type of material, water content, steepness of terrain, and more. The CGS has not mapped the Project Site region for susceptibility to landslide risks under the Seismic Hazards Mapping Act (Public Resources Code §2690 et seq.).

The Shasta County General Plan, however, mentions that landslides are known to occur throughout the County, and are especially prevalent in its northern and eastern areas. Although landslides are known to occur throughout the County, seismically-induced landslides are not considered a significant hazard in Shasta County (Shasta County, 2004).

According to geologic mapping by Dupras, there are no landslide deposits mapped within the Project Site (Dupras, 1997). According to topographic maps of the United States Geological Survey (USGS), the Project Site includes relatively steep slopes (USGS, 2018a, 2018b) where landslides, debris flows, or rock falls could occur.

3.9.1.3 Regulatory Setting

Federal

Occupational Safety and Health Administration

The Occupational Safety and Health Act requires employers to comply with safety and health standards promulgated by the Occupational Safety and Health Administration (OSHA). OSHA Excavation standards, which are set forth in Title 29 Code of Federal Regulations (CFR) Part 1926, Subpart P, contain requirements for excavation and trenching operations.

State

The Z'Berg-Nejedly Forest Practice Act of 1973 (Pub. Res. Code §4511-4360.2) and its implementing regulations, the Forest Practice Rules (14 Cal. Code Regs. §895 et seq.), govern the management of privately owned forestlands in California, including requisite erosion controls, such as drainage facilities, soil stabilization treatments, road and landing abandonment, removal and treatment of watercourse crossings, and any other features or actions to reduce surface erosion, gullying, channel erosion, and mass erosion. See, for example:

- Rule 915.1, 935.1, 955.1, which establishes performance standards for the use of heavy equipment for site preparation, including that such equipment "shall not be used for site preparation under saturated soil conditions that may produce significant sediment discharge; or when it cannot operate under its own power due to wet conditions" (14 Cal. Code Regs. §§915.1, 935.1, 955.1[b]).
- Rule 916.7, 936.7, 956.7, which establishes performance standards for the reduction of soil loss (14 Cal. Code Regs. §§916.7, 936.7, 956.7).
- Rule 3706(d), which establishes the following performance standard for drainage, diversion structures, waterways, and erosion control: "Surface runoff and drainage from surface mining activities shall be controlled by berms, silt fences, sediment ponds, revegetation, hay bales, or other erosion control measures, to ensure that surrounding land and water resources are protected from erosion, gullying, sedimentation and contamination. Erosion control methods shall be designed to handle runoff from not less than the 20 year/1-hour intensity storm event" (14 Cal. Code Regs. §3706[d]).

The California Board of Forestry and Fire Protection provides additional guidance in its 2013 Road Rules and Technical Addendum No. 5: Guidance on hydrologic disconnection, road drainage, minimization of diversion potential and high risk crossings (CAL FIRE, 2013).

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the State Geologist established regulatory zones, called "earthquake fault zones," around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace, because many active faults are complex and consist of more than one branch. There is the potential for ground surface rupture along any of the branches. Currently, there are no earthquake fault zones that are mapped as intersecting or adjacent to the Project Site.

California Building Code

The California Building Code (CBC), codified in Title 24 of the California Code of Regulations Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards for structural strength, means of ingress/egress to facilities (entering and exiting), and general stability of buildings. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction.

The CBC is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable. The provisions of the CBC apply to the construction, alteration, movement, replacement, location, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The 2019 edition of the CBC is based on the 2018 International Building Code published by the International Code Council, which replaced the Uniform Building Code. The code is updated triennially; the 2019 edition of the CBC was published by the California Building Standards Commission on July 1, 2019, and went into effect on January 1, 2020. The 2019 CBC contains California amendments based on the American Society of Civil Engineers (ASCE) Minimum Design Standard ASCE/SEI 7-16, Minimum Design Loads for Buildings and Other Structures. The CBC provides requirements for general structural design and includes means for determining earthquake loads, as well as other loads (such as wind loads), for inclusion in building codes.

CBC Chapter 18 covers the requirements of geotechnical investigations (Section 1803), excavation, grading, and fills (Section 1804), load bearing of soils (Section 1806) and foundations (Section 1808), shallow foundations (Section 1809), and deep foundations (Section 1810).

Requirements for geotechnical investigations are included in Appendix J, CBC Section J104, Engineered Grading Requirements. As outlined in Section J104, applications for a grading permit must be accompanied by plans, specifications, and supporting data consisting of a soils engineering report and engineering geology report. Additional requirements for subdivisions requiring tentative and final maps and for other specified types of structures are in Health and Safety Code Sections 17953–17955 and in 2019 CBC Section 1802. Samples from subsurface investigations, such as from borings or test pits, must undergo testing. Studies must be done as needed to evaluate slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on load-bearing capacity, compressibility, liquefaction, differential settlement, and expansiveness.

The design of the proposed buildings, structures and infrastructure would be required to comply with CBC requirements.

California Occupational Safety and Health Administration

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the workplace. In California, the California Division of Occupational Safety and Health (Cal/OSHA) and the federal Occupational Safety and Health Administration (OSHA) are the agencies responsible for ensuring worker safety in the workplace.

The OSHA Excavation and Trenching standard (29 CFR §1926.650) covers requirements for excavation and trenching operations. OSHA requires protecting all excavations in which employees could potentially be exposed to cave-ins, by sloping or benching the sides of the excavation, supporting the sides of the excavation, or placing a shield between the side of the excavation and the work area. Cal/OSHA also regulates dust protection during construction and the issues around fugitive dust is discussed more fully in Section 3.3, *Air Quality*. Cal/OSHA is the implementing agency for both federal and state OSHA standards. All contractors must comply with OSHA regulations, which would make the Project consistent with OSHA.

National Pollutant Discharge Elimination System Construction General Permit

Construction of the Project would disturb more than 1 acre of land surface, potentially affecting the quality of stormwater discharges into waters of the United States. The Project therefore would

be subject to the National Pollutant Discharge Elimination System (NPDES) *General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002, Construction General Permit; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ).

The Construction General Permit regulates discharges of pollutants in stormwater associated with construction activity to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface. The permit regulates stormwater discharges from construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects, including installation of water pipelines and other utility lines.

The Construction General Permit requires that construction sites be assigned a risk level of 1 (low), 2 (medium), or 3 (high), based both on the sediment transport risk at the site and the risk to receiving waters during periods of soil exposure (e.g., grading and site stabilization). The sediment risk level reflects the relative amount of sediment that could be discharged to receiving water bodies, and is based on the nature of the construction activities and the location of the site relative to receiving water bodies. The receiving-waters risk level reflects the risk to receiving waters from the sediment discharge. Depending on the risk level, construction projects governed by the Construction General Permit could be subject to the following requirements:

- Effluent standards
- Good site management "housekeeping"
- Non-stormwater management
- Erosion and sediment controls
- Run-on and runoff controls
- Inspection, maintenance, and repair
- Monitoring and reporting requirements

The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) that includes specific best management practices (BMPs) designed to prevent sediment and pollutants from coming into contact with stormwater and moving off-site into receiving waters. The BMPs fall into several categories, including erosion control, sediment control, waste management, and good housekeeping. They are intended to protect surface water quality by preventing eroded soil and construction-related pollutants from migrating off-site from the construction area. Routine inspection of all BMPs is required under the Construction General Permit. In addition, the SWPPP must contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. See Section 3.12.1.3, *Regulatory Setting*, for details about the 303(d) list.

The SWPPP must be prepared before construction begins. The SWPPP must contain a site map(s) that delineates the construction work area, existing and proposed buildings, parcel boundaries, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the project area. The SWPPP must list BMPs and the placement of those BMPs that the applicant would use to protect stormwater runoff.

Examples of typical construction BMPs include scheduling or limiting certain activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations, and washing and fueling of vehicles and equipment. The Construction General Permit also sets post-construction standards (i.e., implementation of BMPs to reduce pollutants in stormwater discharges from the site after construction).

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones, and cities, counties, and other local permitting agencies to regulate certain development projects within these zones. For projects that would locate structures for human occupancy within designated Zones of Required Investigation, the Seismic Hazards Mapping Act requires project applicants to perform a site-specific geotechnical investigation to identify the potential site-specific seismic hazards and corrective measures, as appropriate, prior to receiving building permits. The *CGS Guidelines for Evaluating and Mitigating Seismic Hazards* (Special Publication 117A) provides guidance for evaluating and mitigating seismic hazards (CGS, 2008). The CGS is in the process of producing official maps based on USGS topographic quadrangles, as required by the Act. However, no mapping of the region that includes the Project Site has been compiled by the CGS.

Local

Shasta County General Plan

Section 5.1, *Seismic and Geological Hazards,* of the Shasta County General Plan describes the following objectives and policies regarding seismic and geological hazards that are related to the Project (Shasta County, 2004).

Objectives:

***SG-1*:** Protection of all development from seismic hazards by developing standards for the location of development relative to these hazards; and protection of essential or critical structures, such as schools, public meeting facilities, emergency services, high-rise and high-density structures, by developing standards appropriate for such protection.

***SG-2*:** Protection of development on unstable slopes by developing standards for the location of development relative to these hazards.

***SG-3*:** Protection of development from other geologic hazards, such as volcanoes, erosion, and expansive soils.

***SG-4*:** Protection of waterways from adverse water quality impacts caused by development on highly erodible soils.

Policies:

SG-a: Development proposals for critical or high density structures, as defined in the Uniform Building Code, located within a half mile of any fault identified as an Earthquake Fault Zone by the California Division of Mines and Geology shall include a geologic study of potential fault rupture. Geologic studies which are undertaken shall be performed by a registered geologist according to general guidelines of the California Division of Mines and Geology. Proposals for critical structures, as defined in the Uniform Building Code, within the study area shall include a site-specific seismic hazards evaluation, including ground motion criteria for the design of new buildings and structures.

SG-b: In order to minimize development that would be endangered by landslides, geological investigations by a registered geologist or a geological engineer will be required on all subdivision and/or developments where the preliminary staff report indicates the possibility of landslides on or adjacent to the development. A landslide map shall be developed and maintained as these reports are accumulated for reference by the development sponsors.

SG-c: Shasta County shall coordinate with State and Federal agencies monitoring volcanic activity and shall periodically review and update the Shasta County Emergency Plan with respect to volcanic hazards.

SG-d: Shasta County shall develop and maintain standards for erosion and sediment control plans for new land use development. Special attention shall be given to erosion prone hillside areas, including those with extremely erodible soils types such as those evolved from decomposed granite.

SG-e: When soil tests reveal the presence of expansive soils, engineering design measures designed to eliminate or mitigate their impacts shall be employed.

SG-f: Shasta County shall pursue preparation of development standards based on topography and soil erosion potential in revising its land capability standards pursuant to Policy CO-h.

SG-g: Shasta County should comply with the requirements of the Seismic Hazards Mapping Act, when the Seismic Hazards Maps for the County are completed and made available by the State Geologist. The Maps will include liquefaction hazard zones and earthquake-induced landslide hazard zones.

3.9.2 Significance Criteria

CEQA Guidelines Appendix G Section VII identifies considerations relating to geology and soils resources. See Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area*, as it relates to the County's analysis of the potential impacts of this Project to the considerations suggested in CEQA Guidelines Appendix G Section VII. Otherwise, for purposes of this analysis, a project would result in a significant impact to Geology and Soils Resources if it would:

a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

   i. Strong seismic ground shaking;

ii. Seismic-related ground failure, including liquefaction; or

iii. Landslides

b) Result in substantial soil erosion or the loss of topsoil;

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;

d) Be located on expansive soil, as defined in California Building Code (2019) Section 1803.5.3[4], creating substantial direct or indirect risks to life or property; or

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

3.9.3 Direct and Indirect Effects

3.9.3.1 Methodology

The following impact analysis is based on the Project characteristics and publicly available information on site conditions including geologic mapping. The analysis also considers the current regulatory requirements that would apply to the proposed improvements.

3.9.3.2 Direct and Indirect Effects of the Project

a.i) Whether the Project would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.

Impact 3.9-1: The Project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking. (*Less-than-Significant Impact*)

Strong seismic ground shaking could occur at the Project Site because there are active fault zones within 15 miles of the Project Site as well as potential seismic events related to volcanic activity. As discussed in the CBC subsection identified in Section 3.9.1.3, *Regulatory Setting*, a preliminary and final, Project-specific, site-specific, design-level geotechnical investigation and accompanying report would be required prior to construction. The geotechnical investigation that would result from compliance with this independently enforceable legal requirement would provide seismic design requirements consistent with the most updated version of the CBC. These seismic design requirements would be based on site–specific, Project-specific data, would be implemented during construction, and would significantly reduce the potential for damage to structures caused in the event of strong seismic ground shaking.

[4] Note that Appendix G refers to Table 18-1-B of the 1994 Uniform Building Code. The Uniform Building Code is no longer the basis for the California Building Code which is now based on the 2018 International Building Code. Because the considerations in CEQA Guidelines Appendix G are advisory rather than compulsory, the preparers of this EIR have elected to rely on the 2018 International Building Code, which provides the basis for State law.

Compliance with CBC requirements, including recommendations provided by a final design level geotechnical report, would ensure impacts related to strong seismic groundshaking, would be less than significant.

Mitigation: None required.

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a.ii) Whether the Project would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.

Impact 3.9-2: The Project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction. (*Less-than-Significant Impact*)

While the Project Site may be subject to strong seismic groundshaking in the event of an earthquake in the area, there is a general low risk of liquefaction according to the Shasta County General Plan and geologic mapping (Shasta County, 2004; Dupras, 1997). The Project Site is underlain primarily by volcanic deposits (not generally susceptible to liquefaction) and the groundwater level being relatively deep (greater than 50 feet deep), the potential for liquefaction or other ground failure is unlikely.

However, liquefaction hazards can only really be determined based on site-specific data. The required design-level geotechnical investigation identified above would analyze conditions within the Project Site where improvements are proposed, and would identify any potential for liquefaction or other seismic-related ground failure as required by the CBC. Should any potential liquefaction hazards be identified, the final design-level geotechnical report would provide seismic design requirements consistent with the most updated version of the CBC, which would be implemented during construction to significantly reduce the potential for any damage to structures caused by seismic-related ground failures, including liquefaction.

Compliance with CBC requirements, including recommendations provided by a geotechnical report, would ensure impacts related to ground failure, including liquefaction, would be less than significant.

Mitigation: None required.

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a.iii) Whether the Project would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.

Impact 3.9-3: The Project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides. (*Less-than-Significant Impact*)

Although landslides are known to occur in throughout Shasta County, seismically-induced landslides are not considered a significant hazard pursuant to the General Plan (Shasta County,

2004). Geologic mapping by Dupras (Dupras, 1997) indicates there are no landslide deposits located within the Project Site. However, as described in Section 3.9.1.2, *Environmental Setting*, the Project Site includes relatively steep slopes where landslides, debris flows, or rock falls could occur.

However, required site-specific, design-level geotechnical investigation identified above would analyze site-specific conditions, including any potential for landslide potential or other slope instability in accordance with CBC requirements. Should any potential impact be identified, the resulting report would provide seismic design requirements consistent with the most updated version of the CBC, which would be implemented during construction and decommissioning to significantly reduce the potential for any damage to structures that may be caused by landslides.

Compliance with CBC requirements, including recommendations provided by the requisite Project-specific, site-specific design-level geotechnical report, would ensure impacts related to landslides would be less than significant.

Mitigation: None required.

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b) Whether the Project would result in substantial soil erosion or the loss of topsoil.

Impact 3.9-4: The Project could result in substantial soil erosion or the loss of topsoil. (*Less-than-Significant Impact*)

The Project would include ground-disturbing activities during construction, operation and decommissioning that could increase the risk of erosion or sediment transport, if not managed appropriately. As mentioned in the introduction to this section, scoping input inquired about the possible presence of natural arsenic within Project Site soils: arsenic and the potential for it to contaminate groundwater is discussed in Section 3.11, *Hazards and Hazardous Materials*. Otherwise, ground-disturbing activities could result in soil erosion during excavation, grading, trenching, and soil stockpiling. Because such activities would exceed 1 acre during construction and decommissioning, the Project would be required to comply with the Construction General Permit described in Section 3.9.1.3, *Regulatory Setting*, and discussed further in Section 3.12, *Hydrology and Water Quality*. This state requirement was developed to ensure that stormwater is managed to protect water quality and includes erosion control measures for construction sites as well as post construction requirements. The Construction General Permit requires preparation and implementation of a SWPPP, which requires applying BMPs to control run-on and runoff from construction work sites. The BMPs would include but not be limited to physical barriers to prevent erosion and sedimentation; construction of sedimentation basins; limitations on work periods during storm events; use of infiltration swales; protection of stockpiled materials; and a variety of other measures that would substantially reduce or prevent erosion from occurring during construction. Through compliance with these independently enforceable existing requirements, the potential impacts of the Project associated with soil erosion and loss of topsoil during construction, operation, and decommissioning would be less than significant.

As discussed in Section 2.4.5, *Site Preparation and Construction*, existing commercial and pre-commercial timber would be harvested, treated, and/or removed from the Project Site prior to construction. Soil erosion could occur as a result of timber clearance and harvesting activities. Prior to any clearing and harvesting activities the Project would be required to comply with a Timber Harvesting Plan (THP). The THP would specify the location of timber to be harvested, how it would be harvested, and environmental BMPs that would be implemented during harvesting. The BMPs would include practices to protect water quality (by regulating soil erosion) during timber harvesting. In addition, as discussed above in the Regulatory Setting, the timber harvest activities would be required to adhere to the Z'Berg-Nejedly Forest Practice Act of 1973 (Pub. Res. Code §§4511–4360.2) and its implementing regulations, the Forest Practice Rules (14 Cal. Code Regs. §895 et seq.). Compliance would include implementing erosion controls, such as drainage facilities, soil stabilization treatments, road and landing abandonment, removal and treatment of watercourse crossings, and any other features or actions to reduce surface erosion, gullying, channel erosion, and mass erosion. Typically, implementation of erosion control measures during the timber removal activities followed by prompt soil stabilization treatments have proven effective in minimizing erosion and the loss of topsoil. Therefore, timber harvesting would have a less-than-significant impact related to erosion and loss of topsoil.

Activities that would occur during the Project's operation and maintenance period also could increase the risk of erosion or sediment transport if not managed appropriately. Such activities could include, for example, on-site use of utility vehicles, cranes, and other equipment to maintain rotors or other major wind turbine components as well as periodic grading or compaction of permanent access roads to minimize erosion, and the cleaning of catch basins, roadway ditches, and culverts. If not managed properly, these activities could increase the risk of erosion and sediment transport, and could create a significant impact.

Implementation of the required SWPPP and adherence to the requisite BMPs during the construction, and operations and maintenance phases, as well as the BMPs included in the THP during timber clearance and harvesting, the impacts related to soil erosion and loss of topsoil would be less than significant.

Mitigation: None required.

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c) Whether the Project would be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.

Impact 3.9-5: The Project could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. (*Less-than-Significant Impact*)

As discussed previously, the impact of the Project related to liquefaction, landslide, or other ground failure would be less than significant. While the potential for liquefaction, landslides, or

other ground failures is low, the required geotechnical investigation would analyze the site-specific conditions within the Project Site where foundations, footings and other infrastructure would be located as identified in final designs, and would identify any potential for geologic hazards to adversely affect proposed improvements. Should any potential hazards be identified, the geotechnical report would provide specific measures to address relevant site preparation, design or other requirements consistent with the most updated version of the CBC. These would be implemented during construction and decommissioning to significantly reduce the potential for any damage to structures.

Compliance with CBC requirements, including recommendations provided by a geotechnical report, would ensure impacts related to liquefaction, landslides, or other ground failures would be less than significant.

Mitigation: None required.

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d) Whether the Project would be located on expansive or corrosive soil, as defined in California Building Code (2019) Section 1803.5.3, creating substantial direct or indirect risks to life or property.

Impact 3.9-6: The Project could be located on expansive or corrosive soil, as defined in California Building Code Section 1803.5.3, creating substantial direct or indirect risks to life or property. (*Less-than-Significant Impact*)

***Expansive Soil*:** According to the NRCS Web Soil Survey data described in Section 3.9.1.2, *Environmental Setting*, a majority of the soil underlying the Project Site has a low expansion potential, with minor areas of moderate expansion potential. The potential impacts to life or property associated with expansive soils could be significant if not addressed appropriately. The Project design and construction activities would be required to comply with CBC regulations and requirements and would employ standard engineering and building practices common to construction projects throughout California (e.g., soil removal and replacement with engineered soil) that are also consistent with building code requirements.

The required design-level geotechnical investigation described above would identify any expansive soils within the Project Site and specific responsive requirements to ensure that all foundations and other below-ground infrastructure would not be adversely affected by expansive soils. Adherence to design requirements consistent with the most updated version of the CBC and site-specific geotechnical report would ensure that the impact of the Project related to expansive soils would be less than significant.

***Corrosive Soil*:** NRCS Web Soil Survey mapping (Figure 3.9-1, *Potentially Corrosive Soils*) shows a majority of the Project Site as underlain by soils that have a range of potential to corrode both steel and concrete. Because Project components include steel support structures and concrete foundations, these structures could be in contact with potentially corrosive soils. The impacts to life or property associated with corrosive soils, if not addressed appropriately, would be

significant due to the soils corroding and/or weakening the concrete and/or steel followed by subsequent failure of the affected infrastructure.

The required design-level geotechnical investigation described above would identify any corrosive soils that could be affected by Project infrastructure pursuant to the final design, and would impose site-specific design and soil amendment requirements, if necessary, to ensure that all foundations and other below-ground improvements would not be impacted by corrosive soils. Adherence to design requirements consistent with the most updated version of the CBC and the site-specific, final design-level geotechnical report would ensure that the impact of the Project related to corrosive soils would be less than significant.

Mitigation: None required.

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e) Whether the Project would have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

Impact 3.9-7: The Project could have soils incapable of adequately supporting the use of a septic tank. (*Less-than-Significant Impact*)

No alternative waste water disposal systems are proposed for disposal of waste water. As discussed in Section 2.4.4.3, *Operation and Maintenance Facility*, the O&M facility would be served by an onsite septic system for the disposal of wastewater. As discussed in Section 3.9.1.2, *Study Area*, the soils within the Project Site are rated as "Very limited" in relation to septic tank usage according to the generalized NRCS Web Soil Survey data. Actual performance of the soils in the vicinity of the O&M facility would be dependent on site-specific characteristics. If the system is not designed appropriately, onsite soils could be incapable of disposing the anticipated volumes of wastewater.

Prior to installation, a septic system permit would be required by the Shasta County Department of Resource Management's Environmental Health Division. Adherence to requirements of the septic system permit would include site-specific soil testing and percolation tests to ensure the onsite septic system would be installed properly and within adequate soils that meet minimum County standards. As a result, the Project would not introduce an environmental or public health hazard by building septic tanks or other wastewater disposal system in soils that are incapable of adequately supporting such systems. A less-than-significant impact would result.

Mitigation: None required.

3.9.3.3 PG&E Interconnection Infrastructure

The Project would connect into the existing PG&E 230 kV line via an aboveground line tap located directly adjacent to the switching station. Minor modifications or upgrades to the existing 230 kV line may be required to facilitate the Project's interconnection. Upgrades to PG&E

facilities are anticipated to include construction and/or reconfiguration of utility line structures and transmission line circuits involving four to six new transmission poles. Geologic, seismic, and soil hazards and impacts discussed above would be the same for this portion of the site; therefore, all less-than-significant impact conclusions described above are applicable and would be the same for the Interconnection Infrastructure.

3.9.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, no turbines would be erected north of SR 299. The elements of Alternative 1 would be required to comply with CBC regulations and stormwater permitting regulations governing erosion control. Because a septic system would be constructed, operated and maintained and ultimately decommissioned, the same County and other requirements as described for the Project also would apply to Alternative 1. Therefore, impacts associated with seismic groundshaking, seismic related ground failures, erosion and expansive and corrosive soils, and the suitability of Project Site soils to support a septic system would be less than significant for the same reasons as described for the Project.

Alternative 2: Increased Setbacks

Under Alternative 2, there would be fewer turbines reducing overall temporary (construction-related) and permanent disturbance. The elements of Alternative 2 would be required to comply with CBC regulations and stormwater permitting regulations governing erosion control. Because a septic system would be constructed, operated and maintained and ultimately decommissioned, the same County and other requirements as described for the Project also would apply to Alternative 2. Therefore, impacts associated with seismic groundshaking, seismic related ground failures, erosion and expansive and corrosive soils, and the suitability of Project Site soils to support a septic system would be less than significant for the same reasons as described for the Project.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind turbines, turbine foundations, or other associated infrastructure (including the proposed septic system), facilities, or structures would be constructed, operated and maintained, or decommissioned on the Project Site. The proposed overhead and underground electrical collector system and communications lines would not be developed; and the meteorological towers, onsite collector substation, switching station, and operation and maintenance (O&M) facility would not be constructed. Laydown areas would not be cleared, no new access roads would be constructed, and no existing roads would be improved. None of the proposed belowground disturbance would occur, and the Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to Geology and Soils.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect to Geology or Soils. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.9.4 Cumulative Analysis

Impacts related to geology, soils, and seismicity tend to be site-specific and depend on the local geology and soil conditions. For these reasons, the geographic scope for potential cumulative impacts consists of the Project Site. The Project could contribute to a cumulative impact on geology, soils, and seismicity if the effects of the Project overlapped in time and space with those of other projects in the area, producing similar effects. Significant cumulative impacts related to geology and soils could occur if the incremental impacts of the Project combined with the incremental impacts of one or more of the cumulative projects described in Section 3.1.2.1, *Cumulative Scenario*, would cause substantial adverse effects involving geologic, seismic, or soil hazards.

The NPDES Construction General Permit would require each cumulative project involving disturbance of 1 acre or more of land to prepare and implement a SWPPP. The SWPPPs would describe BMPs to control runoff and prevent erosion for each such project. Through compliance with this requirement, the potential for erosion impacts would be reduced for all cumulative projects. The Construction General Permit has been developed to address cumulative conditions arising from construction throughout the state, and is intended to maintain cumulative effects of projects subject to this requirement below levels that would be considered significant. For example, two adjacent construction sites would be required to implement BMPs to reduce and control the release of sediment and/or other pollutants in any runoff leaving their respective sites. The runoff water from both sites would be required to achieve the same action levels, measured as a maximum amount of sediment or pollutant allowed per unit volume of runoff water. Thus, even if the runoff waters were to combine after leaving the sites, the sediments and/or pollutants in the combined runoff would still be at concentrations (amount of sediment or pollutants per volume of runoff water) below action levels and would not combine to be cumulatively significant.

Soil erosion and sedimentation would occur during timber clearance and harvesting, and these impact would be the same for any other possible timber harvesting or clearance associated with other potential projects. Any other projects including timber harvest and clearance would be required to prepare a project THP and would be subject to the same BMPs requirements within that

THP, which would further reduce any cumulative impact related to erosion and sedimentation. (Less than Significant)

Seismically-induced ground shaking, liquefaction and lateral spreading, and expansive or corrosive soils could cause structural damage or pipeline leaks or ruptures during construction and operations phases. However, state and local building regulations and standards have been established to address and reduce the potential for such impacts to occur. The Project and cumulative projects would be required to comply with applicable provisions of these laws and regulations. Through compliance with these requirements, the potential for impacts would be reduced. The purpose of the CBC (and related local ordinances) is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction; by design, it is intended to reduce the cumulative risks from buildings and structures. Based on compliance with these requirements, the incremental impacts of the Project combined with impacts of other projects in the area would not cause a significant cumulative impact related to seismically induced ground shaking, liquefaction and lateral spreading, or expansive or corrosive soils. (Less than Significant)

3.9.5 References

California Board of Forestry and Fire Protection (CAL FIRE, 2013). *Appendix C: California Board of Forestry and Fire Protection 2013 Road Rules and Technical Addendum No. 5: Guidance on hydrologic disconnection, road drainage, minimization of diversion potential and high risk crossing.*

California Geological Survey (CGS), 1990. Fault Evaluation Report FER-209 – Hat Creek, McArthur, and related faults; Shasta, Lassen, Modoc, and Siskiyou Counties, California.

CGS, 1991. State of California Special Studies Zones. Burney Quadrangle. Official Map. effective November 1, 1991.

CGS, 2008. *Guidelines for Evaluating and Mitigating Seismic Hazards* (Special Publication 117A). California Geological Survey. September 11, 2008.

CGS, 2010. Fault Activity Map of California. Available online at: https://maps.conservation.ca.gov/cgs/fam/app/.

CGS, 2018. Department of Conservation Fact Sheet: California Geological Survey, California Volcanoes.

Clynne et al., 2012. Geologic Field-Trip Guide to the Lassen Segment of the Cascades Arc, Northern California. Scientific Investigation Report 2017-5022-K2. U.S. Geological Survey.

Clynne, M. A., J. E. Robinson, M. Nathenson, and L. J. P. Muffler, 2018. Volcanic Hazards Assessment for the Lassen Region, Northern California. Scientific Investigations Report 2012-5176-A. U.S. Geological Survey.

Dupras, D., 1997. Geology of Eastern Shasta County. California Geological Survey. Map. Scale 1:100,000.

Field, E. H., G. P. Biasi, P. Bird, T. E. Dawson, K. R. Felzer, D. D. Jackson, K. M. Johnson, T. H. Jordan, C. Madden, A. J. Michael, K. R. Milner, M. T. Page, T. Parsons, P. M. Powers, B. E. Shaw, W. R. Thatcher, R. J. Weldon II, and Y. Zeng, 2015. Long-Term Time-Dependent Probabilities for the Third Uniform California Earthquake Rupture Forecast (UCERF3). Bulletin of the Seismological Society of America, Vol. 105, No. 2A, pp. 511–543. April 2015. doi: 10.1785/0120140093.

Shasta County, 2004. *Shasta County General Plan*; Chapter 5.0 Public Safety Group, 5.1 Seismic and Geologic Hazards. Available online at: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/GeneralPlanContents.pdf?sfvrsn=f16347c6_0.

Shasta County, 2018. Shasta County General Plan, Section 5.1, Seismic and Geologic Hazards. Available online at: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/51seismic.pdf?sfvrsn=3dc59a95_0.

U.S. Geological Survey (USGS), 2016. M 7.2 Scenario Earthquake—Hat Creek-McArthur-Mayfield. Earthquake Hazards Program. Available online at: https://earthquake.usgs.gov/scenarios/eventpage/nclegacyhatcreekmcarthurmayfieldm7p2_se/shakemap/intensity. Accessed March 24, 2020.

USGS, 2018a. The National Map—US Topo. Hatchet Mountain Pass Quadrangle, California—Shasta County, 7.5-Minute Series. Map. Scale 1:24,000.

USGS, 2018b. The National Map—US Topo. Burney Mountain West Quadrangle, California—Shasta County, 7.5-Minute Series. Map. Scale 1:24,000.

USGS, 2020. Earthquake Scenarios. Available online at: https://earthquake.usgs.gov/scenarios/. Accessed June 24, 2020.

U.S. Natural Resources Conservation Service (NRCS), 2017. National Soil Survey Handbook. Title 430-VI. Part 618—Soil Properties and Qualities. Subpart B, Section 618.80 (Guides for Estimating Risk of Corrosion Potential for Uncoated Steel), pp. 618-B. 1.

NRCS, 2019a. Web Soil Survey. Linear Extensibility—Intermountain Area, Parts of Lassen, Modoc, Shasta, and Siskiyou Counties, California; and Shasta County Area, California. Run date March 12, 2020.

NRCS, 2019b. Web Soil Survey. Corrosion of Concrete—Intermountain Area, Parts of Lassen, Modoc, Shasta, and Siskiyou Counties.

NRCS, 2019c. Web Soil Survey. Corrosion of Steel—Intermountain Area, Parts of Lassen, Modoc, Shasta, and Siskiyou Counties.

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3.10 Greenhouse Gas Emissions

This section identifies and evaluates issues related to greenhouse gas (GHG) emissions in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating the impacts, and the results of the impact assessment. The information and analysis presented in this section rely on the modeling results presented in **Appendix B**, *Air Quality and Greenhouse Gas Emissions*.

In response to its notice of intention to prepare this Draft EIR, the County received scoping input about annual rainfall assumptions, annual average wind speed, and concerns that operation of the proposed wind turbines could result in "localized atmospheric warming" (also referred to as a "heat island effect") that would affect the snow pack and temperatures required to grow apples on property near the Project Site. The possibility also was raised that the wind turbulence of turbines located along ridge lines could impact local weather by disrupting normal air flow over ridge tops, that spinning turbine rotors increase the vertical mixing of heat and water vapor, thereby affecting downwind meteorological conditions, including rainfall.

Multiple scoping comments requested disclosure of the Project's net effect on GHGs, including any reduction of other green sources of energy production (such as local hydroelectric capacity that would have to be throttled back during the operation of the proposed turbines) and any reduction in the site's GHG sequestration capacity caused by the temporary and permanent removal of forested acres. All scoping input received, including regarding GHG emissions and climate change, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

Scoping comments also requested that the EIR provide a "cradle-to-grave" carbon life cycle analysis that factors in emissions associated with the mining, manufacture, transportation, and construction of turbines, concrete, rebar, and other materials for the Project. CEQA does not require the suggested depth of inquiry (OPR, 2017), and it is not provided here.

The California Natural Resources Agency (CNRA) has indicated that in the context of GHG emissions, (1) there exists no standard regulatory definition for "life cycle"; and (2) even if a standard definition for life cycle existed, the term might be interpreted to refer to emissions beyond those that could be considered "indirect effects" as defined by the CEQA Guidelines, and therefore, beyond what an EIR is required to estimate and mitigate (CNRA, 2009).

This reasoning was reaffirmed in Section 15126.2(b) of the November 2018 CEQA Guidelines, which cautions that the analysis of impacts is subject to the rule of reason, and must focus on energy demand (and associated GHG emissions) caused by the project, signaling that a full "life cycle" analysis that would account for energy used by industrial facilities in building materials and consumer projects generally is not be required (CNRA, 2018a).

3.10.1 Setting

3.10.1.1 Study Area

The geographic scope of impacts related to GHG emissions is global. This analysis focuses on the impacts from the Project's emissions associated with potential conflicts with California's GHG reduction targets set forth in Senate Bill (SB) 32 and SB 100, and the Project's direct and/or indirect generation of GHG emissions.

3.10.1.2 Environmental Setting

Greenhouse Gases

The principal GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). Every GHG has its own global warming potential (GWP), which is a measurement of how much heat the GHG can trap within the atmosphere and how much of an environmental impact it is expected to have. GWPs determine the ratio of heat trapped by one unit mass of the specific GHG to that of one unit mass of CO_2 over a specified time period. The GWP factors were developed by the International Panel on Climate Change (IPCC), a United Nations–established scientific organization.

CO_2 is the most common reference gas for climate change. To account for the warming potential of different GHGs, GHG emissions often are quantified and reported as CO_2 equivalents (CO_2e). For example, SF_6 is a GHG commonly used in the utility industry as an insulating gas in circuit breakers and other electronic equipment. SF_6, while comprising a small fraction of the total GHGs emitted annually world-wide, is a much more potent GHG with 22,800 times the global warming potential as CO_2, which has a global warming potential of 1.[1] Large emission sources are reported in million metric tons of CO_2e.[2]

Impacts of Climate Change

Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). The scientific community's understanding of the fundamental processes responsible for global climate change has improved over the past decade, and its predictive capabilities are advancing. However, there remain significant scientific uncertainties in, for example, predictions of local effects of climate change, occurrence, frequency, and magnitude of extreme weather events, effects of aerosols, changes in clouds, shifts in the intensity and distribution of precipitation, and changes in oceanic circulation. Due to the complexity of the Earth's climate system and inability to accurately model it, the uncertainty surrounding the localized effects of climate change may never be completely eliminated.

[1] The California Emissions Estimator Model (CalEEMod) is the modeling software used chiefly for determining GHG emissions from CEQA projects. CalEEMod currently utilizes the global warming potentials from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4).

[2] The term metric ton is commonly used in the U.S. to refer to the metric system unit, tonne, which is defined as a mass equal to 1,000 kilograms. A metric ton is approximately 1.1 short tons and approximately 2,204.6 pounds.

The *Fourth California Climate Change Assessment* (Fourth Assessment), published in 2018, found that the potential impacts in California due to global climate change include: loss in snow pack; sea level rise; more extreme heat days per year; more high ozone days; more extreme forest fires; more severe droughts punctuated by extreme precipitation events; increased erosion of California's coastlines and seawater intrusion into the Sacramento–San Joaquin Delta and associated levee systems; and increased pest infestation (OPR et al., 2018).

Surface temperature is projected to rise over the 21st century under all assessed emission scenarios. It is very likely that heat waves will occur more often and last longer, and that extreme precipitation events will become more intense and frequent in many regions. The expectation is that the ocean will continue to warm and acidify, and global mean sea level will rise. Continued human-based generation of GHGs will likely cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive, and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in GHG emissions which, together with adaptation, can limit climate change risks (IPCC, 2014).

Temperature Increase. The primary effect of adding GHGs to the atmosphere has been a rise in the average global temperature. The impact of human activities on global temperature is readily apparent in the observational record. While year-to-year variations occur due to natural variability, 2019 was 2.19°F above a pre-industrial baseline (1881–1910) temperature, and the five warmest years have occurred over the past 5-year period (Climate Central, 2020). In 2019, the average annual temperature for the contiguous U.S. was 52.7°F, 0.7°F above the 20th Century average, ranking in the warmest third of the 125-year record (NOAA, 2020). The Fourth Assessment indicates that average temperatures in California could rise 5.6°F to 8.8°F by the end of the century, depending on the global trajectory of GHG emissions (OPR et al, 2018).

Wildfires. The hotter and dryer conditions expected with climate change will make forests more susceptible to extreme wildfires. A recent study found that, if GHG emissions continue to rise, the frequency of extreme wildfires burning over approximately 25,000 acres would increase by nearly 50 percent, and the average area burned statewide each year would increase by 77 percent, by the year 2100.

Air Quality. Higher temperatures, conducive to air pollution formation, could worsen air quality in California and make it more difficult for the state to achieve air quality standards. Climate change may increase the concentration of ground-level ozone in particular, which can cause breathing problems, aggravate lung diseases such as asthma, emphysema, and chronic bronchitis, and cause chronic obstructive pulmonary disease (COPD). Emissions from wildfires can lead to excessive levels of particulate matter, ozone, and volatile organic compounds (Kenward et al., 2013).

Hydrology and Sea Level Rise. California's hydrology is already changing due to global climate shifts. The vulnerability of the water sector to climate change stems from a modified hydrology that affects the frequency, magnitude, and duration of extreme events, which in turn, affect water quantity, quality, and infrastructure. Changes in hydrology include declining snowpack, earlier snow melt, more precipitation as rain than snow, more frequent and longer droughts, more frequent and more severe flooding, changes in the timing and volume of peak runoff, and

consequent impacts on water quality and water availability. Additionally, rising sea levels will produce higher storm surges during coastal storms.

Sea levels measured at stations in San Francisco have risen at a rate of 8 inches over the century. Sea level rise in California could lead to flooding of low-lying areas, loss of coastal wetlands such as portions of the San Francisco Bay-Delta system, erosion of cliffs and beaches, saltwater contamination of drinking water, impacts on roads and bridges, and harmful ecological effects along the coastline (CNRA, 2018b).

Agriculture. Successful food crop production is closely tied to weather, which reflects the conditions of the atmosphere over a short period of time. Climate change is changing the longer-term patterns of atmospheric conditions, and the resulting impacts are expected to worsen over the next century. Climate impacts like unpredictable water availability, rising minimum and maximum temperatures, extended heat waves, changes in the prevalence of plant and livestock pests and diseases, and impacts to beneficial species directly affect agricultural food crop and livestock production. This poses a significant threat to California farms, which grow over 33 percent of the vegetables and two-thirds of the fruits and nuts in the U.S. (CNRA, 2018b).

Ecosystem and Biodiversity Impacts. Climate change impacts on ecosystems and biodiversity are being observed in alteration of the timing of critical biological events such as spring bud burst and substantial range shifts of many species. In the longer term, there is an increased risk of species extinction. Events such as droughts, floods, wildfires, and pest outbreaks associated with climate change can also disrupt ecosystems (Melillo et al., 2014).

Human Health Impacts. Global climate change also is anticipated to result in more extreme heat events (OPR et al., 2018). These extreme heat events increase the risk of death from dehydration, heart attack, stroke, and respiratory distress, especially with people who are ill, children, the elderly, and the poor, who may lack access to air conditioning and medical assistance. A warming planet is expected to bring more severe weather events, worsening wildfires and droughts, a decline in air quality, rising sea levels, increases in allergens and in vector-borne diseases, all of which present significant health and wellbeing risks for California populations (CNRA, 2018b).

Greenhouse Gas Emissions Estimates

Global Emissions

Total global annual GHG emissions, including from land-use change, reached a record high of 55.3 gigatons (Gt) CO_2e in 2018, an increase of 3.4 Gt CO_2e compared with 2017. GHG emissions have risen at a rate of 1.5 percent per year in the last decade, stabilizing only briefly between 2014 and 2016 (UN Environment, 2019).

U.S. Emissions

In 2018, the United States emitted about 6.68 billion tons of CO_2e, representing a 2.9 percent increase from 2017. The increase in total GHG emissions between 2017 and 2018 was driven largely driven by an increase in CO_2 emissions from fossil fuel combustion. CO_2 accounts for approximately 82 percent of GHG emissions. The increase in CO_2 emissions from fossil fuel

combustion was a result of multiple factors, including increased energy consumption from greater heating and cooling needs due to a colder winter and hotter summer in 2018 (in comparison to 2017).

Of the five major sectors nationwide—residential and commercial, industry, agriculture, transportation, and electricity—transportation accounts for the highest fraction of GHG emissions (approximately 28 percent), closely followed by the electric power industry (approximately 27 percent), and general industry (approximately 22 percent). Total emissions from the electric power sector have decreased by 3.4 percent since 1990, and the carbon intensity of the electric power sector has decreased by 13 percent during that same time frame. Between 1990 and 2018, renewable energy generation (in kilowatt-hours) from solar and wind energy have increased from 0.1 percent in 1990 to 8 percent of total electricity generation in 2018, which helped drive the decrease in the carbon intensity of the electricity supply in the U.S. (USEPA, 2020).

State of California Emissions

In 2017, California emitted approximately 424 million tons of CO_2e, representing a 1.2 percent decrease from 2016. For the first time since California started to track GHG emissions, electricity generation from zero-GHG sources, including solar, hydroelectric, wind, and nuclear, exceeded generation from GHG-emitting sources. The transportation sector remains the largest source of GHG emissions in the State and saw a one percent increase in emissions in 2017; however, this represents the lowest growth rate for this sector over the past 4 years.

The latest California Air Resources Board (CARB) inventory also reports that transportation is the source of approximately 41 percent of the state's GHG emissions, followed by industrial sources at 24 percent, and electricity generation (both in-state and out-of-state) at 15 percent. Emissions from the electricity sector showed another large (9 percent) reduction in emissions in 2017 from approximately 68.3 to 62.3 million tons of CO_2e due to a large increase in renewable energy. Residential and commercial activity is the source of about 12 percent of California's GHG emissions and agriculture is the source of approximately 8 percent of California's GHG emissions (CARB, 2019).

Shasta County Emissions

Shasta County completed a baseline GHG emissions inventory as a part of its regional climate action planning process. In 2008, Shasta County generated a total of approximately 4.48 million metric tons of CO_2e (MT CO_2e) emissions. Stationary sources (e.g., cement plants, lumber mills, biomass generation facilities) were the highest source of emissions countywide contributing approximately 54 percent of the total emissions, followed by transportation emissions (19 percent) and energy-related emissions (14 percent). When agriculture, forestry, and stationary source emissions are removed, as the County does not have authority to influence these activities, the 2008 countywide jurisdictional inventory was reduced to 1.76 million MT CO_2e. In the jurisdictional-only inventory, transportation emissions contributed approximately 48 percent of total emissions and energy-related emissions were approximately 37 percent.

In 2008, the unincorporated areas of Shasta County, where the Project Site is located, generated a total of approximately 3.13 million MT CO_2e, with the stationary sources being the largest source of emissions at 72 percent of total emissions, followed by transportation (8 percent), energy (7 percent), forestry (5 percent), and agriculture emissions (4 percent). When the agriculture, forestry, and stationary source sectors are removed in the jurisdictional inventory, baseline emissions dropped considerably to approximately 0.57 million MT CO_2e. In the jurisdictional-only inventory, the transportation and energy sectors were the largest emissions sources at 43 percent and 36 percent, respectively (Shasta County, 2012).

3.10.1.3 Regulatory Setting

Federal

U.S. Environmental Protection Agency "Endangerment" and "Cause or Contribute" Findings

GHGs fit within the Clean Air Act's definition of a pollutant and are regulated by the USEPA. On December 7, 2009, the USEPA Administrator signed two findings regarding GHGs under Section 202(a) of the federal Clean Air Act:

- **Endangerment Finding:** The current and projected concentrations of six key GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) in the atmosphere threaten the public health and welfare of current and future generations.
- **Cause or Contribute Finding:** The combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare.

Mandatory Greenhouse Gas Reporting Rule

On September 22, 2009, the USEPA released its final Greenhouse Gas Reporting Rule (Reporting Rule). The Reporting Rule is a response to the fiscal year (FY) 2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110-161), that required the USEPA to develop "…mandatory reporting of GHGs above appropriate thresholds in all sectors of the economy." The Reporting Rule applies to most entities that emit 25,000 metric tons of CO_2e or more per year. The Project would not reach this threshold.

Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards

In 2014 the USEPA and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) established a program that reduces GHG emissions and improves fuel economy for all new cars and trucks sold in the U.S. The program required manufacturers to build a fleet that meets all federal and State requirements with an end target fuel economy of 54.5 miles per gallon by model year 2025. In January 2017, USEPA issued its Mid-Term Evaluation of the GHG emissions standards, finding that it would be practical and feasible for automakers to meet the model year 2022 to 2025 standards through a number of existing technologies.

In August 2018, the USEPA revised its 2017 determination, and issued a proposed rule that maintains the 2020 Corporate Average Fuel Economy (CAFE) and CO_2 standards for model years

2021 through 2026 (83 Fed. Reg. 42986). The estimated CAFE and CO_2 standards for model year 2020 are 43.7 miles per gallon (mpg) and 204 grams of CO_2 per mile for passenger cars and 31.3 mpg and 284 grams of CO_2 per mile for light trucks, projecting an overall industry average of 37 mpg, as compared to 46.7 mpg under the standards issued in 2012. On May 1, 2018, California, joined by 16 other states and the District of Columbia, filed a petition challenging the USEPA's proposed rule to revise the vehicle emissions standards, arguing that the USEPA had reached erroneous conclusions about the feasibility of meeting the existing standards. On October 25, 2019, the D.C. Circuit dismissed the challenges, concluding that it did not have jurisdiction to consider the US EPA's withdrawal of the Obama administration's mid-term determination that model year 2022 to 2025 GHG emission standards promulgated in 2012 remained appropriate. The court noted that the withdrawal did not itself change the emission standards established in 2012 but only created the possibility that the standards could be modified in the future, similar to an agency's grant of a petition for reconsideration of a rule.[3] Accordingly, due to the uncertainty of future federal regulations, this analysis assumes that the existing CAFE standards will remain in place.

State

Executive Order S-3-05

In 2005, in recognition of California's vulnerability to the effects of climate change and information from the IPCC, Governor Arnold Schwarzenegger issued Executive Order S-3-05 (EO S-3-05), which announced goals for statewide GHG emission reductions and target dates by which those goals should be met. These included a reduction of GHG emissions to 2000 levels by 2010; a reduction of GHG emissions to 1990 levels by 2020; and a reduction of GHG emissions to 80 percent below 1990 levels by 2050.

As discussed below, the 2020 reduction target was codified in 2006 as Assembly Bill 32. However, the 2050 reduction target has not been codified and the California Supreme Court has ruled that CEQA lead agencies are not required to use it as a significance threshold. *Cleveland National Forest Foundation v. San Diego Association of Governments* (2017) 3 Cal.5th 497.

Assembly Bill 32 and the California Climate Change Scoping Plan

In 2006, the California Legislature enacted Assembly Bill 32 (Health and Safety Code §38500 et seq., or AB 32), also known as the Global Warming Solutions Act. AB 32 required CARB to design and implement feasible and cost-effective emission limits, regulations, and other measures, such that statewide GHG emissions are reduced to 1990 levels (i.e., 427 million metric tons CO_2e) by 2020 (representing a 25 percent reduction in emissions). AB 32 anticipated that the GHG reduction goals will be met, in part, through local government actions.

Pursuant to AB 32, CARB adopted a Scoping Plan in December 2008 (CARB, 2009), which was re-approved by CARB on August 24, 2011, that outlines measures to meet the 2020 GHG reduction target. To meet this target, California had to reduce its GHG emissions by 30 percent below projected 2020 business-as-usual emissions levels or about 15 percent from 2008 levels.

[3] The State of California's May 1, 2018 petition, the October 25, 2019 decision by the U.S. Court of Appeals for the D.C. Circuit, and other materials in the docket for Case No. 18-1114 are available online: http://climatecasechart.com/case/california-v-epa-4. Accessed December 10, 2019.

The Scoping Plan recommended measures for further study and possible State implementation, such as new fuel regulations. It estimated that a reduction of 174 million metric tons of CO_2e (about 191 million U.S. tons) from the transportation, energy, agriculture, and forestry sectors and other sources could be achieved should the State implement all of the measures in the Scoping Plan. CARB noted that successful GHG emission reductions would rely in part on local governments' land use planning and urban growth decisions, as addressed by SB 375, discussed below. The AB 32 emissions reduction target was achieved in 2017, 3 years prior to the 2020 goal.

The Scoping Plan is required by AB 32 to be updated at least every 5 years. The most recent scoping plan update, the 2017 Scoping Plan Update, was adopted on December 14, 2017. It addressed the 2030 target established by SB 32, as discussed below, and established a proposed framework of action for California to meet a 40 percent reduction in GHG emissions by 2030 compared to 1990 levels. The key programs that the Scoping Plan Update builds on include increasing the use of renewable energy in the state, the Cap-and-Trade Regulation, the Low Carbon Fuel Standard, and reduction of methane emissions from agricultural and other wastes (CARB, 2017).

Executive Order B-30-15 and Senate Bill 32

California Executive Order B-30-15 (April 29, 2015) set an "interim" statewide emission target to reduce GHG emissions to 40 percent below 1990 levels by 2030, and directed State agencies with jurisdiction over GHG emissions to implement measures pursuant to statutory authority to achieve this 2030 target. Specifically, the Executive Order directed CARB to update the Scoping Plan to express this 2030 target in metric tons. On September 8, 2016, Governor Jerry Brown signed SB 32, which codified the 2030 reduction target called for in Executive Order B-30-15. CARB's 2017 Scoping Plan update addressed the 2030 target, as discussed above (CARB, 2017).

Senate Bill 605

On September 21, 2014, Governor Jerry Brown signed SB 605, which required CARB to complete a comprehensive strategy to reduce emissions of short-lived climate pollutants in the state no later than January 1, 2016. As defined in the statute, short-lived climate pollutant means "an agent that has a relatively short lifetime in the atmosphere, from a few days to a few decades, and a warming influence on the climate that is more potent than that of carbon dioxide." SB 605, however, does not prescribe specific compounds as short-lived climate pollutants or add to the list of GHGs regulated under AB 32. In developing the strategy, CARB completed an inventory of sources and emissions of short-lived climate pollutants in the state based on available data, identified research needs to address any data gaps, identified existing and potential new control measures to reduce emissions, and prioritized the development of new measures for short-lived climate pollutants that offer co-benefits by improving water quality or reducing other air pollutants that impact community health and benefit disadvantaged communities.

Senate Bill 375

In addition to policy directly guided by AB 32, the California Legislature in 2008 enacted SB 375, which provides for regional coordination in land use and transportation planning and funding to help meet the AB 32 GHG reduction goals. SB 375 aligns regional transportation

planning efforts, regional GHG emissions reduction targets for light duty vehicles, and land use assumptions in General Plans, and housing allocations. SB 375 requires Regional Transportation Plans (RTPs) developed by the state's 18 metropolitan planning organizations (MPOs) to incorporate sustainable communities strategies (SCS) that will achieve GHG emission reduction targets set by CARB and coordinate regional housing and transportation. Shasta Regional Transportation Agency (SRTA) is the federally recognized metropolitan planning organization (MPO) for the Shasta County region.

The *2018 Regional Transportation Plan & Sustainable Communities Strategy for the Shasta Region* was adopted by the SRTA Board of Directors on October 9, 2018 (SRTA, 2018a). The RTP/SCS lays out how the region will meet certain GHG reduction targets. Pursuant to SB 375, CARB established emission reduction targets for California's 18 MPO regions for the years 2020 and 2035. Shasta County was assigned a zero percent per capita change for its two targets when compared to the 2005 baseline year. The 2018 RTP meets these targets as a result of integrated land use, housing, and transportation planning. The SCS features seven Strategic Growth Areas (SGAs) where various strategies are focused to reduce per capita vehicle miles traveled and associated GHG emissions. Strategies are intended to increase population and employment density within SGAs and to provide a range of practical mobility alternatives.

On March 22, 2018, CARB revised the Shasta Region's reduction target to four percent for both 2020 and 2035. However, these revised targets will apply to the 2022 RTP update cycle (SRTA, 2018a).

Senate Bill 1368

SB 1368 (Chapter 598, Statutes of 2006) is the companion bill of AB 32 and was signed by Governor Schwarzenegger in September 2006. SB 1368 requires the California Public Utilities Commission (CPUC) to establish a GHG emissions performance standard for baseload generation from investor-owned utilities by February 1, 2007. The California Energy Commission (CEC) also was required to establish a similar standard for local publicly owned utilities by June 30, 2007. These standards cannot exceed the GHG emission rate from a baseload combined-cycle natural gas-fired plant. The legislation further requires that all electricity provided to California, including imported electricity, must be generated from plants that meet the standards set by the CPUC and CEC. The Project, as a renewable energy generation facility, complies with the GHG EPS requirements of SB 1368.

Renewables Portfolio Standards

The State of California adopted standards to increase the percentage that retail sellers of electricity, including investor-owned utilities and community choice aggregators, must provide from renewable resources. The standards are referred to as the Renewables Portfolio Standards (RPS). Qualifying renewables under the RPS include bioenergy such as biogas and biomass, small hydroelectric facilities 30 megawatt (MW) or less, wind, solar, and geothermal energy. The CPUC and the CEC jointly implement the RPS program. The CPUC's responsibilities include: (1) determining annual procurement targets and enforcing compliance; (2) reviewing and approving each investor-owned utility's renewable energy procurement plan; (3) reviewing

contracts for RPS-eligible energy; and (4) establishing the standard terms and conditions used in contracts for eligible renewable energy (CPUC, 2020).

Senate Bill 350

SB 350, known as the Clean Energy and Pollution Reduction Act of 2015, was enacted on October 7, 2015, and provides a new set of objectives in clean energy, clean air, and pollution reduction by 2030. The objectives include the following:

1. Increase the procurement of the state's electricity from renewable sources from 33 percent to 50 percent by December 31, 2030.
2. Double the energy efficiency savings in electricity and natural gas for final end uses of retail customers through energy efficiency and conservation.

Senate Bill 100

On September 10, 2018, Governor Brown signed SB 100, establishing that 100 percent of all electricity in California must be obtained from renewable and zero-carbon energy resources by December 31, 2045. SB 100 also creates new standards for the RPS goals that were established by SB 350 in 2015. Specifically, the bill increases required energy from renewable sources for both investor-owned and publicly owned utilities from 50 percent to 60 percent by 2030. Incrementally, these energy providers are also required to have a renewable energy supply of 33 percent by 2020, 44 percent by 2024, and 52 percent by 2027. The updated RPS goals are considered achievable, since many California energy providers are already meeting or exceeding the RPS goals established by SB 350.

On the same day that SB 100 was signed, Governor Brown signed Executive Order B-55-18 with a new statewide goal to achieve carbon neutrality (zero-net GHG emissions) by 2045 and to maintain net negative emissions thereafter.

Forest Carbon Plan

In 2018, the Forest Climate Action Team, made up of California agencies including the California Natural Resources Agency, the California Environmental Protection Agency, and the California Department of Forestry, and Fire Protection (CAL FIRE), prepared the Forest Carbon Plan. The Forest Carbon Plan describes forest conditions across California and provides a projection of future conditions given the ongoing and expected impacts of climate change. The plan also describes goals and related specific actions to improve overall forest health, enhance carbon storage resilience, increase sequestration, and reduce GHG emissions, and provides principles and policies to guide and support those actions. A key finding of the plan is that reducing carbon losses from forests, particularly the extensive carbon losses that occur during and after extreme wildfires in forests and through uncharacteristic tree mortality, is essential to meeting the State's long-term climate goals (Forest Climate Action Team, 2018).

17 Cal. Code Regs. Section 95350 et seq.

The purpose of this regulation is to achieve GHG emission reductions by reducing SF_6 emissions from gas-insulated switchgear. Owners of such switchgear must not exceed maximum allowable

annual emissions rates, which are reduced each year until 2020, after which annual emissions must not exceed 1.0 percent. Owners must regularly inventory gas-insulated switchgear equipment, measure quantities of SF_6, and maintain the applicable records for at least 3 years. Additionally, by June 1st each year, owners must submit an annual report to CARB's Executive Officer for emissions that occurred during the previous calendar year.

Local

Shasta Regional Climate Action Plan

In 2010, the Shasta County Air Quality Management District (AQMD) initiated the regional climate action planning (RCAP) process. The primary objectives of the RCAP process are to contribute to the State's climate protection efforts and includes emission reduction measures. Chapter 2 of the RCAP serves as the Climate Action Plan (CAP) for the unincorporated areas within the County, including the Project Site.

Unincorporated Shasta County's GHG reduction targets are as follows:

1. Reduce community emissions to 15 percent below 2008 levels by 2020 (i.e., 485,567 MT CO_2e/yr).
2. Reduce community emissions to 49 percent below 2008 levels by 2035 (i.e., 291,340 MT CO_2e/yr).
3. Reduce community emissions to 83 percent below 2008 levels by 2050 (i.e., 97,113 MT CO_2e/yr).

The RCAP describes measures that can achieve the 2020 reduction target and work toward the 2035 target. Focus on the 2050 reduction target was reserved for future reevaluation of long-term GHG reduction efforts to reflect future conditions and adjustment of emission reduction measures accordingly. The RCAP relies on the State RPS goals that will lead to an increase in renewable electricity, reduce the community energy-related emissions in unincorporated Shasta County, and make it easier for the community to achieve 2020 and 2035 emission reduction goals (Shasta County, 2012). While the RCAP was not ultimately adopted by the Shasta County AQMD Board, it was designed to set GHG emissions reduction targets consistent with AB 32 and CARB's adopted Scoping Plan.

3.10.2 Significance Criteria

A project would result in a significant impact to GHG emissions if it would:

a) Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or

b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.

3.10.3 Direct and Indirect Effects

3.10.3.1 Methodology

Neither CEQA Guidelines Section 15064.4 nor any other law requires or endorses a specific analytical methodology or quantitative criteria for determining the significance of GHG emissions.[4] Rather, lead agencies are to make a "good faith effort" to "describe, calculate or estimate" GHG emissions and to consider the extent to which the project would: increase or reduce GHG emissions; exceed a locally applicable threshold of significance; or comply with "regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions." A project may be found to have a less-than-significant impact related to GHG emissions if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (14 Cal. Code Regs. §15064[h][3]).

As noted in the Regulatory Setting above, the RCAP includes a GHG emission inventory and forecast, emission reduction measures, and an implementation and monitoring program for unincorporated Shasta County, and was finalized in 2012. However, the RCAP was not ultimately adopted by the Shasta County AQMD Board. The RCAP also does not provide specific reduction targets or CEQA significance thresholds for individual development projects. Therefore, while the RCAP is discussed in this analysis with regard to consistency with plans, the RCAP is not used to determine the impact of Project GHG emissions.

Other prominent air districts in northern California, such as the Bay Area Air Quality Management District and the Sacramento Metropolitan Air Quality Management District, have established project-level thresholds of 1,100 MT CO_2e per year (BAAQMD, 2017; SMAQMD, 2018). In addition, the California Air Pollution Control Officers Association (CAPCOA) recommended an interim 900 MT CO_2e per year screening level as a theoretical approach to identify projects that require further analysis and potential mitigation (CAPCOA, 2008). However, these quantitative thresholds were developed to address land use development projects and stationary sources of GHG emissions, and do not directly apply to the proposed wind power generation Project.

Because an adopted quantitative threshold does not apply to this Project, and since the Project by its nature of renewable energy generation would result in an offset of GHG emissions, this analysis uses a no net annual increase of GHG emissions threshold to determine whether the Project's GHG emissions would be significant. GHG emissions from construction and decommissioning, operational emissions, the loss of carbon sequestration capacity from tree removal, and the offset of emissions from fossil-fuel powered energy sources were combined to determine whether the Project would result in a net increase in GHG emissions.

[4] See *Center for Biological Diversity v. Department of Fish and Wildlife* (2015) 62 Cal.4th 204 (identifying three "potential options" for lead agencies evaluating cumulative significance of a proposed land use development's GHG emissions and explicitly stating that none of the three options came with a "guarantee" that it would be sufficient if later challenged.)

As a conservative estimate, GHG emissions include construction emissions annualized over the 40-year life of the Project, as well as operational emissions. Construction emissions can be amortized over a project lifetime, so that GHG reduction measures can address construction GHG emissions as part of the operational GHG reduction strategies. Other prominent air districts in northern California, such as the Bay Area Air Quality Management District and the Sacramento Metropolitan Air Quality Management District, have provided estimates for the operational life of buildings ranging from 25 to 40 years (BAAQMD, 2017; SMAQMD, 2018). However, the operational life of a wind energy facility may not coincide with the operational life of a building. As discussed in Chapter 2, *Project Description*, although upgrading and replacing equipment could extend the operating life of the wind energy facility indefinitely, for CEQA purposes, the life of the Project would be coterminous with the term of the use permit that is requested for its operation, i.e., 40 years. Therefore, the construction GHG emissions in this analysis are amortized over 40 years to consider the impact over the duration of the Project's initially permitted time frame. Any proposed extension of the term of the use permit would require approval of a use permit amendment and would be subject to subsequent environmental review. Decommissioning and site reclamation emissions are assumed to be equivalent to construction emissions and are also annualized over the 40-year life of the Project.

The potential loss of sequestration capacity from tree removal and offset of emissions from fossil-fuel powered energy sources are also considered for the Project in determining whether there would be a net increase in GHG emissions as a result of the Project. The CalEEMod forestland carbon biogenic emissions rate was used to estimate the potential loss of sequestration capacity. Other methodologies to estimate carbon sequestration, such as that contained in CARB's *Compliance Offset Protocol U.S. Forest Projects*, were considered, but may require on-site plot sampling to determine actual on-site carbon inventories (CARB, 2015). Thus, CalEEMod values for forestland with trees were used to calculate sequestration capacity which is more generalized, but results in conservative modeling. The potential offset of emissions from fossil-fuel powered energy sources was estimated using a value developed by CARB representing the GHG reduction resulting from the displacement of generation from the grid by renewable resources (CARB, 2010).

The potential for the Project to conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHG was assessed by examining any potential conflicts of the Project with the GHG reduction measures related to implementation of SB 32, including the potential conflict with CARB's *Climate Change Scoping Plan* and RPS-related goals.

3.10.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.

Impact 3.10-1: The Project would generate GHG emissions, directly and indirectly. (*Less-than-Significant Impact*)

Construction, operation, and decommissioning of the Project would generate GHG emissions. The use of fossil fuels in construction equipment and motor vehicles would generate GHGs such as CO_2, methane, and nitrous oxide. During the operations and maintenance period, the Project

would generate GHG emissions primarily from motor vehicle use by commuting workers, fugitive emissions from equipment containing SF_6 gas, emergency generator testing, and O&M building electricity use, solid waste generation, and water use. See Section 3.3, *Air Quality*, Impacts 3.3-2a and 3.3-2b, for a discussion of methodology used to calculate emissions from construction equipment and motor vehicle use. O&M building electricity use, solid waste generation, and water use-related emissions were estimated using default emission factors from the CalEEMod model.[5] Helicopter emissions that would be associated with conductor line stringing for the overhead collection system and transmission line connection were estimated manually using emissions factors obtained from The Climate Registry (TCR, 2019).

Construction, Decommissioning, and Site Reclamation

Project construction is expected to last up to 24 months, but no work would occur during the winter months (i.e., January 1 through March 31). Year 1 construction activities would include timber removal and grubbing, grading and access road work, temporary concrete batch plant construction, and foundation work. Year 2 construction activities would include turbine and transformer installation, substation and O&M building installation, underground and overhead connector system work, the transmission line connection, and substation aggregate and security fencing installation. Sources of GHG emissions would include off-road equipment, a helicopter, and on-road vehicles (e.g., haul trucks and worker vehicles). Project construction would also require water for dust control, to batch concrete, emergency fire suppression, and for other activities. Water used during construction would generate indirect GHG emissions through the consumption of electricity associated with water supply. **Table 3.10-1**, *Estimated Construction Greenhouse Gas Emissions*, presents construction emissions for the Project for construction Year 1, Year 2, and construction water use from on-site and off-site emission sources. It is assumed that Project decommissioning and site reclamation emissions would result in a similar amount of emissions as described in Table 3.10-1 for the construction activities. Additional details on calculations can be found in Appendix B.

TABLE 3.10-1
ESTIMATED CONSTRUCTION GREENHOUSE GAS EMISSIONS

Year and Activity	CO_2e (metric tons)
Year 1	5,106
Year 2	4,687
Water Use	17
Total	**9,810**
Amortized Annual Emissions over 40 Years	245

NOTES: Columns may not total precisely due to rounding.
CO_2e = carbon dioxide equivalent

SOURCE: Appendix B

[5] Since CalEEMod does not have demand factors specifically for wind O&M facilities, emissions were calculated using demand factors for a heavy industrial type building. This is a conservative assumption as the demand factors assume a high number of employees and the manufacturing of large items.

Construction emissions can be amortized over a project lifetime, so that GHG reduction measures can address construction GHG emissions as part of the operational GHG reduction strategies. The life of the Project is assumed to be the same as the term of the use permit that is required for its operation, i.e., 40 years. Thus, the total construction, decommissioning, and site reclamation GHG emissions were calculated, amortized over 40 years, and added to the total operational emissions for comparison with the GHG significance threshold of no net annual increase in GHG emissions as a result of the Project.

As shown in Table 3.10-1, the estimated total GHG emissions during Project construction would be approximately 5,106 MT CO_2e in Year 1, 4,687 MT CO_2e in Year 2, and 17 MT CO_2e from construction-related water use for a total of 9,810 MT CO_2e over the up to 21-month construction period (2 years with no construction in January through March). Estimated Project-generated construction emissions amortized over 40 years, would be approximately 245 MT CO_2e per year.

GHG emissions generated during construction of the Project would be short-term in nature, and would not represent a long-term source of GHG emissions. Emissions associated with decommissioning and site reclamation of the Project were conservatively assumed to be the same as those from construction, 245 MT CO_2e per year, and so also would not represent a long-term source of GHG emissions. This is a conservatively assumption, as some construction activities such as tree removal and grading for access roads would not be required during decommissioning activities. The total amortized construction, decommissioning, and site reclamation GHG emissions were added to the total operational emissions for comparison with the GHG significance threshold of no net increase in GHG emissions (see below).

Operation and Maintenance

Operation and maintenance of the Project would generate GHG emissions through worker motor vehicle trips to and from the Project site; emergency generator testing, energy use (electricity consumed by the Project, as required when the Project is not powered by on-site energy generation); cranes used to access turbines for maintenance work; mowers used for maintenance; solid waste disposal; SF_6 leaked from circuit breakers at the proposed substation site; and consumption of electricity associated with water supply. The annual GHG emissions calculations are based on the operational assumptions presented in Appendix B.[6]

SF_6 has a high global warming potential and is used for insulation in electric power transmission and distribution equipment. During operation and maintenance, one of the sources of GHG emissions would be fugitive emissions from equipment containing SF_6 gas installed at the proposed substation. Based on an approved substation of similar voltage that will have a combined SF_6 capacity of 289 pounds (CPUC, 2018), it is conservatively assumed that this equipment would use up to 1,000 pounds of SF_6 with a leak rate of 0.5 percent. This leak-rate is less than allowed under CARB's *Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear* (17 Cal. Code Regs. §95350 et seq.), which requires that annual emissions of SF_6 must not exceed 1.0 percent after 2020; however, the new equipment would be required to comply with the International Electrotechnical Commission standard for new

[6] Since CalEEMod does not have demand factors specifically for wind O&M facilities, emissions were calculated using demand factors for a heavy industrial type building, as shown in the CalEEMod output.

equipment leakage, which is 0.5 percent per year (USEPA, 2017). Thus, annual SF_6 emissions leaked would be approximately 5 pounds per year, or approximately 52 MT CO_2e.

As shown in **Table 3.10-2**, *Estimated Annual Operational Greenhouse Gas Emissions*, estimated annual Project-generated GHG emissions would be approximately 318 MT CO_2e per year as a result of Project operation. Estimated annual Project-generated operational emissions and amortized Project construction, decommissioning, and site reclamation emissions would be approximately 809 MT CO_2e per year.

TABLE 3.10-2
ESTIMATED ANNUAL OPERATIONAL GREENHOUSE GAS EMISSIONS

Emission Source	CO_2e
Commuting workers	137
Emergency Generator Testing	10
O&M Building Electricity Use and Solid Waste	17
Cranes and Mowers Used for Maintenance	96
Fugitive Emissions (SF_6)	52
Water Use	5
Total Operation	**318**
Amortized Annual Construction Emissions over 40 Years	245
Amortized Annual Decommissioning and Site Reclamation Emissions over 40 Years	245
Total Operation and Construction	**809**
Amortized Loss of Carbon Sequestration over 40 Years	1,977
Displaced use of traditional energy source per year	-227,917
Total Net Emissions	**-225,131**

NOTES: Columns may not total precisely due to rounding; co_2e = carbon dioxide equivalent; O&M Building includes electricity and solid waste.

SOURCE: Appendix B

The Project would result in the permanent conversion of up to 713 acres of timberland to develop power generation facilities that would be used for the duration of the Project's operational time frame. Based on the CalEEMod forestland carbon biogenic emissions rate of 111 MT CO_2/acre, the Project could result in a loss of approximately 79,143 MT CO_2 of carbon sequestration capacity or approximately 1,977 MT CO_2 per year amortized over the life of the Project.[7] However, as discussed in Chapter 2, *Description of the Project and Alternatives*, all timber within the permanent and temporary disturbance areas, including the areas to be replanted after construction, would continue to grow and would not be affected by operation of the Project. The permanent disturbance area also would be revegetated upon completion of the Project's operational life to be as similar to preconstruction conditions as possible. In coordination with the

[7] Tree removal and associated loss of CO_2 sequestration is considered to result in a one-time carbon-stock change. This value has been amortized to consider the impact over the duration of the Project's operational time frame.

land owner, disturbed areas would be replanted with trees. The goal of site revegetation would be to develop a vegetation cover, composition, and diversity similar to the area's ecological setting and consistent with the landowner's current and future land use practices.

Renewable energy offsets GHG emissions generated by fossil-fuel power plants to the extent that it serves demand that otherwise would be served with a fossil-fuel powered source. For the most part, the power being displaced would be comprised of incremental power provided by generators to address load changes, which is typically provided by natural gas power plants. According to CARB, each MWh of wind generation could displace approximately 830 pounds CO_2e or 0.38 MT CO_2e from natural gas peaking plants (CARB, 2010). As discussed in Section 3.7, *Energy*, using the Project's total nameplate generating capacity of up to 216 MW and conservatively assuming an average capacity factor of 32 percent, the Project is anticipated to generate up to approximately 605,491 MWh per year. Thus, the Project would provide a potential net offset of 227,917 MT CO_2e per year[8] if the electricity generated by the Project were to be used in place of electricity generated by fossil-fuel sources. After accounting for the annualized construction and decommissioning, and annual operational emissions of 809 MT CO_2e per year, and the annualized loss of carbon sequestration capacity during the Project's operational time frame, the Project would provide a potential net offset of 225,131 MT CO_2e per year. Therefore, the Project would not result in net increase in GHG emissions, and the impact would be less than significant. Overall, this would be a beneficial impact.

Mitigation: None required.

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b) Whether the Project would conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.

Impact 3.10-2: The Project could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. (*Less-than-Significant Impact*)

Consistency with State GHG Reduction Targets and RPS Goals

The Project would involve the construction, operation and maintenance, and decommissioning and site reclamation of a wind power facility that would produce a new renewable source of energy in Shasta County. Therefore, the Project would directly support the 40 percent reduction in GHG emissions by 2030 target under the 2017 Scoping Plan Update and targets of SB 100 for increasing California's procurement of electricity from renewable sources to 60 percent by 2030 and to 100 percent by 2045. Because carbon-free energy is a pivotal element of achieving statewide GHG reductions, the Project would also provide direct support to Executive Order B-55-18 and the new statewide goal of achieving carbon neutrality (zero net GHG emissions) by 2045 and maintaining net negative emissions thereafter.

[8] 605,491 MWh * (830 lbs CO_2e per MWh/2,205 lbs per MT) = 227,917 MT

The RCAP[9] relies on compliance with the RPS standard of 33 percent by 2020, as a part of State actions that would reduce communitywide GHG emissions supporting a 49 percent GHG reduction target by 2035. Therefore, the Project would directly support the emission reduction goals of the RCAP and facilitate exceeding the reduction projections related to RPS from the RCAP. Additionally, while the RCAP deferred adjustment of emission reduction measures related to the 83 percent reduction target by 2050, the Project would directly support meeting this reduction target through contributing to meet new RPS goals since publication of the RCAP. Because the development of the RCAP, the State has increased its RPS goal to 100 percent by 2045 through SB 100 as described above. The Project would help the State to meet that target.

Consistency with the Regional Sustainable Communities Strategy

If the Project were to be found inconsistent with the SRTA 2018 RTP/SCS based on a qualitative assessment of the Project's consistency with SRTA's Sustainable Communities Strategy policies, there could be a conflict with a GHG reduction plan. The GHG emission reduction goals in the SRTA 2018 RTP/SCS are based on demographic data trends and projections that include household, employment, and total population statistics. Because the Project does not propose housing, and would not result in a population increase, only the Project's contribution to employment would need to be considered.

The STRA 2018 RTP/SCS relies on estimates that employment within the region is projected to grow to approximately 14,702 jobs in 2040, an increase of approximately 21 percent from 2015 (SRTA, 2018b). The Project construction, decommissioning, and site reclamation workforces would be temporary, lasting up to 24 months of employment, and would be expected to come from the existing construction labor pool in Shasta County. Other specialized workers may reside outside the local area. Non-local workers would stay at local hotels and commute to the Project Site. The Project is anticipated to have up to 12 full-time employees. Therefore, the additional jobs estimated by the Project would be well within the growth projections for the 2018 RTP/SCS.

Additionally, 2018 RTP/SCS strategies are intended to increase population and employment density within Strategic Growth Areas. The general area around Burney is identified as a Strategic Growth Area in the 2018 RTP/SCS. Because the Project would facilitate the opportunity for local employment in the area surrounding Burney, which would support vehicle miles travelled and associated GHG per capita emissions reductions, the Project would be consistent with the 2018 RTP/SCS. Therefore, the Project would be consistent with the SRTA 2018 RTP/SCS, and the Project would have a less-than-significant impact with regard to potential conflicts.

Consistency with the Forest Carbon Plan

The Project would result in the permanent conversion of up to 713 acres of timberland for development of power generation facilities for the duration of the Project's operational time frame. As described under Impact 3.10-1, while the Project could result in a loss of approximately 79,143 MT CO_2 of carbon sequestration capacity, the Project would offset that loss through the potential reduction of 227,917 MT CO_2e per year if the electricity generated by the Project were

[9] While the RCAP was not ultimately adopted by the Shasta County AQMD Board, it was designed to set GHG emissions reduction targets consistent with AB 32 and CARB's adopted Scoping Plan.

to be used in place of electricity generated by fossil-fuel-sourced generation. Existing commercial and pre-commercial timber would be harvested, treated, and/or removed from the Project Site to allow development of the Project. Areas that would be removed from timber production as a result of the Project would be harvested in accordance with a Timberland Conversion Permit (TCP) and Timber Harvesting Plan (THP) authorization from CAL FIRE and environmental Best Management Practices would be implemented during harvesting. The Applicant would also prepare a Project-specific Fire Prevention Plan (FPP) prior to the commencement of on-site activities that would include procedures for fire prevention and vegetation management. The landowner, separate from and independent of the Project, is also installing helicopter dip tanks throughout the leasehold to aid fire suppression, including within the Project Site.

Altogether, while the Project would result in the loss of timberland that sequesters carbon, the Project would offset the amount of carbon sequestration capacity lost during Project operation and implement an FPP in order to prevent potential extensive carbon losses that could occur during and after extreme wildfires in forests, consistent with the Forest Carbon Plan. Additionally, the Project Site would also be revegetated, including replanted with trees, upon completion of the Project's operational life to be as similar to preconstruction conditions as possible.

Consistency with Other Regulations

As described under Impact 3.10-1, during operation and maintenance, one of the sources of GHG emissions would be fugitive emissions from equipment containing SF_6 gas installed at the proposed on-site substation. The Project would comply with CARB's *Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear* (17 Cal. Code Regs. §95350 et seq.), which requires that annual emissions of SF_6 must not exceed 1.0 percent after 2020.

Conclusion

Therefore, considering the above, development of the Project would not conflict with any applicable plans, policies, or regulations adopted with the intent to reduce GHG emissions. The impact would be less than significant.

Mitigation: None required.

3.10.3.3 PG&E Interconnection Infrastructure

Upgrades to PG&E facilities to facilitate the interconnection between the Project's electrical substation and the PG&E transmission lines are anticipated to include construction and/or reconfiguration of utility line structures and transmission line circuits involving four to six new transmission poles. If required, these new poles are anticipated to occur adjacent to the proposed substation and switching station. The construction equipment, workers, and vehicle trips required for upgrades to these facilities and maintenance would be minimal compared to overall Project construction and operational activities, and are captured by the Project's GHG emissions calculations. Therefore, activities associated with the PG&E interconnection infrastructure would also result in a less-than-significant impact relating to GHG emissions.

3.10.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Alternative 1, would implement the Project exclusively in that portion of the Project Site located south of SR 299: none of the up to seven turbines proposed to the north of SR 299 (turbine numbers A01 through A07) or related infrastructure would be developed. Alternative 1 could have a total nameplate generating capacity of up to 195 MW, or approximately 21 MW fewer total nameplate generating capacity as compared to the Project. The number of workers and durations of construction, operation and maintenance, and decommissioning and site reclamation would be substantially the same as for the Project, resulting in similar GHG emissions.

Alternative 1 would continue to provide a new source of renewable energy supporting SB 100 and the state's GHG reduction goals and would have less-than-significant impacts in regard to generation of GHG emissions and conflicts with plans, policies, or regulations adopted for the purpose of reducing GHG emissions. However, the reduced generating capacity also would contribute to a reduced overall benefit in terms of GHG emissions if the electricity generated by the Project were to be used in place of electricity generated by fossil-fuel sources. Overall, Alternative 1 would result in no significant impacts to GHG emissions; and the impact conclusions would be the same as those identified for the Project.

Alternative 2: Increased Setbacks

Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within three times the height of the turbine (i.e., within 2,037 feet) of a residential property line and within 1.5 times the height of the turbine (i.e., within 1,018.5 feet) of State Route 299, any other publicly maintained public highway or street, and of Supan Road or Terry Mill Road. This would preclude the construction of four wind turbines, as compared to the Project, potentially resulting in the loss of approximately 12 to 22.8 MW of generating capacity based on generation potential per turbine.

Under Alternative 2, the number of workers and durations of construction, operation and maintenance, and decommissioning and site reclamation would be substantially the same as for the Project, resulting in similar GHG emissions. Alternative 2 would continue to provide a new source of renewable energy supporting SB 100 and the State's GHG reduction goals and would have less-than-significant impacts in regards to generation of GHG emissions and conflicts with plans, policies, or regulations adopted for the purpose of reducing GHG emissions. However, the reduced generating capacity also would contribute to a reduced overall benefit in terms of GHG emissions if the electricity generated by the Project were to be used in place of electricity generated by fossil-fuel sources. Overall, Alternative 2 would result in no significant impacts to GHG emissions; and the impact conclusions would be the same as those identified for the Project.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind project infrastructure would be delivered to the Project Site or constructed, operated and maintained, or decommissioned there. No construction equipment or additional vehicle trips would be made to,

from, or within the site relative to baseline conditions. Ground clearance would not occur for laydown areas; utility line rights-of-way; roads; or the collector substation, switching station, or operation and maintenance (O&M) facility. Baseline levels of carbon sequestration within the Project Site would remain unchanged by the Project, and the Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to GHG emissions. It should be noted that the No Project Alternative would not result in the same GHG reduction benefits as the Project and associated alternatives.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect relating to GHG emissions. CAL FIRE would review any future timber harvesting proposal to evaluate any potential site-specific environmental impacts.

3.10.4 Cumulative Analysis

GHG emissions are inherently a cumulative concern, in that the significance of GHG emissions is determined based on whether such emissions would have a cumulatively considerable impact on global climate change. Although the geographic scope of cumulative impacts related to GHG emissions is global, this analysis focuses on the state, the region, and this Project's direct and/or indirect generation or offset of GHG emissions. CAPCOA considers GHG impacts to be exclusively cumulative impacts, in that no single project could, by itself, result in a substantial change in climate (CAPCOA, 2008). Therefore, the evaluation of cumulative GHG impacts presented above evaluated whether the Project would make a considerable contribution to existing cumulative significant climate change impact. The Project would result in a 40-year long-term net offset of approximately 225,131 MT CO_2e per year and would not conflict with the State's GHG reduction goals.

In response to its notice of intention to prepare this Draft EIR, the County received scoping input including concerns that operation of the proposed wind turbines could result in a heat island effect. Studies have indicated that wind turbines may alter local climate through near-surface air temperature increases downwind of the wind farm during night and early morning hours, and near-surface air temperature decreases during the rest of the day (Roy and Traiteur, 2010). Generally, based on observations from 28 wind facilities in the U.S., daytime temperature differences were small and slightly warmer and cooler, while nighttime temperature differences were larger and almost always warmer. The observation at the site with the highest number of observed-years, is 0.02°F warmer during the day and 0.52°F warmer at night (Miller and Keith, 2018).

It is important to note that wind turbines have the potential to redistribute heat already present in the atmosphere. When wind turbines are not in operation, this effect would likely cease. As discussed in Section 3.10.1.2, *Environmental Setting*, increased GHGs in the atmosphere cause a rise in the average global temperature, and average temperatures in California could rise 5.6°F to 8.8°F by the end of the century, depending on the global trajectory of GHG emissions. Thus, while the Project may contribute to localized temperature fluctuations near the Project Site, the Project would not contribute to substantial local temperature increases when compared to projections of average long-term temperature increases for California under climate change. Additionally, the Project would continue to have the potential to offset the total GHG emissions in the state and beyond, and would not contribute to further climate change-related impacts. Therefore, the Project-specific incremental impact on GHG emissions would not be cumulatively considerable.

3.10.5 References

Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines, May 2017. Available online at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en. Accessed March 24, 2020.

California Air Pollution Control Officers Association (CAPCOA), 2008. CEQA & Climate Change Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act, January 2008. Available online at: http://www.capcoa.org/wp-content/uploads/2012/03/CAPCOA-White-Paper.pdf. Accessed March 24, 2020.

California Air Resources Board (CARB), 2009. Climate Change Scoping Plan: A Framework for Change, published December 2008; amended version posted May 11, 2009 (included errata and Board requested modifications). Available online at: http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf. Accessed March 25, 2020.

CARB, 2010. Proposed Regulation for a California Renewable Electricity Standard, Staff Report: Initial Statement of Reasons, June 2010. Available online at: https://ww3.arb.ca.gov/regact/2010/res2010/res10isor.pdf. Accessed March 24, 2020.

CARB, 2015. Compliance Offset Protocol U.S. Forest Projects, adopted June 25, 2015. Available online at: https://ww3.arb.ca.gov/cc/capandtrade/protocols/usforest/forestprotocol2015.pdf. Accessed March 31, 2020.

CARB, 2017. The 2017 Climate Change Scoping Plan Update, January 20, 2017. Available online at: https://www.arb.ca.gov/cc/scopingplan/2030sp_pp_final.pdf. Accessed on March 25, 2020.

CARB, 2019. California Greenhouse Gas Emissions for 2000 to 2017—Trends of Emissions and Other Indicators, August 2019. Available online at: https://ww2.arb.ca.gov/ghg-inventory-data. Accessed March 13, 2020.

California Governor's Office of Planning and Research (OPR), 2017. State of California 2017 General Plan Guidelines. Ch. 8, Climate Change. Available online at: http://opr.ca.gov/docs/OPR_COMPLETE_7.31.17.pdf. July 31, 2017.

California Governor's Office of Planning and Research, California Energy Commission, and California Natural Resources Agency (OPR et al.), 2018. Fourth Climate Change Assessment, Statewide Summary Report, August 2018. Available online at: http://climateassessment.ca.gov/state/. Accessed March 13, 2020.

California Natural Resources Agency (CNRA), 2009. Final Statement of Reasons for Regulatory Action: Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB97, pp. 71 and 72, December 2009. Available online at: http://resources.ca.gov/ceqa/docs/Final_Statement_of_Reasons.pdf. Accessed March 30, 2020.

CNRA, 2018a. Final Statement of Reasons for Regulatory Action, Amendments to the State CEQA Guidelines, November 2018, p. 41. Available online at: http://resources.ca.gov/ceqa/docs/2018_CEQA_Final_Statement_of%20Reasons_111218.pdf. Accessed March 30, 2020.

CNRA, 2018b. Safeguarding California Plan: 2018 Update, January 2018. Available online at: https://www.slc.ca.gov/sea-level-rise/safeguarding-california-plan-2018-update/. Accessed March 13, 2020.

California Public Utilities Commission (CPUC), 2018. SDG&E Artesian 230 kV Substation Expansion Project (A.16-08-010) Initial Study/Mitigated Negative Declaration, February 2018.

CPUC, 2020. RPS Program Overview. Available online at: https://www.cpuc.ca.gov/RPS_Overview/. Accessed March 22, 2020.

Climate Central, 2020. 2019 in Review: Global Temperature Rankings, January 15, 2020. Available online at: https://www.climatecentral.org/gallery/maps/2019-in-review-global-temperature-rankings. Accessed March 13, 2020.

Forest Climate Action Team, 2018. California Forest Carbon Plan, Managing Our Forest Landscapes in a Changing Climate, May 2018. Available online at: https://resources.ca.gov/CNRALegacyFiles/wp-content/uploads/2018/05/California-Forest-Carbon-Plan-Final-Draft-for-Public-Release-May-2018.pdf. Accessed March 24, 2020.

Intergovernmental Panel on Climate Change (IPCC), 2014. Climate Change 2014 Synthesis Report. Available online at: https://www.ipcc.ch/report/ar5/syr/. Accessed March 13, 2020.

Kenward, A., D. Adams-Smith, and U. Raja, 2013. Wildfires and Air Pollution: The Hidden Health Hazards of Climate Change. Climate Central. Available online at: http://assets.climatecentral.org/pdfs/WildfiresAndAirPollution.pdf. Accessed March 13, 2020.

Melillo, J. M., T. C. Richmond, and G. W. Yohe (eds.), 2014. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, May 2014, revised October 2014. Available online at: https://nca2014.globalchange.gov/downloads. Accessed March 13, 2020.

Miller, L. M., and D. W. Keith, 2018. Climatic Impacts of Wind Power. Joule 2:2618–2632, December 19, 2018.

National Oceanic and Atmospheric Administration (NOAA), 2020. Assessing the U.S. Climate in 2019, January 8, 2020. Available online at: https://www.ncei.noaa.gov/news/national-climate-201912. Accessed March 13, 2020.

Roy, S. B., and J. J. Traiteur, 2010. Impacts of Wind Farms on Surface Air Temperatures. Proceedings of the National Academy of Sciences of the United States of America 107, 42:17899–17904, October 19, 2010.

Sacramento Metropolitan Air Quality Management District (SMAQMD), 2018. Guide to Air Quality Assessment in Sacramento County, Chapter 6, Greenhouse Gas Emissions, May 2018. Available online at: http://www.airquality.org/LandUseTransportation/Documents/Ch6GHGFinal5-2018.pdf. Accessed March 24, 2020.

Shasta County, 2012. Shasta Regional Climate Action Plan, November 2012. Available online at: https://www.co.shasta.ca.us/index/drm/air-quality/programs/rcap. Accessed March 13, 2020.

Shasta Regional Transportation Agency (SRTA), 2018a. 2018 Regional Transportation Plan & Sustainable Communities Strategy for the Shasta Region, adopted October 9, 2018. Available online at: https://www.srta.ca.gov/DocumentCenter/View/4285/2018-Regional-Transportation-Plan--Sustainable-Communities-Strategy-adopted-Oct-9-2018?bidId=. Accessed March 25, 2020.

SRTA, 2018b. 2018 Regional Transportation Plan and Sustainable Communities Strategy for the Shasta Region, Final Supplemental Environmental Impact Report, August 2018, certified October 9, 2018. Available online at: https://www.srta.ca.gov/DocumentCenter/View/4287/2018-Supplemental-Environmental-Impact-Report-for-2018-RTPSCS-for-certification-Oct-9-2018?bidId=. Accessed March 25, 2020.

The Climate Registry (TCR), 2019. The Climate Registry 2019 Default Emissions Factors, May 2019.

United Nations Environment Programme (UN Environment), 2019. Emissions Gap Report 2019, November 2019. Available online at: https://www.unenvironment.org/resources/emissions-gap-report-2019. Accessed March 13, 2020.

U.S. Environmental Protection Agency (USEPA), 2017. SF6 Leak Rates from High Voltage Circuit Breakers—U.S. EPA Investigates Potential Greenhouse Gas Emissions Source, last updated February 21, 2017. Available online at: https://www.epa.gov/sites/production/files/2016-02/documents/leakrates_circuitbreakers.pdf. Accessed June 26, 2020.

USEPA, 2020. Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2018. Available online at: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks. Accessed March 13, 2020.

3.11 Hazards and Hazardous Materials

This section identifies and evaluates potential issues related to Hazards and Hazardous Materials in the context of implementing the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. Data related to existing conditions present in the study area is based largely on a Phase I Environmental Site Assessment (Phase I) that was prepared for the Project by Stantec Consulting Services (Stantec) (**Appendix F1**, *Environmental Records Review*). The County independently reviewed the Phase I and found it to be suitable for reliance in combination with other sources of data in this analysis.

In response to its notice of intention to prepare this Draft EIR, the County received scoping input that suggests consideration of Shasta County's local hazard mitigation plan, which addresses wildfires and other hazards, and that identify potential causes or contributors to hazards (i.e., increased truck traffic on Moose Camp roads, activities that would disturb natural deposits of arsenic which could be released to surface waters and equipment that could leak toxic chemicals or flammable materials (e.g., transformers, turbines, or batteries). See **Appendix J**, *Scoping Report*. However, no sources of information regarding the presence of arsenic were provided and none were identified during follow-up research conducted by the EIR preparers (identified in Chapter 5, *Report Preparation*).

3.11.1 Setting

3.11.1.1 Study Area

The study area for this evaluation of hazards and hazardous materials includes the Project Site and transportation routes used to deliver or remove any hazardous materials or equipment.

3.11.1.2 Environmental Setting

Hazardous Materials

A hazardous material is defined as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment (Health and Safety Code §25501[o]). The term "hazardous materials" refers to both hazardous substances and hazardous wastes. Under federal and state laws, any material, including wastes, may be considered hazardous if it is specifically listed by statute as such or if it is toxic (causes adverse human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), or reactive (causes explosions or generates toxic gases).

Hazardous wastes are hazardous substances that no longer have practical use, such as materials that have been spent, discarded, discharged, spilled, contaminated, or are being stored until they can be disposed of properly (22 Cal. Code Regs. §66261.10). Soil that is excavated from a site containing hazardous materials is a hazardous waste if it exceeds specific regulatory criteria

(22 Cal. Code Regs. §§66261.20–66261.24). While hazardous substances are regulated by multiple agencies, as described in Section 3.11.1.3, *Regulatory Setting*, cleanup requirements of hazardous wastes are determined on a case-by-case basis according to the agency with lead jurisdiction over the release.

Potential Receptors/Exposure

The sensitivity of potential receptors in areas of known or potential hazardous materials contamination depends on several factors. The primary factor is the potential pathway for human exposure. Exposure pathways include dermal exposure, inhalation, and ingestion of contaminated soil, air, water, or food. The magnitude, frequency, and duration of human exposure can cause a variety of health effects, from short-term acute symptoms to long-term chronic effects, depending on the specific material.

Hazardous Materials Database Search

The Phase I included a database search report consistent with ASTM Standard Practice E1527-13. The database search includes a thorough review of environmental databases that are maintained by various federal, state, and local agencies to identify sites with releases of hazardous materials or documented uses of hazardous materials. According to the findings of the search, the Project Site was not listed on any of the databases reviewed. The closest site to the Project Site listed in any of the search results is Whitmore Gap Filler Annex, a "gap filler radar" facility that deployed in the late 1950s to alleviate the need for civilians to scan the skies for enemy bombers (MilitaryMuseum.org, 2020). The Whitmore Gap Filler Annex is located on the peak of Clover Mountain, approximately 0.84 mile southeast of the Project Site. The site has been decommissioned; its current status is listed as requiring no further action (Appendix F1; DTSC, 2014).

An independent review of the Department of Toxic Substances Control (DTSC) EnviroStor and State Water Resources Control Board (SWRCB) GeoTracker hazardous materials databases confirms the findings of the database search report by Stantec; there are no active or closed hazardous materials sites within the Project Site boundary. Both GeoTracker and EnviroStor databases further confirm the Whitmore Gap Filler Annex site as the closest listed site to the Project Site (SWRCB, 2020; DTSC, 2020).

Schools and Day Care Centers

The nearest school to the Project Site is the Montgomery Creek Elementary School. It is located approximately 1.5 miles from the western boundary of the Project Site.

Airports

There are three public airports in Shasta County: The Redding Municipal Airport, Benton Airpark, and Fall River Mills Airport. Shasta County also is home to one private airport Tews Field-CA53. The nearest airport to the Project Site, the Fall River Mills Airport, is located approximately 20 miles northeast of the Project Site.

Blasting

As described in Section 2.4.5.1, blasting may be required in advance of excavation for the installation of trenches, for example, depending on the subsurface conditions. Federal, state and local agencies regulate the use, storage, packaging, labeling, and transportation and other aspects of blasting, including, but not limited to, the Occupational Safety and Health Administration (OSHA); the federal Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF); the U.S. Department of Transportation (USDOT); California Division of Occupational Safety and Health (Cal/OSHA), and Shasta County. Local and state laws regulating explosives may be more restrictive than federal requirements. The Applicant's prime construction contractor(s) and any pertinent sub-contractors would comply with the most stringent provisions of applicable federal, state, and local laws governing explosives, and that the plan would address at least the following: safety measures relating to any onsite storage, protection of people and property, fire safety, and transportation; environmental protection measures that avoid or minimize impacts to sensitive environmental resources (including biological resources, cultural resources, wells and springs, and nearby residents, e.g., from vibration, dust or noise.

3.11.1.3 Regulatory Setting

Federal

Hazardous Materials Management

The primary federal agencies with responsibility for hazardous materials management include the U.S. Environmental Protection Agency (USEPA), U.S. Department of Labor Occupational Safety and Health Administration (OSHA), and the U.S. Department of Transportation (DOT). With respect to hazardous materials, state and local agencies often have either parallel or more stringent regulations than federal agencies. In most cases, state law mirrors or overlaps federal law and enforcement of these laws is the responsibility of the state or of a local agency to which enforcement powers are delegated. For these reasons, the requirements of the law and its enforcement are discussed under either the state or local agency section.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act of 1976 (RCRA, 42 USC §6901 et seq.) is the principal law governing the management and disposal of hazardous wastes. RCRA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste, referred to as from "cradle to grave." Under RCRA, individual states may implement their own hazardous waste programs in lieu of RCRA as long as the state program is at least as stringent as federal RCRA requirements and is approved by the USEPA. The USEPA approved California's RCRA program, referred to as the Hazardous Waste Control Law (Health and Safety Code §25100 et seq.) in 1992.

Hazardous and Solid Waste Act

The Hazardous and Solid Waste Act (HSWA) amended RCRA in 1984, affirming and extending the "cradle to grave" system of regulating hazardous wastes. The amendments specifically prohibit the use of certain techniques for the disposal of some hazardous wastes.

Emergency Planning and Community Right-to-Know Act

The Emergency Planning and Community Right-to-Know Act (EPCRA, 42 USC §11001 et seq.) from the Superfund Amendments and Reauthorization Act (SARA) Title III improved community access to information regarding chemical hazards and facilitated the development of business chemical inventories and emergency response plans. EPCRA also established reporting obligations for facilities that store or manage specified chemicals. EPCRA applies to this Project because the contractors who would be called upon to properly manage hazardous materials and, if needed, to clean up accidental spills, remove hazardous materials from the Project Site, and/or to construct remediation systems would be required to prepare and implement written emergency response plans in accordance with EPCRA.

Hazardous Materials Transportation Act

The Hazardous Materials Transportation Act of 1975 (49 USC §§5101–5127) empowered the Secretary of Transportation to designate as hazardous materials that may pose an unreasonable risk to health and safety or property. The DOT, in conjunction with the USEPA, is responsible for enforcement and implementation of federal laws and regulations pertaining to safe storage and transportation of hazardous materials. DOT Regulations implementing the Act (49 CFR Parts 171–180) regulate the transportation of hazardous materials, types of material defined as hazardous, and the marking of vehicles transporting hazardous materials. This Act applies to this Project because contractors who participate in its development, operation, maintenance and decommissioning would be required to comply with its storage and transportation requirements to reduce the possibility of spills. Federal and state agencies determine driver-training requirements, load labeling procedures, and container specifications. Although special requirements apply to transporting hazardous materials, requirements for transporting hazardous waste are more stringent, and hazardous waste haulers must be licensed to transport hazardous waste on public roads.

Occupational Safety and Health Act

Requirements of the Occupational Safety and Health Act (29 USC § 651 et seq.) are administered by OSHA, the agency responsible for assuring worker safety in the handling and use of chemicals in the workplace. The federal regulations pertaining to the safety and health of construction workers are contained in Part 1926 of Title 29 of the Code of Federal Regulations (29 CFR §1926.1 et seq.). They provide standards for safe workplaces and work practices, including standards relating to hazardous materials handling. At sites known or suspected to have soil or groundwater contamination, construction workers must receive training in hazardous materials operations and a site health and safety plan must be prepared. The health and safety plan establishes policies and procedures to protect workers and the public from exposure to potential hazards at the contaminated site.

Oil Pollution Prevention

Under the authority of Clean Water Act Section 311, the Oil Pollution Prevention regulations (40 CFR Part 112) establish procedures, methods, equipment, and other requirements to prevent discharges from non-transportation-related onshore and offshore facilities into the waters of the United States. These regulations require facilities with a single tank or cumulative aboveground storage capacities of 1,320 gallons or greater of petroleum to prepare and implement a Spill

Prevention, Control, and Countermeasure (SPCC) Plan (40 CFR §112.1). The purpose of an SPCC Plan is to form a comprehensive federal/state spill prevention program that minimizes the potential for discharges. The SPCC Plan must address all relevant spill prevention, control, and countermeasures necessary at the specific facility for which the SPCC Plan is written. These regulations are relevant to the Project because more than 5,000 gallons of diesel fuel would be stored in aboveground tanks on the Project Site during construction and operation, and because a comparable amount also could be present during decommissioning and site restoration.

Federal Aviation Administration Regulations on Objects Affecting Navigable Airspace

The Federal Aviation Administration (FAA) is the federal agency that identifies potential impacts related to air traffic and related safety hazards. The FAA's Federal Aviation Regulations (FAR) establish standards and notification requirements for objects affecting navigable airspace (see Advisory Circular [AC] 70/7460-1L) and also helipads (AC 150/5390-2C). Specifically regarding the marking and lighting of obstructions that have been deemed to be a hazard to air navigation, FAA standards and Advisory Circular 70/7460-1L (FAA, 2018) generally require any temporary or permanent structure, including appurtenances, that exceeds an overall height of 200 feet (61 m) above ground level (AGL) to meet the requirements to be marked and/or lighted. For this Project, the requirements would apply to the proposed meteorological evaluation towers (METs) and wind turbines.

State

The Z'Berg-Nejedly Forest Practice Act of 1973 (Pub. Res. Code §§4511–4360.2) and its implementing regulations, the Forest Practice Rules (14 Cal. Code Regs. §895 et seq.), govern the management of privately owned forestlands in California, including the servicing of logging equipment, disposal of refuse, litter, trash and debris. Rule 914.5, 934.5, 954.5, for example, establishes the following performance standard in connection with the servicing of logging equipment: "Equipment used in timber operations shall not be serviced in locations where servicing will allow grease, oil, or fuel to pass into lakes or watercourses" (14 Cal. Code Regs. §914.5, 934.5, 954.5).

California Department of Toxic Substances Control

The California Department of Toxic Substances Control (DTSC) is responsible for regulating the use, storage, transport, and disposal of hazardous substances in the state. The hazardous waste regulations establish criteria for identifying, packaging, and labeling hazardous wastes; prescribe management of hazardous waste; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous waste that cannot be disposed of in landfills. DTSC also maintains a Hazardous Waste and Substances Site List for site cleanup. This list is commonly referred to as the Cortese List. Government Code Section 65962.5 requires the California Environmental Protection Agency (CalEPA) to update the Cortese List at least annually. DTSC is responsible for a portion of the information contained in the Cortese List. Other state and local government agencies are required to provide additional hazardous material release information for the Cortese List.

State Water Resources Control Board

The State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCBs) administer the requirements of the Clean Water Act that regulate pollutant discharges into waterways of the U.S. The Project is proposed within the jurisdiction of the Central Valley RWQCB, Redding Office.

Construction of the Project would disturb more than 1 acre of land surface, and so could affect the quality of stormwater discharges into waters of the U.S. The Project therefore would be subject to the Construction General Permit, more formally known as the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ). See Section 3.12, *Hydrology and Water Quality*, for additional details about the Construction General Permit.

Unified Hazardous Waste and Hazardous Materials Management Regulatory Program

Regulations implementing a Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program) address six elements: hazardous waste generators and hazardous waste on-site treatment; underground storage tanks; aboveground storage tanks; hazardous materials release response plans and inventories; risk management and prevention programs; and Unified Fire Code hazardous materials management plans and inventories. The Certified Unified Program Agency (CUPA) is the local agency responsible for the implementation of the Unified Program. The Shasta County Environmental Health Division is the designated CUPA, and would serve in this capacity for the Project.

Hazardous Materials Release Response Plans and Inventory Law

The California Hazardous Materials Release Response Plan and Inventory Law of 1985 (Business Plan Act, Health and Safety Code §25500 et seq.) requires businesses that store or use hazardous materials to prepare a Hazardous Materials Business Plan (HMBP) and submit it to the CUPA, discussed above. An HMBP includes details of a facility and business conducted at the site, an inventory of hazardous materials that are handled and stored on-site, an emergency response plan, and a safety and emergency response training program for new employees with an annual refresher course.

Hazardous Materials Transportation

In addition to DOT regulations, the State regulates the transportation of hazardous waste originating in the State and passing through the State. Both regulatory programs apply in California. The two state agencies with primary responsibility for enforcing federal and state regulations and for responding to hazardous materials transportation emergencies are the California Highway Patrol (CHP) and California Department of Transportation (Caltrans). The CHP enforces hazardous materials and hazardous waste labeling and packing regulations to prevent leakage and spills of material in transit and to provide detailed information to cleanup crews in the event of an accident. Vehicle and equipment inspection, shipment preparation, container identification, and shipping documentation are the responsibility of the CHP, which conducts regular inspections of licensed transporters to assure regulatory compliance. Caltrans has emergency chemical spill

identification teams at as many as 72 locations throughout the state that can respond quickly in the event of a spill.

Occupational Safety

The California Department of Industrial Relations Division of Occupational Safety and Health (Cal/OSHA) has primary responsibility for developing and enforcing workplace safety regulations in California. Because California has a federally approved OSHA program, state regulations are at least as stringent as those found in Title 29 of the CFR.

Cal/OSHA regulations concerning the use of hazardous materials in the workplace require employee safety training, safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation. Cal/OSHA enforces hazard communication program regulations, which contain training and information requirements, including procedures for identifying and labeling hazardous substances, and communicating hazard information relating to hazardous substances and their handling. The hazard communication program also requires that Safety Data Sheets (SDSs) be available to employees, and that employee information and training programs be documented. These regulations also require preparation of emergency action plans, such as escape and evacuation procedures, rescue and medical duties, alarm systems, and training in emergency evacuation.

Emergency Response

Pursuant to the Emergency Services Act (Government Code §8550 et seq.), California has developed an Emergency Plan to coordinate emergency services provided by federal, state, and local governmental agencies and private persons. Response to hazardous materials incidents is one part of this plan. The plan is administered by the State Office of Emergency Services (OES). The OES coordinates the responses of other agencies, including the USEPA, CHP, California Department of Fish and Wildlife (CDFW), the RWQCBs (in this case, the Central Valley RWQCB), the local air districts (in this case, the Shasta County Air Quality Management District) and local agencies. The State Emergency Plan defines the "policies, concepts, and general protocols" for the proper implementation of the California Standardized Emergency Management System (SEMS). The SEMS is an emergency management protocol that agencies within the State of California must follow during multi-agency response efforts whenever state agencies are involved.

Local

Shasta County General Plan

Section 5.6, *Hazardous Materials,* of the Shasta County General Plan describes the following objectives and policies regarding hazardous materials as they related to the Project (Shasta County, 2004).

Objectives:

***HM-1*:** Protection of life and property from contact with hazardous materials through site design and land use regulations and storage and transportation standards.

***HM-2*:** Protection of life and property in the event of the accidental release of hazardous materials through emergency preparedness planning.

Policies:

HM-a: The County shall make every effort to inform applicants for discretionary and nondiscretionary projects which are located within potential border zone property of known hazardous waste facilities that they must comply with State requirements regarding hazardous waste facilities. A map shall be prepared and maintained which identifies these areas.

HM-b: Shasta County shall maintain an emergency preparedness plan for hazardous materials.

HM-c: Shasta County shall adopt policies for hazardous materials use, transportation, storage and disposal as required by State laws.

HM-d: Shasta County shall adopt policies for the protection of life and property from contact with hazardous materials through site design and land use regulations.

HM-e: Any proposal for development of a disposal site for hazardous wastes in Shasta County shall be reviewed closely to ensure that no significant environmental impacts will result from the project. Review of such project may include a determination of what type of hazardous wastes may be disposed of at the site.

Emergency Response

The Shasta County Sheriff's Office of Emergency Services (OES) coordinates with Federal, State, and local agencies to prepare, respond, and recover from emergencies and natural disasters. OES is responsible for maintaining and updating the County Emergency Operation Plan (EOP), which is an all hazards plan for Shasta County. The Shasta County Multi-Jurisdictional Hazard Mitigation Plan (SCHMP) was approved in November 2017 and includes resources and information to assist in planning for hazards (Shasta County and City of Anderson, 2017). The SCHMP provides a list of actions that may assist the jurisdictions in reducing risk and preventing loss from future hazard events.

3.11.2 Significance Criteria

CEQA Guidelines Appendix G Section IX identifies considerations relating to hazards and hazardous materials. See Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area*, as it relates to the County's analysis of the potential impacts of this Project to the considerations suggested in CEQA Guidelines Appendix G Section IX. Otherwise, for purposes of this analysis, a project would result in a significant impact to Hazards or Hazardous Materials if it would:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;

c) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

CEQA Guidelines Appendix G Section IX(g) suggests that a project also would result in a significant impact to Hazards or Hazardous Materials if it would expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fire. Potential impacts relating to wildland fire are analyzed in Section 3.16, *Wildfire*.

3.11.3 Direct and Indirect Effects

3.11.3.1 Methodology

The following analysis is based on existing conditions as determined by the Project-specific Phase I and publicly available information from various local, state, and federal agencies.

3.11.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.

Impact 3.11-1: The Project could create a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials or wastes. (*Less-than-Significant Impact*)

Project implementation would require the use of common hazardous substances, such as gasoline and diesel fuel, oils and lubricants, hydraulic fluid, and solvents to maintain vehicles and motorized equipment. See Table 2-3*,* Hazardous Materials, which lists the hazardous materials that are expected to be used during site preparation and construction, operation and maintenance, and decommissioning and site restoration phases of the Project. Routine uses of any of these substances could pose a hazard to people or the environment and would be considered potentially significant.

Fuel tanks would be maintained and operated according to all local, state, and federal regulations during construction and operation, and hazardous material storage would be detailed in the Spill Prevention, Countermeasure, and Control (SPCC) Plan. Refueling and general maintenance for construction equipment, such as changing fluids and lubricating parts, would also be subject to sufficient containment capabilities and according to measures outlined in the SPCC Plan.

In accordance with requirements contained in the Health and Safety Code and the California Code of Regulations, the Applicant would prepare a Hazardous Materials Business Plan/Spill Prevention Control and Countermeasures Plan (HMBP/SPCC) prior to construction. The HMBP would include best management practices (BMPs) for the transport, storage, use, and disposal of hazardous materials and waste. The HMBP also would include information regarding construction activities, worker training procedures, and hazardous materials inventory procedures. Prior to operation, the Applicant would update the HMBP (including the BMPs) with information about the types of hazardous materials that would be used during operation.

During construction, waste disposal and collection receptacles would be located onsite to ensure proper disposal of hazardous materials in accordance with regulatory requirements.

Project construction activity would be subject to the Construction General Permit and its required SWPPP, which include BMPs to control hazardous materials used for construction.

Operation, maintenance, and decommissioning of the Project would result in the transportation, storage, use or disposal of fewer hazardous materials compared to construction or decommissioning. During operation, relatively limited quantities of hazardous materials would be stored in the O&M facility and storage sheds in accordance with regulatory requirements and the HMBP. Batteries may be stored at the substation. Monthly inspections would occur to check for leaks and spills. Routine maintenance activities are expected to include, but not be limited to: checking torque on tower bolts and anchors; checking for cracks and other signs of stress on the turbine tower and other turbine components; inspecting for leakage of lubricants, hydraulic fluids and other hazardous materials, and replacing them as necessary; inspecting the grounding cables, wire ropes and clips, and surge arrestors; cleaning; and repainting. Compliance with applicable federal, state, and local regulations and the applicable BMPs and HMBP would ensure that any potential impact would be less than significant during Project operation and maintenance.

The impacts of transportation, storage, use and disposal of hazardous materials would be substantially the same during decommissioning as during construction. As such, the requirements and regulations applicable to the construction phase also would apply during decommissioning to adequately control potential impacts.

Compliance with applicable federal, state, and local requirements summarized in Section 3.11.1.3, *Regulatory Setting*, and related BMPs and plans would ensure that the Project does not create a significant hazard to the public through the routine transport, use, or disposal of hazardous materials. Therefore, this impact would be less than significant.

Mitigation: None required.

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b) Whether the Project would create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.

Impact 3.11-2: The Project could create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. (*Less-than-Significant Impact*)

During all Project phases, activities may involve the transportation, storage, use, or disposal of a variety of hazardous materials, including batteries, hydraulic fluid, diesel fuel, gasoline, propane, antifreeze, dielectric fluids, explosives, herbicides, grease, lubricants, paints, solvents, and adhesives. Ground disturbing activities also could inadvertently release naturally occurring arsenic in the form of fugitive dust or sediment in stormwater if arsenic is present on the Project Site.

The HMBP/SPCC would include BMPs for these activities as well as spill control and spill response measures. In the unlikely event that a spill did occur, the SPCC would include appropriate measures to ensure that workers cease work activities to contain any release and enact the protocols for cleanup including the notification of appropriate agencies and the use of materials stored onsite such as absorbent pads to minimize the spread or exposure.

Accidents or mechanical failure involving heavy equipment could result in the accidental release of fuel, lubricants, hydraulic fluid, or other hazardous substances. These types of spills on construction sites are typically in small quantities, localized, and cleaned up in a timely manner. Construction contractors are contractually responsible for their hazardous materials and are required under their contract to properly store and dispose of these materials in compliance with state and federal laws, including implementing a HMBP/SPCC. As discussed, the Project would require coverage under the Construction General Permit, and so would be subject to the protections included in a SWPPP, which would outline BMPs to contain a potential release and to prevent any such release from reaching an adjacent waterway or stormwater collection system (e.g., erosion control, sediment control, and waste management). Therefore, implementation of the SWPPP would minimize potential adverse effects to groundwater and soils.

Because, compliance with applicable federal, state, and local regulations and the applicable BMPs and HMBP/SPCC plan would ensure that the Project would not result in significant hazards to the public or environment related to accidental release of hazardous materials the impact would be less than significant.

Arsenic is found widely in nature, in trace amounts, including in rocks and sediments (Vaughn, 2006; USEPA, 1998). Inorganic arsenic occurs naturally in many types of rocks (USEPA, 1998), including basaltic and andesitic rocks (Vaughn, 2006; Smedley and Kinniburgh, 2002), which are present at the Project Site. However, there is no available data to suggest that there are elevated concentrations of arsenic within the Project Site. For this reason, the Project would result in a less-than-significant impact relating to the potential creation of a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of naturally occurring arsenic into the environment. If arsenic is present in abundance in the rocks at the Project Site, then construction activities could inadvertently release arsenic into the air. As discussed in Section 3.3, *Air Quality*, the implementation of Mitigation Measure 3.3-2c (Fugitive Dust Controls) to address Impact 3.3-2c would provide further assurance that any fugitive dust emissions containing naturally occurring arsenic would be less than significant. As stated in Section 3.9, *Geology and Soils*, the depth to groundwater is more than 230 feet below ground surface; therefore, the potential risk of Project-caused transport of naturally occurring arsenic to groundwater would be remote. The SWPPP discussed in Section 3.12, *Hydrology and Water Quality*, would provide further assurance that any construction runoff that might contain naturally occurring arsenic in the rocks would not contaminate the groundwater. Additionally, any naturally occurring arsenic in the rock would be present prior to any Project-related ground disturbance, and so the Project would not exacerbate the existing conditions, and would not expose people or the environment to a significant risk associated with arsenic contamination.

Mitigation: None required.

Impact 3.11-3: During normal operation, equipment failure or an extreme event could lead to turbine failure, resulting in a potential hazard. (*Less-than-Significant with Mitigation Incorporated*)

"Tower failure" refers to the collapse of a wind turbine or meteorological tower. "Rotor failure," also known as "blade throw," refers to the disconnection of a wind turbine blade or blade fragment from the tower, typically due to equipment failure or an extreme event such as a lightning strike. Other potential causes could include failure of turbine control/safety system, human error, design error, or poor manufacturing quality (Larwood, 2005).

Tower failure and blade throw are rare. Available documentation indicates that blade failure probability is in the range of 1-in-100 to 1-in-1000 per turbine per year (Larwood, 2005). Further, based on independent research, the EIR preparers were unable to identify any reported injury to a member of the public from a turbine or meteorological tower failure or blade throw. This is consistent with information disseminated by the American Wind Energy Association (AWEA), which reports that "no member of the public has ever been injured by a turbine" (AWEA, 2020). Nonetheless, persons and facilities within a tower failure or blade throw hazard zone could be at risk of damage, injury or death if struck. If a blade or fragment of a blade detaches from the hub, the distance it travels is dependent upon a number of factors including the release velocity (which is a function of the turbine tip speed), tower height, topographic setting, blade or blade fragment length, rotor speed, wind speed, and departure angle.

The Applicant proposes to strictly control access to the wind energy facility, limiting access to Project facilities to persons approved for access by the Applicant. Access to the larger Project Area is controlled by the underlying land owner. Where necessary, safety and "No Trespassing" signs would be posted around towers, transformers, other high-voltage facilities, and along roads in accordance with federal and state regulations. This strict control of public access would reduce the risk of exposure of potential Project hazards to members of the public on the Project Site to a less-than-significant level. The Applicant also proposes that the Project operator would monitor turbines through a Supervisory Control and Data Acquisition (SCADA) monitoring system 24 hours a day, seven days a week. This system would allow the Applicant to perform self-diagnostic tests and would allow a remote operator to perform system checks, establish operating parameters, and ensure that the turbines are operating at peak performance. National Renewable Energy Laboratory (NREL) research indicates that continuous monitoring of wind turbine health using a SCADA system can improve turbine reliability by detecting failures before they reach a catastrophic stage (NREL, 2011). The proposed continuous monitoring of the automated SCADA system would be sufficiently protective of the 12 employees who could be onsite while turbines are operating. For these reasons, a less-than-significant impact would result for O&M personnel and for members of the public within the Project Site.

To address the risk of public exposure to thrown fragments from rotor failure beyond project site boundaries, many jurisdictions have adopted "setback requirements," which establish minimum

distances between wind turbines and neighboring property lines, roads, and occupied structures. Neither the State of California nor Shasta County has adopted setback requirements for wind turbines. In other jurisdictions, required setbacks vary, but usually are based on overall turbine height, i.e., the tower height plus the blade radius. For example:

- Kern County requires a minimum wind generator setback of 2 times the overall turbine height or 500 feet, whichever is less, from exterior project site boundaries adjacent to existing parcels of record that contain less than 40 acres; where neighboring property is greater than 40 acres, then the setback must be the lesser of 1.5 times the overall turbine height or 500 feet. Regardless of parcel area, the minimum required setback from any off-site residence is the greater of 1.5 times the overall turbine machine height or 500 feet (Kern County Code of Ordinances Section 19.64.140, Kern County, 2005).
- Solano County requires wind turbine generators to be set back at least 1.25 times the overall turbine height to any property line (Solano County Code of Ordinances §28.80, Solano County, 2012).
- San Bernardino County requires a setback from off-site residence(s) on adjacent parcels that is the greater of 1.5 times the overall turbine height or 1,500 feet (San Bernardino County Code §84.29.030, San Bernardino County, 2010).
- Riverside County requires a setback of 3 times the overall turbine height from the lot line of any lot containing a "habitable dwelling" and 1.1 times the overall turbine height from all other lot lines, and at least 1.25 times the overall turbine height from any public road or highway (Riverside County Code §17.224.040, Riverside County, 2002).
- El Dorado County also requires a setback of the greater of 3 times the overall turbine height or 500 feet (El Dorado County Code Table 130.40.390.2, El Dorado County, 2015).
- Yolo County also requires a setback from any adjacent parcel containing an offsite residence of the greater of 3 times the overall turbine height or 1,000 feet; the setback to any publicly maintained public highway or street, any public access easement, including any public trail, pedestrian easement, or equestrian easement, or railroad right-of-way is the lesser of 1.5 times the overall turbine height or 500 feet (Yolo County Code §8-2.1103[i], Yolo County, 2014).

Informed by multiple other jurisdictions' requirements, this analysis considers a project to have a significant impact relating to turbine or meteorological tower failure or blade throw if it would be set back less than 2 times the overall turbine height (i.e., 1,358 feet) from the lot line of any off-site residence or 1.25 times the overall turbine height (848.75 feet) from any public road or highway based on the maximum overall turbine height of 679 feet as identified in Chapter 2, *Description of Project and Alternatives*.

Based on these thresholds, all of the proposed turbines would be farther from public roads or highways than that threshold. However, two of the proposed turbines (turbines M03 and D05 as shown on Figure 2-2, *Site Plan*) would be located closer to residential lot lines than the threshold. Although the risk of hazard relating to turbine or meteorological tower failure or blade throw from turbines M03 and D05 would be low, the potential consequences of such an event could be high, and so would be significant unless mitigated. Mitigation Measure 3.11-3, if implemented, turbines M03 and D05 would not be constructed.

Mitigation Measure 3.11-3: Mandatory Setbacks.

A minimum wind turbine setback of two times the total tip height shall be maintained from the exterior Project boundaries where the Project Site is adjacent to existing parcels of record that contain an off-site residence.

Significance after Mitigation: Less than significant.

Impact 3.11-4: During normal operation, weather conditions could lead to ice shed from turbine blades, resulting in a potential hazard. (*Less-than-Significant Impact*)

Ice shed can occur as air temperatures rise, causing ice on turbine blade to thaw and for ice fragments to drop from the rotors to the ground near the base of the turbine (Morgan et al., 1998). Ice also can be thrown from an operating turbine due to aerodynamic and centrifugal forces. A Swiss report entitled *Wind Turbine Ice Throw Studies in the Swiss Alps* (Cattin et al., 2014) confirms that underneath the turbine is the most dangerous place for ice-related wind turbine hazards, and cautions that in arctic conditions, approximately 5 percent of ice fragments can land more than 80 meters (approximately 262.5 feet) from the turbine. GE, a wind turbine manufacturer, reported in 2006 that "rotating turbine blades may propel ice fragments some distance from the turbine— up to several hundred meters if conditions are right" (Wahl and Giguere, 2006). The actual distance that ice could be expected to travel would depend on several factors, including turbine dimensions, rotational speed, weather and especially the wind conditions, the instrumentation of the wind turbine's control system, and on the strategy of the control system itself (see, e.g., Seifert et al., 2003).

Based on independent research, the EIR preparers were unable to identify any reported injury as a result of ice throw from wind turbine. This is consistent with information disseminated by the American Wind Energy Association (AWEA), which reports that "no member of the public has ever been injured by a turbine" (AWEA, 2020). Nonetheless, accumulations of ice on wind turbine blades can pose a risk to O&M personnel and, to a much lesser extent, to the general public.

The risk to both groups is considered low predominantly because ice buildup would slow a turbine's rotation, which would be sensed by a turbine's SCADA system, causing the turbine to shut down. As described in Section 2.4.6, *Operation and Maintenance*, the Project operator would monitor turbines through the SCADA system 24 hours a day, seven days a week. Further, risk literature indicates that environmental cues (e.g., observing ice on wind turbines or hearing ice cracking or falling) result in protective action. Nearly all (92.9 percent) of the O&M personnel surveyed as part of a study of perceived risk and response to the wind turbine ice throw hazard (Klaus, 2017) reported that the principal reaction to environmental cues was for the wind farm to reduce exposure risk by issuing "site stand down orders" evacuating the immediate area and suspending all field work. They also reported that their companies had safety procedures in place for wind turbine icing, and a substantial number of workers (79.7 percent) reported that their company's safety procedures were very to extremely effective for protecting them in the event of an ice throw occurrence (Klaus, 2017).

For this Project, members of the public would not have access to the Project facilities and unauthorized access would be discouraged via locked gates and signage. Standard setbacks typically are sufficient to protect against potential dangers to the public from ice throw (AWEA, 2020). In any event, when asked about responses to environmental cues, the most common response of members of the public was to "stay away" or "keep their distance" from the wind turbines (Klaus, 2017). Any potential risk to illegal trespassing members of the public from ice throw would not put a substantial number of people at risk. (See the analysis of Impact 3.3-5 in Section 3.3, *Air Quality*, regarding the low population in the immediate area). For these reasons, the potential for the Project to result in a potential hazard to a substantial number of people due to ice throw would be less than significant.

Mitigation: None required.

Impact 3.11-5: During normal operations, applications of certain pesticides could result in a potential hazard. (*Less-than-Significant Impact*)

Scoping input identified the use of glyphosate weed killers such as Roundup as having potential to cause cancer and/or deoxyribonucleic acid (DNA) disruption, resulting in sterility and deformities. As explained in Section 2.4.8.3, *Hazardous Materials*, "If deemed necessary, herbicides would be brought to the site and applied by a licensed applicator." Glyphosate is generally acknowledged to be the most widely used agricultural pesticide worldwide: It is registered in 130 countries, has been approved for weed control in more than 100 crops, and is present in more than 750 products (Valavanidis, 2018). Thus, while it is possible that an herbicide that does not contain glyphosate could be used if deemed necessary, it also is possible that an herbicide that does contain glyphosate could be used on the Project Site.

The potential carcinogenic and genotoxic properties of glyphosate are widely debated within the scientific community. On one hand, the International Agency for Research on Cancer (IARC), a research arm of the World Health Organization, classified glyphosate as "probably carcinogenic" in March 2015 (IARC, 2015). On the other hand, a host of other agencies and entities have reached the contrary conclusion that there is no convincing evidence that glyphosate poses a risk for various types of cancer in humans and no convincing evidence of direct DNA damage *in vitro* or *in vivo* (Valavanidis, 2018; de Roos et al., 2005). For example, in a 2013 study, the German Institute for Risk Assessment evaluated approximately 450 toxicological studies and considered approximately 900 publications from scientific journals before concluding that "available data do not show carcinogenic or mutagenic properties of glyphosate nor that glyphosate is toxic to fertility, reproduction or embryonal/fetal development in laboratory animals" (BfR, 2013). In the United States, a collaborative effort of investigators from the National Cancer Institute, the National Institute of Environmental Health Sciences, the Environmental Protection Agency, and the National Institute for Occupational Safety and Health resulted in series of studies collectively called the Agricultural Health Study (AHS) (NIH, 2018, 2020). The AHS studies of cancer, reproductive health, and other health outcomes between 1990 and 2015 among 52,394 licensed private pesticide applicators (mostly farmers) and 32,345 of their spouses from Iowa and North Carolina, and 4,916 commercial pesticide applicators. The 2018 update's conclusion that

"Glyphosate use was not associated with overall cancer risk" is consistent with the 2005 AHS research finding that "Glyphosate exposure was not associated with cancer incidence overall or with most of the cancer subtypes we studied" (NIH, 2018; de Roos et al., 2005).

A review undertaken in 2000 (Williams et al., 2000) to evaluate the human health risk of glyphosate showed that glyphosate does not bioaccumulate in animal tissue, and that no significant toxicity occurred in acute, subchronic, or chronic studies. Further, "There was no convincing evidence for direct DNA damage in vitro or in vivo, and it was concluded that Roundup and its components do not pose a risk for the production of heritable/somatic mutations in humans…. There were no effects on fertility or reproductive parameters in two multigeneration reproduction studies with glyphosate. Reviewers concluded that 'under present and expected conditions of new use, there is no potential for Roundup herbicide to pose a health risk to humans.'"

Recognizing the ongoing debate about the use of glyphosate weed killers such as Roundup that is occurring internationally and nationally, and that also is an issue of local concern, the County is persuaded by the detailed, ongoing research conducted in the United States by the National Cancer Institute, the National Institute of Environmental Health Sciences, the Environmental Protection Agency, and the National Institute for Occupational Safety and Health, and concludes that there is insufficient evidence to conclude that the use, if any, of glyphosate weed killers on the Project Site would have potential to cause cancer or other adverse health outcomes. Therefore, the Project would result in a less-than-significant potential impact.

Mitigation: None required.

Impact 3.11-6: During normal operations, alternating changes in light intensity could occur when turbine blades are rotating and result in an adverse health effect. (*Less-than-Significant Impact*)

Scoping comments enquired about and suggested potential impacts associated with the alternating changes in light intensity that could occur when turbine blades are rotating (sometimes referred to as "shadow flicker"), including whether epileptic seizures, migraines or adverse impacts on mental health could be caused. Specific weather, light, timing, operational, and experiential conditions are required: shadow flicker only occurs on sunny days, when the sun is low enough on the horizon that the turbine is between the sun and the viewer (i.e., early in the day or late in the evening), the turbines must be rotating, and the viewer's eyes must be open. Shadow flicker does not occur at night, when fog or clouds obscure the sun, or when turbines are not operating. Shadow flicker also is limited in the distance from a turbine it can be perceived. It is suggested that, during normal operation, the visual flicker of the moving shadows of turbine blades could create a strobe-like phenomenon that could be a nuisance or cause adverse health effects to nearby residents.

No consistent national, state, or local standards exist for allowable frequency or duration of shadow flicker from wind turbines at the Project Site, and the County has not adopted a threshold to evaluate the potential significance of a Project-caused change. As discussed below, this

analysis considers both frequency and duration, relying on the expertise of the Epilepsy Foundation of America, the Chief Medical Officer of Health of Ontario, and the National Institutes of Health in identifying thresholds above which the Project's potential shadow-flicker-related health impacts would be considered significant, and on the expertise of the National Association of Regulatory Utility Commissioners.

The frequency of shadow flicker (i.e., the speed of the flashing light) is a function of the number of times the turbine blades turn per second. It is measured in hertz (Hz). However, the effect normally is considered a nuisance above 2.5 Hz, and more severe impacts can occur at higher frequencies. For example, the Epilepsy Foundation of America reports that exposure to flashing lights at certain intensities can trigger seizures in about 3 percent of epileptics, and that the frequency or speed of flashing light most likely to trigger epileptic seizures is between 5 and 30 Hz (EFA, 2019). Flicker frequency caused by a wind turbine is based on the rotor frequency (i.e., 0.6 to 1.0 Hz), which is in a range that is well below the frequency range for epileptic seizures. This conclusion is consistent with that reached by the Chief Medical Officer of Health of Ontario, Canada who, in a May 2010 report entitled "The Potential Health Impact of Wind Turbines," stated "About 3 per cent of people with epilepsy are photosensitive, generally to flicker frequencies between 5-30Hz. Most industrial turbines rotate at a speed below these flicker frequencies" (CMOH, 2010).

Migraines are a recurring type of headache that can cause moderate to severe pulsing or throbbing pain (MedlinePlus, 2019). Migraines affect approximately 12 percent of Americans. Researchers believe they have a genetic cause; flashing or bright lights are identified as among a variety of potential triggering factors (MedlinePlus, 2019). A National Institutes of Health (NIH) study on detection and discrimination of flicker contrast in migraine tested frequencies between 1 and 30 Hz and found that the "greatest sensitivity was seen at and above 10 Hz." No lower bound for sensitivity or effect was reported, and independent research failed to find any medical or peer-reviewed scientific study linking shadow flicker from wind turbines to a statistically significant increase in migraines among those predisposed to experience them. No evidence was found in published, peer-reviewed scientific literature linking the potential for normal operation of a wind turbine to cause flickering and adverse mental health impacts.

In summary, there is a lack of published, peer-reviewed scientific literature linking the flickering that can occur during the normal operation of a wind turbine to epileptic seizure, migraines, or adverse mental health impacts. Accordingly, potential impacts would be less than significant. Even though the Project's potential impacts relating to shadow flicker would be less than significant, the Applicant has proposed, as part of the Project design, to further consider and address the potential annoyance that could be caused by Project-related shadow flicker to those who would not be benefitting personally from the project (i.e., "project participants").

Environmental Design and Research (EDR) prepared a shadow flicker analysis on behalf of the Applicant. A copy of the analysis is provided in **Appendix F2**, *Shadow Flicker Analysis*. The County independently reviewed the shadow flicker analysis and other materials prepared by or on behalf of the Applicant and determined them to be suitable for reliance on (in combination with other materials included in the formal record) in the preparation of this analysis. The analysis

evaluated the largest of the potential project footprints (i.e., 72 Vestas V162 wind turbines, each with a rotor diameter of approximately 531.5 feet [162 meters] and a hub height of approximately 410 feet [125 meters]) within a study area that equates to roughly 10 rotor diameters (approximately 1 mile). Beyond this distance, shadow flicker effects generally are considered negligible (BERR, 2008; Appendix F2).

In its report, EDR modeled potential Project-caused shadow flicker effects at each of the 69 receptor locations within the study area and identified two (i.e., receptor #2 and receptor #58) where the duration of shadow flicker would exceed 30 hours per year – a threshold of significance recommended by the National Association of Regulatory Utility Commissioners in a 2012 report funded by the U.S. Department of Energy (NARUC, 2012). The report distinguishes between "non-participating" and "participating" receptors. Receptor #2 would be "non-participating" while #58 would be "participating." A "non-participating receptor" is a resident who would not benefit personally from the proposal; a participating receptor would receive some personal benefit from the location of turbines in the area. Studies correlating annoyance and wind turbines have found find that project participants are less annoyed by turbines than non-participants. See, e.g., Voicescu et al. (2016) ("Those who did not receive a personal benefit from having [wind turbines] in the area were found to have 4.03 times higher odds of being [highly annoyed by wind turbine shadow flicker] compared to those who did receive personal benefits"); see also Michaud et al. (2016) ("Participants with a high concern for their physical safety had 14 times higher odds of being annoyed by [wind turbine noise]"). The results for receptors #2 and #58 are summarized in **Table 3.11-1**, *Shadow Flicker Results at Receptors Predicted to Exceed 30 Hours*.

TABLE 3.11-1
SHADOW FLICKER RESULTS AT RECEPTORS PREDICTED TO EXCEED 30 HOURS

Receptor ID	Project Status	Predicted Shadow Flicker (days/year)	Predicted Max Daily Shadow Flicker (hh:mm), approximate times[a]	Turbines Contributing to Shadow Flicker
2	Non-participating	119	1:14, 6:45 PM – 8:15 PM	D04, D05
58	Participating	230	0:57, 6:45 AM – 7:30 AM 8:00 AM – 8:45 AM 4:15 PM – 5:45 PM 7:15 PM – 8:30 PM	N02, M08, M10

NOTES:
[a] The times of day represent the range of times during which each receptor could potentially experience shadow flicker throughout the year; however, no receptors will experience shadow flicker every day during all of these hours. See Attachment B for detailed calendars that illustrate the specific time of year and day that each receptor may experience shadow flicker.

SOURCE: Appendix F2, Tables 2 and 3.

Following final turbine model selection and layout, including any micro-siting of locations that may occur as part of the approval process, the Applicant proposes to prepare an updated receptor-specific shadow flicker analysis for non-participating residences. The analysis will account for any screening by existing yard trees, buildings, or proximity to stands of trees and the number and/or orientation of windows in residential receptors. It also will use Project-specific meteorological data to account for wind being below or above generation speeds. If the modeling results show that shadow flicker could exceed 30 hours per year at a non-participating residence,

then the Applicant will work with the landowner to become a Project participant, or to plant trees or install window blinds to block the shadow flicker. These mitigation options could readily be implemented even after the Project has been constructed. These further actions, if determined appropriate based on the updated receptor-specific shadow flicker analysis, would further assure that potential impacts to non-participating residences would be less than specific.

Mitigation: None required.

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c) Whether the Project would impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

Impact 3.11-7: The Project could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (*Less than Significant with Mitigation Incorporated*)

As discussed below, the Project would not impair implementation of or, if mitigated, cause a substantial physical interference with Shasta County's EOP, which is the County's all hazards plan. The Project Site is located in a rural area adjacent to State Route (SR) 299, with three Project driveways allowing adequate egress/ingress to the site in the event of an emergency. Additionally, as part of the Project, additional onsite access roadways (internal to the site) would be constructed. During inclement winter months, emergency access could be provided to and through the Project Site via snowcats or ATVs. Therefore, development of the Project would not physically interfere with emergency vehicle access or personnel evacuation from the site in these respects. The Project would not require closures of public roads, which could inhibit access by emergency vehicles. Further, as described in Section 3.14.3.2, which analyzes the direct and indirect transportation effects of the Project, the proposed use of oversized vehicles during construction and decommissioning would not cause a significant adverse impact on emergency access to or near the Project Site if oversize load permit and related requirements are complied with. The implementation of Mitigation Measure 3.11-7 would assure that emergency access would be maintained during construction and decommissioning.

Mitigation Measure 3.11-7: Implement the Traffic Management Plan that would be required by Mitigation Measure 3.14-3.

Significance after Mitigation: Less than significant.

3.11.3.3 PG&E Interconnection Infrastructure

The proposed an onsite collector substation and switching station would increase the voltage of the electricity from the collection system's 34.5 kV to 230 kV to match the voltage of the existing PG&E 230 kV line and the Project would tap into the existing PG&E 230 kV line via an aboveground line tap located directly adjacent to the switching station. Minor modifications or upgrades to the existing 230 kV line may be required to facilitate the Project's interconnection. The work also could require the construction and/or reconfiguration of utility line structures and

transmission line circuits involving four to six new transmission poles. As designed, the Project would protect public safety by restricting public access, enclosing the onsite substation with a chain-link fence, and posting safety and "No Trespassing" signs around towers, transformers, and other high-voltage facilities.

No mitigation would be required specific to the PG&E interconnection infrastructure. As part of the Project, construction, operation, maintenance and decommissioning of the PG&E interconnection infrastructure would result in a less-than-significant impact relating to: the creation of a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials or wastes, or reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. It also (like the Project) would cause a less-than-significant impact relating to hazards associated with the application of certain pesticides during normal operations. Because no turbines or related oversize loads would be required for the subset of Project activities required to construct, operate, maintain, or decommission the PG&E interconnection infrastructure, neither Mitigation Measure 3.11-3 (Mandatory Setbacks) nor Mitigation Measure 3.11-7 (implementation of the Traffic Management Plan that would be required by Mitigation Measure 3.14-3) would be required in connection with the PG&E interconnection infrastructure, and there would be no impact relating to shadow flicker.

3.11.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, no turbines would be erected north of SR 299. The elements of Alternative 1 that would be required to comply with applicable hazardous materials storage, transportation, use, and disposal regulations, along with stormwater permitting regulations would be the same as those described for the Project. The Project components also would be the same in type, if fewer in number. Like the Project, Alternative 1 would result in a less-than-significant impact relating to: the creation of a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials or wastes, or reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. It also (like the Project) would cause a less-than-significant impact relating to hazards associated with the application of certain pesticides during normal operations. Because turbine construction and operation would be the same as for the project, although restricted to the area south of SR 299, oversize loads would be needed to deliver turbine components. Similar to the Project, Mitigation Measure 3.11-7 (Traffic Management Plan) would be implemented to ensure that emergency access would be maintained during construction and decommissioning reducing impacts to less than significant. Also similar to the Project, there would be a less-than-significant impact relating to shadow flicker.

Similar to the Project, two turbines (M03 and D05) would be located closer to the property lines of private residential lots than 2 times the turbine height, resulting in a significant impact should a blade throw event occur at either of these turbines. This potential impact would be mitigated to less than significant with the implementation of Mitigation Measure 3.11-3 (Mandatory Setbacks) which would prohibit the construction of turbines M03 and M05.

Alternative 2: Increased Setbacks

The elements of Alternative 2 that would be required to comply with applicable hazardous materials storage, transportation, use, and disposal regulations, along with stormwater permitting regulations would be the same as those described for the Project. The Project components also would be the same in type, if fewer in number, as the Project.

Similar to the Project, Alternative 2 would result in a less-than-significant impact relating to: the creation of a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials or wastes, or reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. Alternative 2 also (like the Project) would result in a less-than-significant impact relating to hazards associated with the application of certain pesticides during normal operations. Because oversize loads would be needed to deliver turbine components, Mitigation Measure 3.11-7 (Traffic Management Plan) would be required, to ensure emergency access during construction and decommissioning, reducing the impact to less than significant.

Alternative 2 would differ from the Project by precluding the construction, operation and maintenance of turbines within three times the height of the turbine (i.e., within 2,037 feet) of a residential property line and would require setbacks of 1.5 times the height of the turbine (i.e., within 1,018.5 feet) of private as well as public roads. This would result in four of the Project turbines (M03, D05, B01 and K02) not being constructed. As a result, Alternative 2 would result in a less-than-significant impact relative to whether, during normal operation, equipment failure or an extreme event could lead to a turbine failure resulting in a blade throw. Under Alternative 2, Mitigation Measure 3.11-3 (Mandatory Setbacks) would not be required. Given the greater distance between proposed turbines and potential visual receptors, the less-than-significant impact of the Project relating to shadow flicker would be even more remote under Alternative 2 particularly with respect to receptor #2, because turbine D05 (which would contribute to shadow flicker at this location) would not be constructed.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind project infrastructure would be constructed, operated and maintained, or decommissioned on the Project Site. No potential hazards to air navigation would be installed on the Project Site, no Project-related vehicles or equipment would be present, and no hazardous materials would be transported, used, or disposed of in connection with the Project. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to Hazards and Hazardous Materials.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to

result in a significant adverse individual or cumulative effect relating to Hazards or Hazardous Materials. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.11.4 Cumulative Analysis

The geographic scope for cumulative effects relating to hazards and hazardous materials would be the Sacramento Valley Air Basin, watershed and groundwater basin boundaries (see Section 3.12, *Hydrology and Water Quality*), and the Project materials delivery routes, including I-5 (approximately 35 miles to the west of the Project Site), SR 139 (approximately 60 miles to the east of the Project Site), SR 299, Moose Camp Road, and the three existing, gated logging roads that would be used for direct Project access. Cumulative hazards and hazardous materials-related effects could arise at any point during the Project, from the commencement of construction through operation and maintenance and decommissioning-related activities.

The Project would result in a less-than-significant impact regarding the transport, use, disposal of hazardous materials; and upset and accident conditions involving the release of hazardous materials. Current and reasonably foreseeable projects would be required to comply with the same federal, state, and local regulatory requirements described above that would minimize and/or avoid such impacts. Compliance with these regulations is effective in minimizing releases where emissions or accidental releases tend to be localized and do not combine to become cumulatively considerable. Therefore, considering the localized nature of effects, the temporal and geographic variations in occurrences, any emissions or incidents would not combine to cause a significant cumulative impact. Regarding potential impacts that could occur during normal turbine operations, no other turbines could experience tower failure, blade throw or ice shedding. There is no existing cumulative impact to which the project or an alternative could contribute, and the cumulative effect would be less than significant. The potential for the use, if any, of glyphosate weed killers on the Project Site to cause or contribute to a significant cumulative effect also would be less than significant: there is no evidence of an existing significant impact (i.e., cancer, DNA damage, infertility) attributable to the use of glyphosate weed killers in the relevant geographical area, and insufficient evidence to conclude that the use of such products on the Project Site would cause one. Similarly, there is no evidence of an existing significant impact relating to shadow flicker in the relevant geographical area, and insufficient evidence to conclude that the less-than-significant incremental impact of the Project would cause one. Accordingly, the Project would result in less-than-significant cumulative effects related to hazards and hazardous materials.

3.11.5 References

American Wind Energy Association (AWEA), 2020. Setbacks. Available online at: https://www.awea.org/policy-and-issues/project-development/state-and-local-permitting/setbacks. Accessed March 29, 2020.

Bundesinstitut fur Risikobewertung (BfR), 2015. *The BfR has finalized its draft report for the reevaluation of glyphosate*. BfR Communication No. 008/2015. February 4, 2015.

Business Enterprise & Regulatory Reform (BERR). 2008. *Onshore Wind: Shadow Flicker* Available online at: https://webarchive.nationalarchives.gov.uk/20081013125014/http://www.berr.gov.uk/whatwedo/energy/sources/renewables/planning/onshore-wind/shadow-flicker/page18736.html Archived October 19, 2008; accessed June 19, 2020.

California Department of Toxic Substances Control (DTSC), 2014. EnviroStor database entry. Whitmore Gap Filler Annex (71000058). Available online at: https://www.envirostor.dtsc.ca.gov/public/profile_report?global_id=71000058. Accessed June 23, 2020.

DTSC, 2020. EnviroStor database search; Shasta County. Available online at: https://www.envirostor.dtsc.ca.gov/public/map/?myaddress=burney%2C+ca. Accessed June 23, 2020.

Cattin, R., S. Kunz, A. Heimo, G. Russi, M. Russi, and M. Tiefgraber, 2014. Wind Turbine Ice Throw Studies in the Swiss Alps. June 1, 2014. Available online at: https://www.researchgate.net/publication/228491358_Wind_turbine_ice_throw_studies_in_the_Swiss_Alps.

Chief Medical Officer of Health (CMOH), 2010. The Potential Health Impact of Wind Turbines. May 2010. Available online at: http://health.gov.on.ca/en/common/ministry/publications/reports/wind_turbine/wind_turbine.pdf.

deRoos et al., 2005. *Cancer Incidence among Glyphosate-Exposed Pesticide Applicators in the Agricultural Health Study*. Published in Environ Health Perspect. 2005 Jan; 113(1): 49–54

El Dorado County, 2015. El Dorado County Code Title 130. December 15, 2015. Available online at: https://www.edcgov.us/government/longrangeplanning/landuse/supportingdocuments/zoudec2015/documents/Title-130-Article-4-Dec-2015.pdf.

Epilepsy Foundation of America (EFA), 2019. Photosensitivity and Seizures. September 30, 2019. Available online at: https://www.epilepsy.com/learn/triggers-seizures/photosensitivity-and-seizures.

Federal Aviation Administration (FAA), 2018. Advisory Circular No. 70/7460-1L, Obstruction Marking and Lighting. August 17, 2018. Available online at: https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_70_7460-1L_-_Obstuction_Marking_and_Lighting_-_Change_2.pdf.

International Agency for research on Cancer (IARC), 2015. *IARC Monographs Volume 112: evaluation of five organophosphate insecticides and herbicides*. March 20, 2015.

Kern County, 2005. Kern County Code of Ordinances, Ch. 19.64 - Wind Energy (WE) Combining District. Available online at: https://library.municode.com/ca/kern_county/codes/code_of_ordinances?nodeId=TIT19ZO_CH19.64WIENWECODI. 2005

Klaus, G. 2017. Perceived Risk and Response to the Wind Turbine Ice Throw Hazard: Comparing Community Stakeholders and Operations and Maintenance Personnel in Two Regions of Texas. A dissertation submitted to the Graduate Council of Texas State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy with a major in Environmental Geography. May 2017. Available online at: https://digital.library.txstate.edu/bitstream/handle/10877/6599/KLAUS-DISSERTATION-2017.pdf?sequence=1&isAllowed=y.

Larwood, S. 2005. Permitting Setbacks for Wind Turbines in California and the Blade Throw Hazard. Report Number CWEC-2005-01. California Wind Energy Collaborative, University of California, Davis. June 16, 2005. Available online at: https://docs.wind-watch.org/Larwood-bladethrow-paper.pdf.

MedlinePlus, 2019. Migraines. Available online at: https://medlineplus.gov/migraine.html. September 16, 2019.

Michaud, D. S., S. E. Keith, K. Feder, and S. A. Voicescu, 2016. Personal and Situational Variables Associated with Wind Turbine Noise Annoyance. Available online at: https://asa.scitation.org/doi/10.1121/1.4942390. Accessed June 22, 2020.

MilitaryMuseum.org, 2020. Historic California Posts, Camps, Station and Airfields: Whitmore Gap Filler Annex SM-157B. Available online at: http://www.militarymuseum.org/Whitmore.html. Accessed March 29, 2020.

Morgan, C., E. Bossanyi, and H. Seifert, 1998. Assessment of Safety Risks Arising from Wind Turbine Icing. April 2, 1998. Available online at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.584.6044&rep=rep1&type=pdf.

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. Available online at: https://pubs.naruc.org/pub/FA8663AC-A840-E8B3-FC1D-C7AFEC3ED9D6.

National Institute of Health (NIH), 2018. Agricultural Health Study Update 2018. Available online at: https://aghealth.nih.gov/news/2018.html.

NIH, 2020. Agricultural Health Study Update 2020. Available online at: https://aghealth.nih.gov/news/2020.html.

National Renewable Energy Laboratory (NREL), 2011. Use of SCADA Data for Failure Detection in Wind Turbines. August 7–10, 2011. Available online at: https://www.nrel.gov/docs/fy12osti/51653.pdf.

Riverside County, 2002. Riverside County Code of Ordinances Section 17.224.040—Standards and Development Criteria. Available online at: https://library.municode.com/ca/riverside_county/codes/code_of_ordinances?nodeId=TIT17ZO_CH17.224COWIENCOSYWEPE. 2002.

San Bernardino County, 2010. San Bernardino County Code of Ordinances §84.29.030. Wind Energy Development Standards. Available online at: http://sbcounty-ca.elaws.us/code/coor_t8_d4_ch84.29_sec84.29.030. 2010.

Seifert, H., A. Westerhellweg, and J. Kröning, 2003. Risk Analysis of Ice Throw from Wind Turbines. April 2003. Available online at: http://www.windaction.org/posts/13298-risk-analysis-of-ice-throw-from-wind-turbines#.XuznkmhKg2w.

Shasta County and City of Anderson, 2017. Multi-Jurisdictional Hazard Mitigation Plan. November 16, 2017. Available online at: https://www.co.shasta.ca.us/docs/libraries/public-works-docs/hmp-documents/shasta-county-hazard-mitigation-plan-november-2017.pdf.

Shasta County, 2004. General Plan Section 5.6, *Hazardous Materials.* Available online: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/` 56hazmat.pdf?sfvrsn=d6132daa_0

Smedley, P. L., and D. Kinniburgh, 2002. A Review of the Source, Behaviour and Distribution of Arsenic in Natural Waters. Applied Geochemistry 17:517–568. Available online at: 10.1016/S0883-2927(02)00018-5.

Solano County, 2012. Solano County Code of Ordinances, Chapter 28, Zoning Regulations. Available online at: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=4679.

State Water Resources Control Board (SWRCB), 2020. GeoTracker database search; Shasta County.

U.S. Environmental Protection Agency (USEPA), 1998. Locating and Estimating Air Emissions from Sources of Arsenic and Arsenic Compounds. EPA-454/R-98-013. June 1998.

Valavanidis, 2018. Glyphosate, the Most Widely Used Herbicide. Department of chemistry, national and Kapodistrian University of Athens, Greece. Published March 2018.

Vaughn, D. J., 2006. Arsenic. Elements 2(2):71–75. Available online at: https://doi.org/10.2113/gselements.2.2.71. 2006.

Voicescu, S. A., D. S. Michaud, K. Feder, L. Marro, J. Than, M. Guay, A. Denning, T. Bower, F. van den Berg, N. Broner, and E. Lavigne, 2016. Estimating Annoyance to Calculated Wind Turbine Shadow Flicker Is Improved When Variables Associated with Wind Turbine Noise Exposure Are Considered. March 31, 2016. Available online at: https://asa.scitation.org/doi/pdf/10.1121/1.4942403.

Wahl, D., and P. Giguere, 2006. Wind Application Engineering, GE Energy. Ice Shedding and Ice Throw – Risk and Mitigation. April 2006. Available online at: https://www.ge.com/content/dam/gepower-pgdp/global/en_US/documents/technical/ger/ger-4262-ice-shedding-ice-throw-risk-mitigation.pdf.

Williams, G. M., R. Kroes, and C. Munro, 2000. Safety Evaluation and Risk Assessment of the Herbicide Roundup and Its Active Ingredient, Glyphosate, for Humans. Regul. Toxicol. Pharmacol. April 2000. Available online at: https://www.ncbi.nlm.nih.gov/pubmed/10854122.

Yolo County, 2014. Yolo County Zoning Regulations, Article 11. Energy and Telecommunications Development Standards §8-2.1103, Small and Large Wind Energy Systems. August 14, 2014. Available online at: https://codelibrary.amlegal.com/codes/yolocounty/latest/yolo/0-0-0-27682#JD_8-2.1103.

3.12 Hydrology and Water Quality

This section identifies and evaluates issues related to hydrology and water quality in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment.

The Central Valley Regional Water Quality Control Board (RWQCB) provided initial input for the County's environmental review process shortly after the CUP application was filed for the Project (RWQCB, 2018a). Later, in response to the issuance of notice of intention to prepare this Draft EIR, the County received scoping input about hydrology- and water quality–related considerations from a variety of sources. All scoping input received, including issues raised pertaining to hydrology and water quality, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

3.12.1 Setting

3.12.1.1 Study Area

The study area considered for this analysis of water resources includes the Project Site, which includes all areas of temporary and permanent disturbance (described in Table 2-1), as well as downstream portions of the waterways intersecting the Project Site and the undefined groundwater basins beneath the Project Site that could be impacted by the proposed construction, operation, and decommissioning activities.

3.12.1.2 Environmental Setting

Climate, Precipitation, and Site Topography

Shasta County is located in a Mediterranean climate, characterized by hot, dry summers and cold winters. Annual precipitation falling in the form of rain and snow measured at Round Mountain (3 miles west of the Project Site) is 63 inches on average (WRCC, 2010). By contrast, the annual average precipitation measured in Burney (approximately 6 miles east of the Project Site) is just 28 inches (WRCC, 2015). Thus, eastern portions of the County, including some eastern locations within the Project Site, are likely to receive considerably less precipitation due to rain shadow effects associated with the mountainous terrain. The Project Site is located in the southern portion of the Cascade Range, in the northern Sacramento River Hydrologic Region. Shasta County is located at the headwaters of California's largest watershed, the Sacramento River Basin. As noted in the County's General Plan, about 6.5 percent of all surface runoff in the state of California originates in Shasta County, amounting to more than one-fourth of the total surface runoff within the Sacramento River system, the state's largest source of domestic and agricultural water supplies (Shasta County, 2004). Elevations within the Project Site range from 3,000 to 6,000 feet above mean sea level.

Surface Water Hydrology

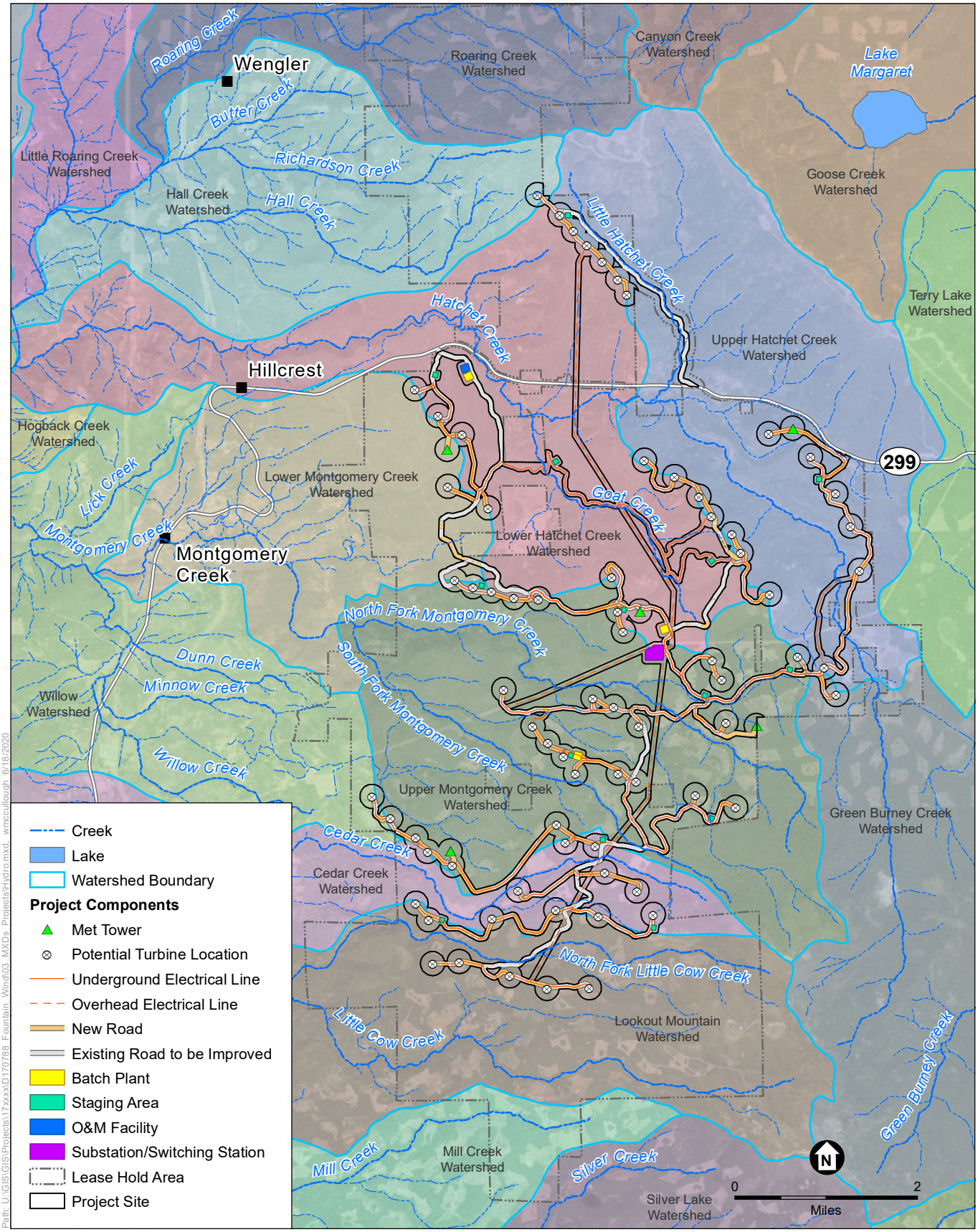
The Project Site is within the Whitmore and Pit River Units of the Sacramento River Hydrologic Region. Waterways in each of these hydrologic units ultimately flow west to the Sacramento River. The lower Pit River watershed drains to the Sacramento River and Lake Shasta (i.e., the confluence of the Pit River and the Sacramento River is within the area inundated by Shasta Dam). Lake Shasta is operated as a surface storage reservoir by the U.S. Bureau of Reclamation, and is managed by the Central Valley Project, as a major water supply resource for the state. **Figure 3.12-1**, *Surface Waters and Hydrology*, depicts the surface waters, watersheds, and hydrology within and surrounding the Project Site. Multiple smaller watersheds span the Project Site including Lower and Upper Hatchet Creek, Lower and Upper Montgomery Creek, Green Burney Creek, and portions of Cedar Creek and Lookout Mountain. Multiple surface waters generally flow from east to west/northwest through the Project Site including Hatchet Creek, Montgomery Creek, Goat Creek, Indian Springs, Willow Creek Cedar Creek, Blue Lake, Little Cow Creek, Mill Creek, Cheddar Creek, Sawdust Creek, and Buffum Creek. In addition to approximately 8 miles of streams and creeks, as well as intermittent streams and other water features, some contributing to approximately 38 acres of wetlands that have been identified within the Project Site. Wetlands and riparian habitats are described in more detail in Section 3.4, *Biological Resources*, and in **Appendix C2**, which contains an Aquatic Resources Survey Report that was prepared for the Project. Due to the local terrain for watersheds in the Project's vicinity, hydrologic conditions for surface waters tend to be flashy in the winter months and dry in the summer, depending on conditions for snowmelt and winter rains.

Water Quality

Surface waters and groundwater in Shasta County have been described as generally having high quality from a drinking water perspective (Shasta County, 2004). Post-fire conditions (such as those following the recent regional fires, described under the heading "Fire History" in Section 3.1.2.1, *Cumulative Scenario*) influence surface water quality, as water flowing through burned areas is likely to carry increased levels of sediment, organic debris, and chemicals (such as residuals from fire suppressants), contributing to degradation of water quality and aquatic resources (Shasta County, 2016). Timber harvesting activities in the region also have affected surface waters through delivery of silt, sediment, and increasing turbidity through runoff. Disturbance processes and effects on hydrology following a forest harvest or wildfire event are emerging areas of research in the region (USGS, 2014).

Groundwater

As described in Section 3.9, *Geology and Soils*, and shown in Figure 3.9-1, *Geologic Units*, the Project Site is underlain by volcanic bedrock. Groundwater basins underlying the Project Site are undefined. The closest defined groundwater basins are Burney Valley Groundwater Basin and Dry Burney Valley Basin beyond the ridge to the east of the Project Site, neither of which is a "medium" or "high-priority" basin or a basin in a condition of critical overdraft regulated under the Sustainable Groundwater Management Act. Groundwater is generally considered to be of high quality throughout most of Shasta County. Depth to groundwater is highly variable, ranging from 5 feet below ground surface to more than 230 feet below ground surface, based on DWR



Fountain Wind Project

Figure 3.12-1
Surface Waters and Hydrology

groundwater well data (DWR, 2020a, 2020b; see also **Appendix I**, which contains a Project-specific Water Supply Assessment).

As noted in Section 3.15, *Utilities and Service Systems*, the Burney Water District is the closest water district to the Project Site. District supplies are sourced from groundwater, and the tap water it provides to its more than 3,000 customers (from that groundwater) complies with federal health-based drinking water standards (Environmental Working Group, 2020). With that said, soil and geologic limitations for septic tanks or on-site wastewater systems, particularly in the eastern portion of the county, have generated concerns about potential groundwater contamination (Shasta County, 2004). To install and operate the onsite septic system proposed to serve the Project's O&M facility, a permit would be required from the County. For analysis of the suitability of on-site soils to support the proposed septic tank use, see Section 3.9, *Geology and Soils*.

Flooding and Inundation Hazards

The Federal Emergency Management Agency (FEMA) has developed mapping of flood hazard risk areas through the National Flood Insurance Program (NFIP). The Project Site is located in Zone X, classified by FEMA as an area of minimal flood hazard (FEMA, 2011). The Project Site is not located in an area subject to tsunamis, seiche or dam inundation. The closest dam to the Project Site is Haynes Reservoir, located approximately 3.3 miles northeast of the Project Site. In the unlikely event of a dam failure, projected inundation would extend north and down gradient, away from the Project Site.

3.12.1.3 Regulatory Setting

Federal

Clean Water Act

Under the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), the U.S. Environmental Protection Agency seeks to restore and maintain the chemical, physical, and biological integrity of the nation's waters by implementing water quality regulations. Multiple CWA sections apply to activities near or within surface water or groundwater.

The federal Antidegradation Policy, established in 1968 under CWA Section 303, is designed to protect existing uses, water quality, and national water resources. The states implement a set of antidegradation measures when evaluating activities that may affect the quality of waters of the United States. Implementing antidegradation measures is integral to the comprehensive protection and enhancement of surface water and groundwater quality.

CWA Section 303(d) requires states to identify water bodies or segments of water bodies that are "impaired." (Impaired water bodies do not meet one or more of the water quality standards established by the state, even after point sources of pollution have been equipped with the minimum required levels of pollution control technology.) A point source is any discernible, confined, and discrete conveyance (e.g., a pipe discharge) of pollutants to a water body from

sources such as industrial facilities or wastewater treatment plants. Including a water body on the Section 303(d) List of Impaired Water Bodies triggers development of a total maximum daily load (TMDL) for that water body and a plan to control the associated pollutant or stressor on the list. The TMDL is the maximum amount of a pollutant/stressor that a water body can assimilate and still meet the water quality standards. Typically, a TMDL is the sum of the allowable loads of a single pollutant from all contributing point and non-point sources. Non-point pollutant sources are those that do not have a single, identifiable discharge point but are rather a combination of many sources. For example, a non-point source can be stormwater runoff from land that contains petroleum from parking lots, pesticides from timber harvesting operations, or sediment from soil erosion.

The regional water quality control plan (referred to as the "basin plan") identifies relevant TMDLs and specifies applicable regulatory requirements, including waste load allocations for entities that have permitted discharges. Once a water body is placed on the list of water quality limited segments, the "Section 303(d) list," the water body remains on the list until a TMDL or alternative approach is adopted and the water quality standards are attained.

The Project Site is under the jurisdiction of Region 5, the Central Valley RWQCB. The RWQCB's Basin Plan, which identifies beneficial uses, impairment statuses, and related requirements for the protection of waterways within and near the Project Site, is discussed further under regional regulations. A list of beneficial uses and impairment statuses of water bodies in the Project area is provided in **Table 3.12-1**.

TABLE 3.12-1
BENEFICIAL USES AND IMPAIRMENT STATUS

Water Body	Beneficial Use(s)	Impairment Status	Pollutants
Pit River (from confluence of N and S forks to Shasta Lake)	Municipal and Domestic Supply (MUN), Agriculture Irrigation and Stock Watering (AG), Industry Power (POW), Cold Freshwater Habitat (COLD), Warm Freshwater Habitat (WARM), Wildlife Habitat (WILD), Water Contact Recreation (REC-1), Noncontact Water Recreation (REC-2)	Impaired; at least one beneficial use is not supported and a TMDL is required.	Nutrients, source unknown; Organic Enrichment/ Low Dissolved Oxygen, source unknown; Temperature, source unknown.
Lower Hatchet Creek	COLD, WARM, WILD, REC-1, REC-2	Not listed as impaired; drains to Hogback Creek	

SOURCE: RWQCB, 2018b.

Section 404 of the CWA authorizes the U.S. Army Corps of Engineers (USACE) to regulate the discharge of dredged or fill material to waters of the U.S., including wetlands (33 USC §1344). USACE evaluates and issues site-specific individual or general (i.e., Nationwide) permits for such discharges. Because, based on a wetlands delineation prepared for the Project, construction would include stream crossings (Appendix C2, *Aquatic Resources Survey Report*), this work would include dredge and fill activity within jurisdictional waters of the U.S. and so would

necessitate a Section 404 permit. As of June 2020, USACE has not asserted a jurisdictional determination confirming whether a Section 404 Nationwide Permit would be required.

Under Section 401 of the CWA, any applicant for a federal license or permit to conduct any activity that may result in any discharge into navigable waters (such as a Section 404 permit) must provide the licensing or permitting agency with a certification that the discharge would comply with the applicable CWA provisions (33 USC §1341). If a federal permit, such as a USACE Section 404 Nationwide Permit for dredge and fill discharges, is required for the Project, then the Applicant would also need to obtain a Section 401 Water Quality Certification from the Central Valley RWQCB prior to construction. An evaluation of on-site wetlands as well as a description of proposed avoidance and minimization measures would be required as part of the permit application.

State

Porter-Cologne Water Quality Control Act

The State of California's Porter-Cologne Water Quality Control Act (Porter-Cologne Act) provides the basis for water quality regulation within California and assigns primary responsibility for the protection and enhancement of water quality to the State Water Resources Control Board (SWRCB) and the nine RWQCBs. Under the Porter-Cologne Act, the SWRCB and RWQCBs also have the responsibility for granting CWA National Pollutant Discharge Elimination System (NPDES) permits and Waste Discharge Requirements (WDRs) for certain point-source and non-point discharges to waters.

The Porter-Cologne Act allows the California SWRCB to adopt statewide Water Quality Control Plans and basin-specific water quality control plans, which serve as the legal, technical, and programmatic basis of water quality regulation statewide or for a particular region. The water quality control plans limit impacts on water quality from a variety of sources. The RWQCB Basin Plan and permit requirements relevant to this Project are described below.

California Fish and Game Code Section 1602

Pursuant to Division 2, Chapter 6, Section 1602 of the State Fish and Game Code, the California Department of Fish and Wildlife (CDFW) regulates diversion obstructions, or alterations to the natural flow or bed, channel, or bank of any river, stream or lake which supports fish or wildlife. According to the Jurisdictional Delineation, there are waters of the state on the Project site that could be subject to CDFW jurisdiction including wetland and riparian vegetation and ephemeral drainages, and perennial waterways (Appendix C2, *Aquatic Resources Survey Report*). Therefore, the Project may be required to apply for a Lake and Streambed Alteration Agreement through CDFW.

California Forest Practice Act

Areas that would be removed from timber production as a result of the Project (such as access roads and a 2-acre buffer around each proposed turbine) would be harvested in accordance with a Timberland Conversion Permit (TCP) and Timber Harvesting Plan (THP) authorization from the California Department of Forestry and Fire Protection (CAL FIRE). The Z'Berg-Nejedly Forest

Practice Act of 1973 (Pub. Res. Code §§4511–4360.2) and its implementing regulations, the Forest Practice Rules (14 Cal. Code Regs. §895 et seq.), govern the management of privately owned forestlands in California, including regarding the construction of watercourse crossings. The following Forest Practice Rules are relevant to the No Project Alternative and the Project's proposed timber harvest activities.

1. Rule 934.5 establishes the following performance standard in connection with waste disposal: "Non-biodegradable refuse, litter, trash, and debris resulting from timber operations, and other activity in connection with the operations shall be disposed of concurrently with the conduct of timber operations" (14 Cal. Code Regs. §934.5).
2. Rule 934.8 establishes performance standards for watercourse crossing facilities on tractor roads (including their planning, construction, maintenance, and removal) (14 Cal. Code Regs. §934.5).
3. Rule 936.2 establishes performance standards for the protection of the beneficial uses of water and riparian functions (14 Cal. Code Regs. §936.2).
4. Rule 936.3 prescribes general limitations near watercourses, lakes, marshes, meadows and other wet areas (14 Cal. Code Regs. §936.3).
5. Rule 936.4 regulates watercourse and lake protection (14 Cal. Code Regs. §936.4).
6. Rule 936.10 regulates domestic water supply protection (14 Cal. Code Regs. §936.10). It says: "(a) When proposed timber operations may threaten to degrade a domestic water supply the Director shall evaluate any mitigations recommended prior to the close of the public comment period (Pub. Res. Code §4582.7) and shall require the adoption of those practices which are feasible and necessary to protect the quality and beneficial use of the supply. (b) The Director may require a post-harvest evaluation of the effectiveness of the mitigations and practices designed to protect the domestic water supply as a condition of plan approval. The Director shall require an evaluation at the request of the California Regional Water Quality Control Board, or any affected water purveyor, if the necessity for the evaluation is supported by substantial evidence in the record. This evidence may include, but is not limited to, potential land failures, accelerated rate of road construction or harvesting within a watershed, concentration or intensity of harvesting activity near streams or springs. The design and implementation of the evaluation shall be done in consultation with the Director, appropriate RWQCB, and THP submitter, and the sufficiency of the information requested by the Director shall be judged in light of reasonableness and practicality."

General Order of Waste Discharge Requirements for Timberland Management Activities on Non-Federal and Federal Lands (Order No. R5-2017-0061)

Activities associated with timber harvest that could affect the quality of waters of the state are required to apply for coverage under General Order Number R5-2017-0061. As analyzed in Section 3.8, *Forestry Resources*, the Project proposes to convert private timberland acreage to a non-timber use; therefore, in addition to a TCP from CAL FIRE, the Project would require WDR coverage under General Order No. R5-2017-0061. Under the order, "timberland management activities" means commercial activities relating to forest management and timberland conversions, including, but not limited to: cutting or removal of timber and other solid wood forest products; construction, reconstruction and maintenance of roads, fuel breaks, firebreaks, watercourse crossings, landings, skid trails, or beds for the falling of trees; fire hazard abatement and fuel

reduction activities; pesticide applications; site preparation that involves disturbance of soil or burning of vegetation following timberland management activities (RWQCB, 2017). Depending on how the proposed timber management activity is categorized (e.g., as having a high or low threat to water quality), avoidance and impact minimization measures, notification for pesticide use, and design safeguards for water crossings may be imposed to protect slopes and waterways.

California Department of Pesticide Regulation

The Department of Pesticide Regulation (DPR) is the California agency responsible for implementing the NPDES Pesticide General Permit requirements. DPR's strict oversight begins with pesticide product evaluation and registration and continues through statewide licensing of commercial applicators, dealers, consultants, and other pesticide professionals; evaluation of health impacts of pesticides through illness surveillance and risk assessment; environmental monitoring of air, water, and soil; field enforcement (with county agricultural commissioners) of laws regulating pesticide use; residue testing of fresh produce; and encouraging development and adoption of least-toxic pest management practices through incentives and grants.

California's Food and Agricultural Code authorizes the state's pesticide regulatory program and mandates it to:

- Provide for the proper, safe, and efficient use of pesticides and protection of public safety.
- Protect the environment from environmentally harmful pesticides by prohibiting, regulating or ensuring proper stewardship of those pesticides.
- Assure agricultural and pest control workers have safe working conditions where pesticides are present.
- Authorize agricultural pest control by competent and responsible licensees and permittees under strict control of DPR and the state's county agricultural commissioners.
- Assure pesticides are properly labeled and appropriate for the use designated by the label, and that state or local governmental dissemination of information on uses of any registered pesticide product is consistent with the uses for which the product is registered.
- Encourage the development and implementation of pest management systems, stressing application of biological and cultural pest control techniques with selective pesticides when necessary to achieve acceptable levels of control with the least possible harm to public health, nontarget organisms, and the environment.

California Safe Drinking Water Act

The California Safe Drinking Water Act of 1996 requires the Office of Environmental Health Hazard Assessment (OEHHA) to develop public health goals for chemical contaminants to drinking water (OEHHA, 2007). Contaminants in herbicide application such as glyphosate (discussed in Section 3.11, *Hazards and Hazardous Materials*) are among the chemicals included as public health goals to prevent pollutants from entering waterways.

Regional

NPDES Construction General Permit

Construction activities disturbing 1 acre or more of land, as proposed for the Project Site, are subject to the permitting requirements of the NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (Construction General Permit, Order 2009-0009-DWQ, NPDES No. CAS000002, as amended by Orders 2010-0014-DWQ and 2012-006-DWQ; SWRCB, 2014) and must apply for Construction General Permit coverage. The permit regulates stormwater discharges from construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects, including the installation of utility lines. This General Permit requires that stormwater discharges and authorized non-stormwater discharges must not contain pollutants that cause or contribute to an exceedance of any applicable water quality objective or water quality standards (identified in the Basin Plan). The Central Valley RWQCB administers and enforces the Construction General Permit throughout Region 5, which includes the Project Site.

For all new projects, applicants must electronically file permit registration documents using the Stormwater Multiple Applications and Report Tracking Systems (SMARTS), and must include a Notice of Intent (NOI), risk assessment, site map, and storm water pollution prevention plan (SWPPP) to be covered by the General Construction Permit prior to beginning construction. The risk assessment and SWPPP must be prepared by a State-Qualified SWPPP Developer (QSD). In addition, the SWPPP must contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

The Construction General Permit requires that construction sites be assigned a risk level of 1 (low), 2 (medium), or 3 (high), based both on the sediment transport risk at the site and the risk to receiving waters during periods of soil exposure (e.g., grading and site stabilization). The sediment risk level reflects the relative amount of sediment that could be discharged to receiving water bodies, and is based on the nature of the construction activities and the location of the site relative to receiving water bodies. The receiving-waters risk level reflects the risk to receiving waters from the sediment discharge. Depending on the risk level, construction projects governed by the Construction General Permit could be subject to the following best management practice requirements (BMPs): Effluent standards; good site management "housekeeping;" non-stormwater management; erosion and sediment controls; run-on and runoff controls; inspection, maintenance, and repair; and monitoring and reporting requirements. Such BMPs are designed to protect surface water quality by preventing eroded soil and construction-related pollutants from migrating off-site from the construction area. Routine inspection of all BMPs is required under the Construction General Permit.

Local

Shasta County General Plan

Multiple elements of the Shasta County General Plan discuss and prioritize considerations of water resources. Water supply, flooding, water quality, erosion, dam safety and inundation are

key areas of hydrological consideration in the General Plan. The following objectives and policies pertain to a consideration of hydrology and water quality (Shasta County, 2004).

5.1 Seismic and Geologic Hazards

***SG-4*:** Protection of waterways from adverse water quality impacts caused by development on highly erodible soils.

***SG-d*:** Shasta County shall develop and maintain standards for erosion and sediment control plans for new land use development. Special attention shall be given to erosion prone hillside areas, including those with extremely erodible soils types such as those evolved from decomposed granite.

5.2 Flood Protection

***FL-2*:** Protection of public health and safety, both on-site and downstream, from flooding through floodplain management which regulates the types of land uses which may locate in the floodplain, prescribes construction designs for floodplain development, and requires mitigation measures for development which would impact the floodplain by increasing runoff quantities.

6.6 Water Resources

***W-9*:** Institute effective measures to protect groundwater quality from potential adverse effects of increased pumping or potential sources of contamination.

***W-a*:** Sedimentation and erosion from proposed developments shall be minimized through grading and hillside development ordinances and other similar safeguards as adopted and implemented by the County.

***W-b*:** Septic systems, waste disposal sites, and other sources of hazardous or polluting materials shall be designed to prevent contamination to streams, creeks, rivers, reservoirs, or groundwater basins in accordance with standards and water resource management plans adopted by the County.

***W-c*:** All proposed land divisions and developments in Shasta County shall have an adequate water supply of a quantity and a quality for the planned uses. Project proponents shall submit sufficient data and reports, when requested, which demonstrate that potential adverse impacts on the existing water users will not be significant. The reports for land divisions shall be submitted to the County for review and acceptance prior to a completeness determination of a tentative map. This policy will not apply to developments in special districts which have committed and documented, in writing, the ability to provide the needed water supply.

3.12.2 Significance Criteria

CEQA Guidelines Appendix G Section X identifies considerations relating to hydrology and water quality. See Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area*, as it relates to the County's analysis of the potential impacts of this Project to the considerations suggested in CEQA Guidelines Appendix G Section X. Otherwise, for purposes of this analysis, a project would result in a significant impact to Hydrology or Water Quality if it would:

a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality;

b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin;

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

   i. Result in substantial erosion or siltation on- or off-site;

   ii. Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;

   iii. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or

   iv. Impede or redirect flood flows; or

d) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

Neither the Project nor alternatives would have any impact relating to flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation. See Section 3.1.4, *Environmental Topics Removed from Consideration*, for details.

3.12.3 Direct and Indirect Effects

3.12.3.1 Methodology

The analysis conservatively assumes that all areas of temporary and permanent disturbance, identified in Table 2-1 would, to varying degrees, alter the hydrology of the Project Site. The analysis includes all phases of the Project: site clearing, construction, operation and maintenance, as well as decommissioning, and associated site reclamation following the anticipated 40-year term of the use permit.

3.12.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality.

Impact 3.12-1: The Project would, unless mitigated, violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality during construction and decommissioning. (*Less than Significant with Mitigation Incorporated*)

Construction

Whether a discharge of waste would adversely affect the quality of the waters of the state depends on various factors including distribution and sensitivity of the beneficial uses of water; presence

of domestic water supplies and aquatic species; proximity of operations to other critical beneficial uses; current water quality conditions including existing TMDL or 303(d) listings; erodible soils and topography; and presence of any post fire landscapes, evaluated against the type and scope of proposed activities.

Construction associated with the Project would be subject to water quality policies and standards identified in the Basin Plan and waste discharge requirements pursuant to RWQCB General Order Number R5-2017-0061 for proposed timber harvest activities. Waste discharge requirements would be implemented, as required, along with their associated compliance conditions, which could include establishing equipment limitation zones near watercourses, installation of and/or protective structures for culverts at stream crossings; and retention of riparian vegetation along waterways and wetlands, and restrictions on pesticide use near water courses, among others. The Project would be constructed in a manner that would minimize hill cuts and other actions that could generate unchecked conditions of erosion, runoff, and associated water quality violations. The Project design would be further refined and ultimately finalized based on conditions of specific permits and other authorizations if the Project is approved.

Beneficial uses of waters in the vicinity of the Project (as identified in the Basin Plan and listed in Table 3.12-1) include municipal water supply, recreation, freshwater and wildlife habitat, among others. Project construction activity would involve soil disturbances that could temporarily generate erosion and/or sedimentation causing exceedances of state or federal water quality standards, or impact beneficial uses for receiving waters. Site clearing, soil disturbance, removal of vegetation, and timber harvesting, and surface water diversions associated with access road construction, and installation of the on-site septic system as well as other construction activities have the potential to substantially degrade surface and groundwater quality within the Project Site. Such effects could extend to the surrounding watersheds.

As detailed in Table 2-1, construction of Project components would include widening and development of access roads; clearing and grading for turbine pads; work footprints for electrical collector systems; substation, O&M building equipment areas and staging areas. Temporary disturbance associated with these activities has been estimated to include an area of up to 1,384 acres. Water quality impacts associated with soil disturbances would vary depending on proximity to waterways, types of disturbances, and impact avoidance and minimization measures intended and implemented to protect surface water and groundwater quality. The Project's internal access/circulation road construction north of SR 299 would be in very close proximity to a 2-mile reach of Little Hatchet Creek. Thus grading activity during construction could result in significant sedimentation of this waterway within the upper Hatchet Creek watershed. The Project would include a relatively high number of turbines within the Upper Montgomery Creek watershed; thus, temporary and permanent impacts associated with construction of turbine pads and access roads would be higher within this watershed than in other watershed areas affected. To reduce direct impacts to waters and wetlands, mitigation measures (such as Mitigation Measure 3.4-15a) would be implemented as described in Section 3.4, *Biological Resources*. This mitigation measure includes specific provisions for marking locations of wetlands, waterways, and wells that could be affected by the Project and procedures for establishing buffers for the protection of aquatic resources.

Consistent with requirements of the Construction General Permit, a SWPPP and a Temporary Erosion and Sediment Control (TESC) plan, containing site-appropriate BMPs consistent with the requirements of the Forest Practice Rules as well as the recommendations of the California Association of Stormwater Quality Agencies (CASQA), would be implemented to limit potential water quality contamination. Temporary and permanent measures would be installed to protect stormwater conveyance infrastructure. Measures could include engineered erosion control devices such as silt fences and straw wattles (along contours) and interceptors at culverts and stormwater inlets to limit delivery of silt, sediment, and stormwater contaminants into receiving waters. The TESC would stipulate appropriate intervals to monitor and adjust BMPs to ensure that measures perform as designed.

Construction activities and other Project phases may involve the transportation, use, or storage of a variety of hazardous materials, that in the absence of appropriate procedures, could compromise the water quality of surface and groundwater. However, as discussed in the Project Description (Section 2.4.8.3, *Hazardous Materials*) and in Section 3.11, *Hazards and Hazardous Materials*, the Project would prepare a Hazardous Materials Business Plan (HMBP) which would include a Spill Prevention Control and Countermeasures Plan (SPCC) prior to construction. The HMBP would include BMPs for the transport, storage, use, and disposal of hazardous materials and waste. The HMBP would also include information regarding construction activities, worker training procedures, and hazardous materials inventory procedures. The Applicant further proposes as part of the Project that all equipment would be maintained in good working condition, and free of leaks; all vehicles would be equipped with drip pans during storage to contain minor spills and drips; no refueling or storage would take place within 100 feet of a drainage channel; spill kits would be located onsite and in vehicles for use in spill response; and crews working with heavy equipment would be trained in spill containment and response.

Even with implementation of a SWPPP, HMBP/SPCC, and associated BMPs, given the Project's location and scale of soil disturbing activities proposed to occur in close proximity to waterways, the Project could violate water quality standards through the contribution of contaminants to waterways during construction. This would be a significant impact. To reduce this potential significant effect on water quality, Mitigation Measure 3.12-1, Water Quality Best Management Practices during Activities in and near Water, would be implemented during construction.

Operation and Maintenance

For purposes of this analysis, permanent disturbance would occur in those areas that would remain cleared and in use throughout Project operations, regardless of whether they are returned to original use after decommissioning. The total area of permanent disturbance for the Project has been estimated to include up to 713 acres of land, as quantified in Table 2-1.

Operation of the Project would include an on-site septic system as part of the O&M Building facility. Unless properly sited, designed and operated, the proposed septic system could degrade surface or groundwater. A Shasta County septic permit and review and clearance from the Shasta County Office of Environmental Health would be required to permit this facility. Adherence to these County permit requirements would ensure that the septic system would have a less-than-significant impact on water quality.

For the Project's operational phase, the Applicant would prepare and implement a HMBP (including operational BMPs) with information about the types of hazardous materials that would be used during operation and maintenance of the Project. The HMBP also would include spill prevention and spill response measures to ensure that in the event of an unlikely release, the area affected is swiftly contained and minimized. Permanent erosion control measures (installed at the time of construction) would be maintained to protect access roads, culverts, and stormwater infrastructure throughout the life of the Project. With implementation of the HMBP, operation and maintenance of the Project would not violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality during construction. A less-than-significant impact would result during this phase of the Project.

Decommissioning

Following the anticipated 40-year term of the requested conditional use permit, the Project's above-ground components would be dismantled and the site would be restored generally to pre-Project conditions. Removal of Project components would include ground disturbance, including to excavate turbine and structure foundations to a depth of approximately 3 feet below grade. The types of equipment and vehicles necessary to decommission the Project would be generally similar to the requirements for construction. In areas where trees and vegetation were removed, replanting would occur. Given the Project's location in close proximity to multiple waterways and proposed activities that would disturb soil and potentially convey contaminants to these waterways, decommissioning of the Project could violate water quality standards. To reduce this potential significant effect to water quality, Mitigation Measure 3.12-1, Water Quality Best Management Practices during Activities in and Near Water, would be implemented during construction and decommissioning.

Mitigation Measure 3.12-1: Water Quality Best Management Practices during Activities in and near Water.

To avoid and/or minimize potential impacts on water quality (and jurisdictional waters) during construction- and decommissioning-related project activities that would be conducted near (i.e., within 50 feet), in, or over waterways, the project contractor shall implement the following standard construction BMPs to prevent releases of hazardous materials and to avoid other potential environmental impacts:

1. In-stream construction shall be scheduled during the summer low-flow season to minimize impacts on aquatic resources. If instream construction takes place during higher flow seasons, the following measures shall be implemented:
    a. Minimize mechanized equipment use below top of bank of streams;
    b. Perform activities in accordance with all permit conditions and best practices; and
    c. Have environmental monitors on-site to monitor instream construction to ensure compliance with permit conditions and best practices.
2. All construction material, wastes, debris, sediment, rubbish, trash, etc., shall be removed from the Project Site daily during construction and decommissioning, and

thoroughly at the completion of each of these phases. Debris shall be transported to an authorized upland disposal area.

3. Consistent with the Project's Hazardous Materials Business Plan (HMBP) and Spill Prevention Control and Countermeasures Plan (SPCC), construction workers shall receive training prior to construction/decommissioning and protective measures shall be implemented to prevent accidental discharges of oils, gasoline, or other hazardous materials to jurisdictional waters during fueling, cleaning, and maintenance of equipment, as outlined in the Project's HMBP. Equipment used to perform construction work on the Project Site shall be maintained in accordance with manufacturers' protocols, and, except in the case of failure or breakdown, equipment maintenance shall be performed off-site. Crews shall check heavy equipment daily for leaks; if a leak is discovered, it shall be immediately contained and use of the equipment shall be suspended until repaired. The source of the leak shall be identified, material shall be cleaned up, and the cleaning materials shall be collected and properly disposed.
4. Vehicles and equipment shall be serviced off-site, or, if on-site service is necessary, in a designated location a minimum distance of 100 feet from drainage channels and other waterways. Fueling locations shall be inspected after fueling to document that no spills have occurred. Any spills shall be cleaned up immediately.

Significance after Mitigation: Less than significant.

Impact 3.12-2: Blasting, if it occurs, could substantially degrade groundwater quality. (*Less than Significant with Mitigation Incorporated*)

As proposed, the Project could include blasting prior to trenching or excavating in rocky areas. If blasting is necessary, the Applicant would prepare a Blasting Plan that identifies the locations where blasting is anticipated to be needed, all applicable regulations governing the activity, the times and distances where explosives would be permitted, and a commitment to notify the County and emergency responders at least 24 hours in advance of blasting. Nonetheless, if it occurs, blasting could result in the release of a regulated or unregulated substance to the groundwater (e.g., by spilling or releasing chemicals from blasting materials) or could result in potential impacts to state or private water supplies by causing the subsurface fracturing of volcanic rock and alteration of hydrological conditions for adjacent aquifers. Blasting also could cause a shaking loose of silt, rock, or other particles that line fracture surfaces in the subsurface and, thereby result in increased turbidity in well water. Should they occur, a significant adverse impact to groundwater would result. As described in Section 3.4, *Biological Resources*, Mitigation Measure 3.4-15a would be implemented, which includes measures to protect aquatic resources. In addition to these measures and to reduce this potentially significant effect, Mitigation Measure 3.12-2, *Best Management Practices for Blasting*, also would be implemented.

Mitigation Measure 3.12-2: Best Management Practices for Blasting.

All activities related to blasting shall follow Best Management Practices (BMPs) to prevent contamination of groundwater including preparing, reviewing and following an approved blasting plan; proper drilling, explosive handing and loading procedures;

observing the entire blasting procedures; evaluating blasting performance; and handling and storage of blasted rock.

(1) ***Blasting Plan.*** Prior to conducting the first blast on the Project Site, the Applicant shall prepare and submit a detailed blasting plan to the Shasta County Department of Resource Management and the Shasta County Sheriff's Department. The blasting plan shall contain a complete description of how explosives will be safely transported and used at the site; evacuation, security and fire prevention procedures; blasting equipment list; and procedures for notification of nearby receptors. The blasting plan shall explain how the Applicant will comply with the requirements of 30 CFR §§816.61 through 816.68 regarding the use of explosives to be consistent with the technical requirements of the statute. Procedures for notification shall include, but not be limited to, the following:

a. At least 30 days before initiation of blasting, the operator shall notify, in writing, all residents or owners of dwellings or other structures located within 0.5-mile of the permit area describing how to request and submit a pre-blasting survey. Notification shall include posting a written notice within the Project Site, and on the County's public website describing how to obtain and submit a pre-blasting survey.

b. A resident or owner of a dwelling or structure within 0.5 mile of any part of the permit area may request a pre-blasting survey. This request shall be made, in writing, directly to the operator or to the regulatory authority, who shall promptly notify the operator. The operator shall promptly conduct a pre-blasting survey of the dwelling or structure and promptly prepare a written report of the survey detailing the results.

c. The operator shall determine the condition of the dwelling or structure and shall document any pre-blasting damage and other physical factors that could reasonably be affected by the blasting. Structures such as pipelines, cables, transmission lines, and cisterns, wells, and other water systems warrant special attention; however, the assessment of these structures may be limited to surface conditions and other readily available data.

d. Prior to finalizing the blasting plan, the County or designated operator shall consult with jurisdictional authorities tasked with protecting waters of the state and implement avoidance and minimization measures, as required by CDFW, USACE, and regional water quality (Section 401) regulatory permits prepared for the Project. Such protective measures shall be included in the blasting plan and/or incorporated by reference.

(2) ***Loading practices.*** The following blast hole loading practices to minimize environmental effects shall be followed:

a. Drilling logs shall be maintained by the driller and communicated directly to the blaster. The logs shall indicate depths and lengths of voids, cavities, and fault zones or other weak zones encountered as well as groundwater conditions.

b. Explosive products shall be managed on-site so that they are either used in the borehole, returned to the delivery vehicle, or placed in secure containers for off-site disposal.

c. Spillage around the borehole shall either be placed in the borehole or cleaned up and returned to an appropriate vehicle for handling or placement in secured containers for off-site disposal.

d. Loaded explosives shall be detonated as soon as possible and shall not be left in the blast holes overnight, unless weather or other documented safety concerns reasonably dictate that detonation should be postponed.

e. Loading equipment shall be cleaned in an area where wastewater can be properly contained and handled in a manner that prevents release of contaminants to the environment.

f. Explosives shall be loaded to maintain good continuity in the column load to promote complete detonation. Industry accepted loading practices for priming, stemming, decking and column rise shall be attended to.

(3) ***Explosive Selection*.** To reduce the potential for groundwater contamination when explosives are used, explosive products shall be selected that (a) are appropriate for site conditions and safe blast execution, and (b) have the appropriate water resistance for the site conditions present to minimize the potential for hazardous effect of the product upon groundwater.

(4) **Prevention of Misfires.** Appropriate practices shall be developed and implemented to prevent misfires.

(5) **Blast Rock Pile Management.** To reduce the potential for contamination, the interaction of blasted rock piles and stormwater shall be managed to prevent contamination of water supply wells or surface water.

Significance after Mitigation: Less than significant.

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b) Whether the Project would substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.

Impact 3.12-3: The Project could decrease groundwater supplies or interfere with groundwater recharge such that the project may impede sustainable groundwater management of the basin. (*Less-than-Significant Impact*)

The Project has the potential to directly and indirectly affect groundwater supplies during construction through use of groundwater for dust suppression and other subsurface disturbances. Direct impacts could include groundwater use potentially placing substantial demands on available supplies. Other considerations raised during the Project's scoping period suggested that alteration to subsurface hydrology could occur with excavation, which could impact groundwater. The Project would require excavation to a depth of 10 to 15 feet to support the turbine pedestals and excavation for a foundation depth of 40 feet to support the Project's microwave tower structure at the switching station. Groundwater levels for wells in the vicinity of the Project's switching station range from 87 to 155 feet below ground surface, so it is unlikely that the depth

of excavation required for construction of the Project would impact these groundwater resources nor alter groundwater flow patterns (DWR, 2020a).

Regarding potential impacts to groundwater supplies, the Project would require up to 49 acre-feet of water for site clearing and construction and 5.6 acre-feet of water per year for operation and maintenance. To put this in context, the Project's annual water requirements for operation and maintenance would be roughly equivalent to annual domestic water use for 22.6 households in California.[1] During both construction and operation and maintenance, water either would be provided from onsite well(s) or would be delivered by a contractor using water trucks from an existing water right. The expected source of offsite water, if used, is the Burney Water District. Because District supplies are sourced from groundwater (Environmental Working Group, 2020), this analysis assumes that all water to supply the Project would come from groundwater. The water supply assessment prepared for the Project (see **Appendix I**) determined that the potential impact of the Project's water demand (with respect to groundwater supply) would be negligible and represents a *de minimis* use of groundwater compared to existing production capacity. Because groundwater basins within Shasta County are not overdrafted, and because the Project's demand, if sourced from the Burney Water District, would represent a small fraction (approximately 7.6 percent) of the overall withdrawal from the Burney Creek Valley Groundwater Basin (estimated to be about 643 acre-feet per year per DWR, 2020c), it is expected that the Project would not substantially decrease groundwater supplies such that the Project could impede sustainable groundwater management of the basin. Therefore, the impact associated with construction would be less than significant.

Operation and Maintenance

Human activity can affect groundwater recharge potential by limiting the percolation of surface water through the ground to an aquifer or by removing water from an aquifer via wells. Here, the Project would increase impervious surfaces or otherwise limit groundwater recharge potential within the Project Site by constructing turbine pads, foundations, roads, and the other components identified in Table 2-1, *Project Components and Disturbance Areas*, that could compact soils or replace soil with concrete so as to preclude percolation of surface waters in the areas where they are proposed. However, given the limited ground surface, and the limited amount of development in the vicinity that would be affected by the Project (see Figure 3.12-1), it is expected that the Project would not interfere substantially with groundwater recharge such that the Project could impede sustainable management of the groundwater basin. Therefore, the impact would be less than significant.

As described in Section 2.4.8, operation and maintenance of the Project would require an estimated 5,000 gallons per day for the 40-year duration of the requested conditional use permit to serve the water needs for the O&M facility and to fill an onsite water tank for emergency fire protection. This limited demand is less intense from year to year than would be generated during construction, and would cause a less-than-significant impact.

[1] This estimate is based on a California per capita average water use of 85 gallons per day, with 2.6 persons per household.

Decommissioning and Site Reclamation

Decommissioning and Site Reclamation would utilize water resources only for fire protection and dust control and would be a temporary demand. For the same reasons discussed in the context of construction, the Project would not have a significant impact on groundwater resources during decommissioning and site reclamation.

Mitigation: None required.

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c) Whether the Project would substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would: i) Result in substantial erosion or siltation on- or off-site; ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite; iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or iv) impede or redirect flood flows.

Impact 3.12-4: The Project would, unless mitigated, substantially increase siltation of waterways or provide substantial additional sources of polluted runoff during construction and decommissioning. (*Less than Significant with Mitigation Incorporated*)

Site Clearing

The Project is designed in a manner to maintain onsite surface drainage patterns to the extent possible. The Project's access roads would be designed to follow natural contours and minimize hill cuts. However, some alteration of contours may be required which could change drainage patterns and result in localized erosion, siltation, and/or runoff. As described in the aquatic resources delineation prepared for the Project, it is anticipated that the construction of the Project would impact wetlands, marshes, intermittent, ephemeral and perennial streams in the survey area. The Project would include clearing of vegetation, tree removal and other soil disturbing activities as summarized in Table 2-1, *Project Components and Disturbance Areas*. Cleared turbine pad sites with 2-acre buffers would be established involving tree removal and replacement with low-growing vegetation. Up to 72 turbines would be installed on constructed spread footing foundations requiring 10-15 feet of subsurface excavation. The Project's construction, at the initiation of site clearing or soil disturbing activities, would require coverage under the Construction General Permit and would include implementation of a SWPPP, and associated BMPs to limit erosion and runoff. Project Site preparation and construction also would be subject to federal and State jurisdiction under Sections 401 and 404 of the federal CWA. Therefore, implementing the Project would require a CWA Section 404 permit from USACE and a Water Quality Certification from the Central Valley RWQCB. Additionally, as described in the regulatory setting, coverage under the General Order for Timber Management Activities would include compliance conditions to limit impacts to surface waters.

Construction

The Project includes improvement (widening) and use of existing logging roads, as well as construction of new graded and graveled access roads, as depicted in Figure 2-5, *Road Network*.

Construction of access roads would alter terrain to enable initial transport of turbine blades and other components. Although roads would be designed and graded to align with the natural contours, and stormwater drainage infrastructure (i.e., upgraded culverts) would be installed to minimize impacts associated with access road construction, soil disturbing activities would have the potential to substantially degrade water quality as sediment and other pollutants could be delivered to waterways through stormwater runoff. Widening of roads, grading, and compaction also could alter drainage patterns and increase the rate and volume of surface runoff.

In addition to access roads, the Project's construction would include construction of pads or foundations for turbines, electrical infrastructure including a substation, operation and maintenance building, METs, parking areas, and other developments to support the overall energy generation facilities. The construction of these Project components would be required to adhere to the SWPPP and TESC, such that erosion control, good housekeeping, and other BMPs would be comprehensively applied as part of construction. As described under question a), the HMBP and SPCC would provide measures to intercept oils, fuels, and other potential contaminants, acting as an effective form of source control during all phases of construction. Similar to impacts identified in question a), with implementation of Mitigation Measure 3.12-1 (Water Quality Best Management Practices during Activities in and near Water) and measures required for the Construction General Permit, the SWPPP, the TESC, and the interception of pollutants through the HMBP and SPCC, impacts would be reduced to less-than-significant levels.

Operation and Maintenance

Access roads, graded and widened as part of the Project, would facilitate long-term maintenance of the Project's wind energy generation facilities. Access roads, as part of these facilities, also would require monitoring and periodic maintenance, such as grading, replacement of gravel for road surfaces. Seasonal monitoring and maintenance of culverts and storm drains also may be required to ensure functionality and limit erosive conditions on site. Culverts at stream crossings would be sized to allow for conveyance of a 100-year storm event without increasing average flow velocity or bed/bank scour potential.

The construction of the turbine pads would introduce new impervious surfaces; however, they would be required to include grading and erosion control requirements in accordance with Shasta County Code, Chapter 12.12 which includes grading requirements (under Section 2, Chapter 15.08.110) for the prevention of sedimentation and damage to off-site property. Pursuant to Section 4, Chapter 15.13.040, a detailed grading and drainage plan also would be required. In addition, these pads, relative to the entire Project Site, would represent a relatively small portion of the site. Therefore, considering the spacing and size, the runoff produced from the pads would be controlled by drainage control improvements and would not concentrate flows such that there would be a substantial increase in erosion, runoff volumes, or flooding potential. Therefore, the proposed increase in impervious surfaces while changing drainage patterns, would not adversely affect receiving waters in water quality, runoff volumes, or impede flood flows. The potential impact would be less than significant.

As noted in Table 2-3, *Hazardous Materials*, herbicides may be utilized for fire safety purposes to control vegetation around Project facilities. Herbicides would be applied in a manner consistent

with product labels, consistent with state (DPR) and federal requirements. See, e.g., Potential impacts of herbicide use to human health are analyzed in Section 3.11, *Hazards and Hazardous Materials*.

Decommissioning

At the conclusion of the Project's term of use, decommissioning would include removal of constructed elements along with some degree of land-disturbing activity. Disturbed areas would be restored to preconstruction conditions (as stated in Section 2.4.7, *Decommissioning and Site Restoration*). Subsurface elements of the project, stormwater drainage facilities would remain on site to ensure that built access roads remain in a condition to allow for appropriately managed drainage.

> **Mitigation Measure 3.12-4:** Implement the water quality best management practices during activities in and near water that would be required by Mitigation Measure 3.12-1.
>
> **Significance after Mitigation:** Less than significant.

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d) Whether the Project would conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

Impact 3.12-5: The Project would, unless mitigated, conflict with implementation of the Central Valley Basin Plan. (*Less than Significant with Mitigation Incorporated*)

The Project Site is not located in a defined groundwater basin, nor is there a groundwater management plan in place or proposed that would be applicable to the Project. With protection measures described as follows, surface and groundwater resources would not become compromised. As discussed in the context of Impact 3.12-1, the Basin Plan identifies numerous beneficial uses of waterways that cross through the Project Site. With implementation of protective erosion control measures defined in the TESC and the SWPPP (as part of the Construction General Permit); source control measures outlined in the HMBP/SPCC; and Mitigation Measure 3.12-1 (Water Quality Best Management Practices during Activities in and near Water) and, if blasting occurs, Mitigation Measure 3.12-2 (Best Management Practices for Blasting), the Project would not conflict with implementation of the Basin Plan.

> **Mitigation Measure 3.12-5a:** Implement the water quality best management practices during activities in and near water that would be required by Mitigation Measure 3.12-1.
>
> **Mitigation Measure 3.12-5b:** Implement the best management practices for blasting that would be required by Mitigation Measure 3.12-2.
>
> **Significance after Mitigation:** Less than significant.

3.12.3.3 PG&E Interconnection Infrastructure

The Project would include interconnection infrastructure as described in Section 2.4.3, *Project Substation, Switching Station and Interconnection Facilities*. Construction and decommissioning of the proposed PG&E infrastructure would require ground disturbance that could affect surface and groundwater, and may require blasting to accommodate rocky terrain. With the implementation of Mitigation Measures Mitigation Measure 3.12-1 (Water Quality Best Management Practices during Activities in and near Water) and Mitigation Measure 3.12-2 (Best Management Practices for Blasting), impacts of the PG&E infrastructure would be less than significant.

3.12.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, no turbines would be erected north of SR 299. Thus, Alternative 1 would avoid all impacts to Little Hatchet Creek and most disturbance-related impacts to the main stem of Hatchet Creek. There would be an overall reduced acreage of temporary and permanent disturbance, limited to a footprint defined in a smaller area with fewer turbines compared to the Project. However, Alternative 1 would still have potentially significant impacts and thus would require implementation of the same mitigation measures to reduce direct and indirect impacts associated with hydrological disturbance and runoff. Consistent with baseline conditions, it is expected that, under Alternative 1, timber harvesting activities would continue to occur in areas north of SR 299, along with the associated disturbance from active forest management of these lands.

Alternative 2: Increased Setbacks

Under Alternative 2, there would be fewer turbines reducing overall temporary (construction-related) and permanent disturbance. However, potential impacts to Little Hatchet Creek and other surface waters and groundwater would be substantially similar to those described for the Project. Alternative 2 would require implementation of the same protective measures and mitigation.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind project infrastructure would be constructed, operated and maintained, or decommissioned on the Project Site. No new roads would be constructed and none of the existing roads would be improved. No stream crossings or other work near surface waters would occur, no grading or other surface preparation work would occur, no wells would be installed, and the existing permeability of on-site soils would remain unchanged. No surface or groundwater would be used for Project purposes. No Project-related vehicles or equipment would be present on the site. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to Hydrology or Water Quality.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect to Hydrology or Water Quality. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.12.4 Cumulative Analysis

The geographic scope of analysis of cumulative effects includes the Project Site, affected waterways, and surrounding watersheds and aquifers potentially impacted by site clearing, construction, operation and maintenance, and decommissioning of the Project. Consideration of the cumulative scenario includes effects of past projects such as legacy land management and timber harvesting within and surrounding the Project Site, as well as current and reasonably foreseeable activities that similar to the Project, have an influence on land contours and hydrological issues across the landscape. This analysis considers the incremental effects of the Project to determine whether, when added to the effects of other projects in the cumulative scenario, would cause or contribute to significant cumulative effects.

The temporal scope of a consideration of incremental construction-related Project effects is assumed to include the initiation of site clearing and soil disturbing activities within the 18- to 24-month time frame for construction (prior to Project operation). The temporal scope for a consideration of operation and maintenance related activities is assumed to be the life of the Project, or the 40-year duration of the requested conditional use permit. This analysis also considers cumulative effects of decommissioning and site restoration for a period of 18 to 24 months.

As described in Section 3.1.2, there are numerous timber management activities and three large-scale projects on Federal lands surrounding the Project, involving tree mortality and removal in response to California's recent drought, climate change, and wildfire conditions. Effects of these activities, though intended for purposes of forest restoration, are likely to include soil disturbance, erosion, hydrological alteration, as well as impacts to water quality for the creeks and streams that cross through the mountainous landscape. Other wind generation development, notably the Hatchet Ridge Wind Project, included alteration of site contours, construction of access routes, erection of wind turbine generators and other soil disturbing activities on a similar scale, with impacts determined to be less than significant with mitigation implemented within 1 mile of the Project Site. \Moreover, scoping comments suggest that the remote location of the proposed site is one that is likely to include cannabis cultivation projects that could impact water quality by introducing pesticides and other contaminants to the watersheds through unregulated methods.

Such projects and associated site alterations and impacts, even those considered to be less than significant, when considered in combination with the Project's potential effects on hydrology and water quality could result in an impact that would be considered cumulatively significant. Because the Project's incremental impacts would be reduced through implementation of various measures to protect waterways and water quality through compliance with water quality standards or waste discharge requirements and best management practices (see Mitigation Measures 3.12-1 and 3.12-2), when considered in combination with the effects of other projects, including presumed projects that employ unregulated hydrology and water quality practices, the Project's incremental contribution to potential significant cumulative effect would not be cumulatively considerable.

3.12.5 References

California Department of Water Resources (DWR), 2020a. Well Completion Report Map Application. Available online at: https://www.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37. Accessed June 23, 2020.

California Office of Environmental Health Hazard Assessment (OEHHA), 2007. Public Health Goals for Chemicals in Drinking Water Glyphosate. Available online at: https://oehha.ca.gov/media/downloads/water/chemicals/phg/glyphg062907.pdf. Accessed April 10, 2020.

Central Valley Regional Water Quality Control Board (RWQCB), 2017. Waste Discharge Requirements for Discharges Related to Timber Management Activities on Non-Federal Lands and Federal Lands Order Number R5-2017-0061. Available online: https://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/general_orders/r5-2017-0061/r5-2017-0061_w_att_a.pdf. Accessed July 2, 2020.

Central Valley RWQCB 2018a. Letter of Dannas J. Berchtold, Engineering Associate, Storm Water and Water Quality Certification Unit, to Bill Walker. February 5, 2018.

Central Valley RWQCB, 2018b. The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region, Fifth Edition. Revised May 2018.

DWR, 2020b. Water Data Library Groundwater Levels for Well 408700N1216500W001. Available online at: https://water.ca.gov/waterdatalibrary/groundwater/hydrographs/brr_hydro.cfm?CFGRIDKEY=46216. Accessed June 17, 2020.

DWR, 2020c. Sustainable Groundwater Management Act, SGMA Basin Prioritization Dashboard. Burney Creek Valley (5-048). Available online at: https://gis.water.ca.gov/app/bp-dashboard/final/#. Accessed June 18, 2020.

Federal Emergency Management Agency (FEMA), 2011. Flood Map Service Center National Flood Hazard Layer FIRMette, Search Unincorporated Shasta County. Available online: https://msc.fema.gov/portal/home. Accessed July 2, 2020.

Environmental Working Group, 2020. Burney Water District. Available online at: https://www.ewg.org/tapwater/system.php?pws=CA4510003. Accessed April 12, 2020.

Shasta County, 2004. Shasta County General Plan. Available online at: https://www.co.shasta.ca.us/index/drm/planning/general-plan. Accessed April 13, 2020.

Shasta County, 2016. Shasta County Communities Wildfire Protection Plan 2016. Available online at: http://www.westernshastarcd.org/Docs/ShastaCWPPs-2016.pdf. Accessed May 22, 2019.

State Water Resources Control Board (SWRCB), 2014. General Permit for Stormwater Discharges Associated with Construction Activity Adopted Order 2009-0009-DWQ (as amended by 2010-0014-DWQ and 2012-0006-DWQ). Available online at: https://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml. Accessed March 18, 2020.

U.S. Geological Survey (USGS), 2014. Climate and Disturbance Impacts on Hydrological Processes. Abstract available online at: https://water.usgs.gov/nrp/climate-disturbance-hydrologic-processes/disturbance-hydrology.html. Accessed March 20, 2020.

Western Regional Climate Center (WRCC), 2010. Period of Record Monthly Climate Summary, Round Mountain, California. Available online at: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca7581. Accessed March 13, 2020.

WRCC, 2015. Period of Record Monthly Climate Summary, Burney, California. Available online at: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca1214. Accessed March 13, 2020.

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3.13 Noise and Vibration

This section identifies and evaluates issues related to Noise and Vibration in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. The information and analysis presented in this section are based in part on data provided in **Appendix G**, *Noise and Vibration*. The County independently reviewed this and other materials prepared by or on behalf of the Applicant and determined them to be suitable for reliance on (in combination with other materials included in the formal record) in the preparation of this EIR.

In response to its notice of intention to prepare this Draft EIR, the County received scoping input about residents in Moose Camp who could be affected by increased noise and vibration during the Project's construction, operation, and maintenance. Comments suggested that noise could result from additional vehicles traveling along the main road proposed between the two substations (which would abut residential property) and along the three roads that surround Moose Camp's fence line, from heavy equipment and from the proposed concrete batch plant; from operation of the turbines (including low-frequency sonic and infrasonic noise caused by the blades combined with the creaking and groaning of the structures) and from operation of the power lines (described in scoping comments as the "hissing sound," "constant buzz" and "sizzle and pop" audible in winter or when it is cold or moist). Vibration, scoping comments suggested, could be caused by operation of the turbines. All scoping input received, including regarding noise and vibration, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

3.13.1 Setting

3.13.1.1 Study Area

The study area for evaluation of noise and vibration impacts from construction and decommissioning activities encompasses the Project Site and the nearest potentially affected sensitive receptors to the proposed work. A maximum potential impact distance of 5,000 feet (approximately 1 mile) without mitigation was established based on maximum noise level potential as described in Section 3.13.3, *Direct and Indirect Effects*. The study area for evaluation of construction vibration impacts was established by considering a worst-case daytime construction vibration level from blasting and the most restrictive threshold applicable to historic structures, which results in a distance of 4,000 feet without mitigation.

The study area for evaluation of operational noise and vibration impacts encompasses the Project Site and receptors up to 2 miles away from proposed turbines as well as receptors within 500 feet of roadways used to access the Project Site based on the attenuation of traffic noise with distance to background levels.

3.13.1.2 Environmental Setting

Technical Background

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the "loudness" of an ambient sound level. Sound pressure level is measured in decibels (dB), with 0 dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies. This method of frequency weighting is referred to as A-weighting and is expressed in units of decibels (dBA).[1] Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements.

Some representative noise sources and their corresponding A-weighted noise levels are shown in **Table 3.13-1**. Alternatively, the *C-weighted sound level (dBC)* also follows the frequency sensitivity of the human ear, but at much higher noise levels. This results in a flatter curve giving more emphasis to low frequency sounds. C-weighting is only used in special cases when low frequency noise is of particular importance.

TABLE 3.13-1
TYPICAL NOISE LEVELS

Noise Level (dBA)	Outdoor Activity	Indoor Activity
90+	Gas lawn mower at 3 feet, jet flyover at 1,000 feet	Rock Band
80-90	Diesel truck at 50 feet	Loud television at 3 feet
70-80	Gas lawn mower at 100 feet, noisy urban area	Garbage disposal at 3 feet, vacuum cleaner at 10 feet
60-70	Commercial area	Normal speech at 3 feet
40-60	Quiet urban daytime, traffic at 300 feet	Large business office, dishwasher next room
20-40	Quiet rural, suburban nighttime	Concert hall (background), library, bedroom at night
10-20	Remote open space	Broadcast / recording studio
0	Lowest threshold of human hearing	Lowest threshold of human hearing

SOURCE: Modified from Caltrans, 2013a

[1] All noise levels reported herein reflect A-weighted decibels unless otherwise stated.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of the noise experienced by the individual over a period of time. A noise level is a measure of noise at a given instant in time. The noise levels presented in Table 4.11-1 represent noise measured at a given instant in time; however, noise levels rarely persist consistently over a long period of time. Rather, community noise varies continuously over time because of the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic and wind. What makes community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration single event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.

These successive additions of sound to the community noise environment varies the community noise level from instant to instant requiring the measurement of noise exposure over a period of time to accurately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: The equivalent sound level is used to describe noise over a specified period of time, typically 1 hour, in terms of a single numerical value. The L_{eq} is the constant sound level, which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

L_{max}: The instantaneous maximum noise level for a specified period of time.

L_{dn}: The Day/Night Average Sound Level is the 24-hour day and night A-weighed noise exposure level, which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night. Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to take into account the greater annoyance from nighttime noise. (Also referred to as "DNL.")

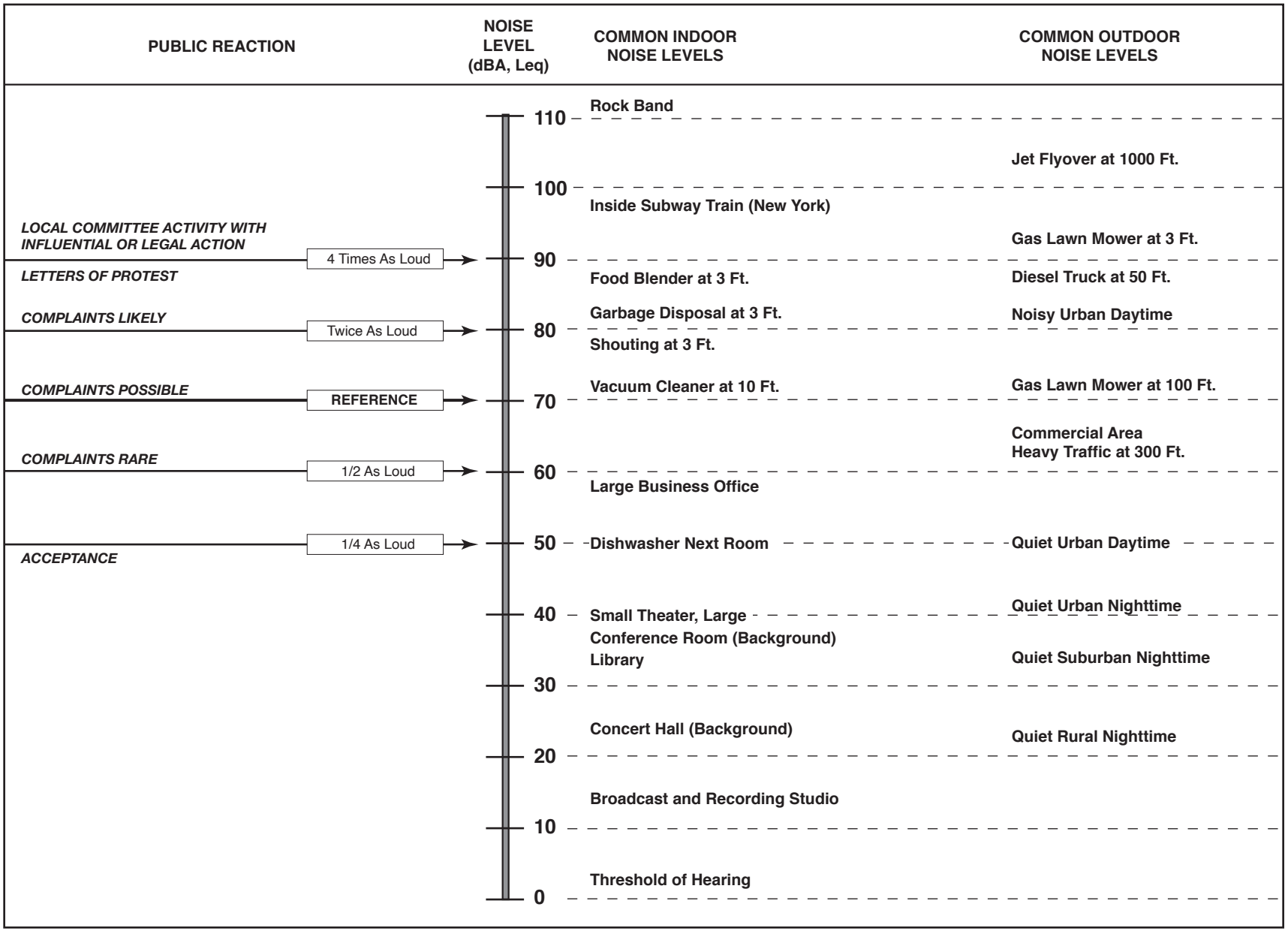
CNEL: Similar to the L_{dn}, the Community Noise Equivalent Level (CNEL) adds a 5-dBA "penalty" for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.

Effects of Noise on People

The effects of noise on people can be placed into three categories:

1. Subjective effects of annoyance, nuisance, dissatisfaction;
2. Interference with activities such as speech, sleep, learning; and
3. Physiological effects such as hearing loss or sudden startling.

Environmental noise typically produces effects in the first two categories (see **Figure 3.13-1**, *Effects of Noise on People*). Workers in industrial plants generally experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction. A wide variation exists in the individual



SOURCE: Caltrans Transportation Laboratory Noise Manual, 1982; and modification by ESA

Fountain Wind

Figure 3.13-1
Effects of Noise on People

thresholds of annoyance, and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so called "ambient noise" level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur (Caltrans, 2013):

- Under controlled conditions in an acoustics laboratory, the trained healthy human ear is able to discern changes in sound levels of 1 dBA.
- Outside these controlled conditions, the trained ear can detect changes of 2 dBA in normal environmental noise.
- It is widely accepted that the average healthy ear, however, can barely perceive changes in the noise level of 3 dBA.
- A change in level of 5 dBA is a readily perceptible increase in noise level.
- A 10 dBA change is recognized as twice as loud as the original source.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a non-linear fashion; hence the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion, rather they combine logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, then the combined sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate of 6 to 7.5 dBA per doubling of distance from the source, depending on the topography of the area and environmental conditions (atmospheric conditions and noise barriers, vegetative or manufactured, etc.). Widely distributed noise, such as a large industrial facility spread over many acres or a street with moving vehicles (known as a "line" source), would typically attenuate at a lower rate, approximately 3 to 4.5 dBA each time the distance doubles from the source, which also depends on environmental conditions (Caltrans, 2009). Noise from large construction sites would exhibit characteristics of both "point" and "line" sources, and attenuation therefore generally will range between 4.5 and 7.5 dBA each time the distance doubles.

Health Effects of Noise

The consequences of exposure of people to excessive noise can include annoyance and disturbance of human activities, and, as a result of, frequent, lengthy, and/or high level exposure, effects on human health. The following discussion is provided so that the health implications of noise exposure are fully understood.

Exposure to high levels of noise can cause permanent hearing impairment. The levels at which noise exposure can lead to hearing loss (140 dB) or pain (120 dB) is a common method of measuring health effects or impacts of noise. The federal Occupational Safety and Health Administration (OSHA) has established an occupational noise exposure program which includes hearing conservation standards for long-term noise exposure. Employers are required to measure noise levels; provide free annual hearing exams, hearing protection, and training; and conduct evaluations of the adequacy of the hearing protection in use where noise environments exceed 85 dBA for an 8-hour daily exposure.

Due to the cessation of U.S. Environmental Protection Agency involvement in the development of noise control guidance related to health impacts and, in the absence of any federal or state regulatory guidance on the health effects of noise outside of workplace exposure, this analysis acknowledges the World Health Organization (WHO) as a noted source of current knowledge regarding the health effects of noise impacts because European nations have continued to study noise and its health effects. According to WHO, sleep disturbance can occur when intermittent interior noise levels reach 45 dBA, particularly if background noise is low. WHO also notes that maintaining noise levels within the recommended levels during the first part of the night is believed to be effective for the ability of people to initially fall asleep (WHO, 1999). Excessive noise during sleep periods can result in difficulty falling asleep, awakenings, and alterations in sleep stages and depth (e.g., a reduction in proportion of rapid eye movement [REM] sleep). Exposure to high levels of noise during sleep can also result in increased blood pressure, increased heart rate, increased finger pulse amplitude, vasoconstriction, changes in respiration, cardiac arrhythmia, and an increase in body movements. Secondary physiological effects of exposure to excessive noise during sleep can occur the following day, including reduced perception of quality sleep, increased fatigue, depressed mood or well-being, and decreased performance of cognitive tasks.

Other potential health effects of noise identified by WHO include decreased performance for complex cognitive tasks, such as reading, attention span, problem solving, and memorization; physiological effects such as hypertension and heart disease (after many years of constant exposure, often by workers, to high noise levels); and hearing impairment (again, generally after long-term occupational exposure, although shorter-term exposure to very high noise levels, for example, exposure several times a year to concert noise at 100 dBA, can also damage hearing). Finally, noise can cause annoyance and can trigger emotional reactions like anger, depression, and anxiety. WHO reports that, during daytime hours, few people are seriously annoyed by activities with noise levels at or below 55 dBA.

In 2019, the Health Officer of San Diego County produced a Position Statement regarding the potential health impacts of wind turbines, including potential health impacts from noise (County of San Diego, 2019). The Position Statement acknowledges that noise from wind turbines may cause annoyance and that annoyance is subjectively experienced by a minority of people. Following a comprehensive literature review of studies of the impacts of noise from wind turbines, San Diego County's 2019 Position Statement concludes that "the weight of the evidence suggests that, when sited properly, wind turbines are not related to adverse health effects."

Vehicle traffic and continuous sources of machinery and mechanical noise contribute to ambient noise levels. Short-term noise sources, such as truck backup beepers, the crashing of material being loaded or unloaded, contribute very little to 24-hour noise levels but are capable of causing sleep disturbance and annoyance. The importance of noise to receptors depends on both time and context. For example, long-term high noise levels from large traffic volumes can make conversation at a normal voice level difficult or impossible, while short-term peak noise levels, if they occur at night, can disturb sleep.

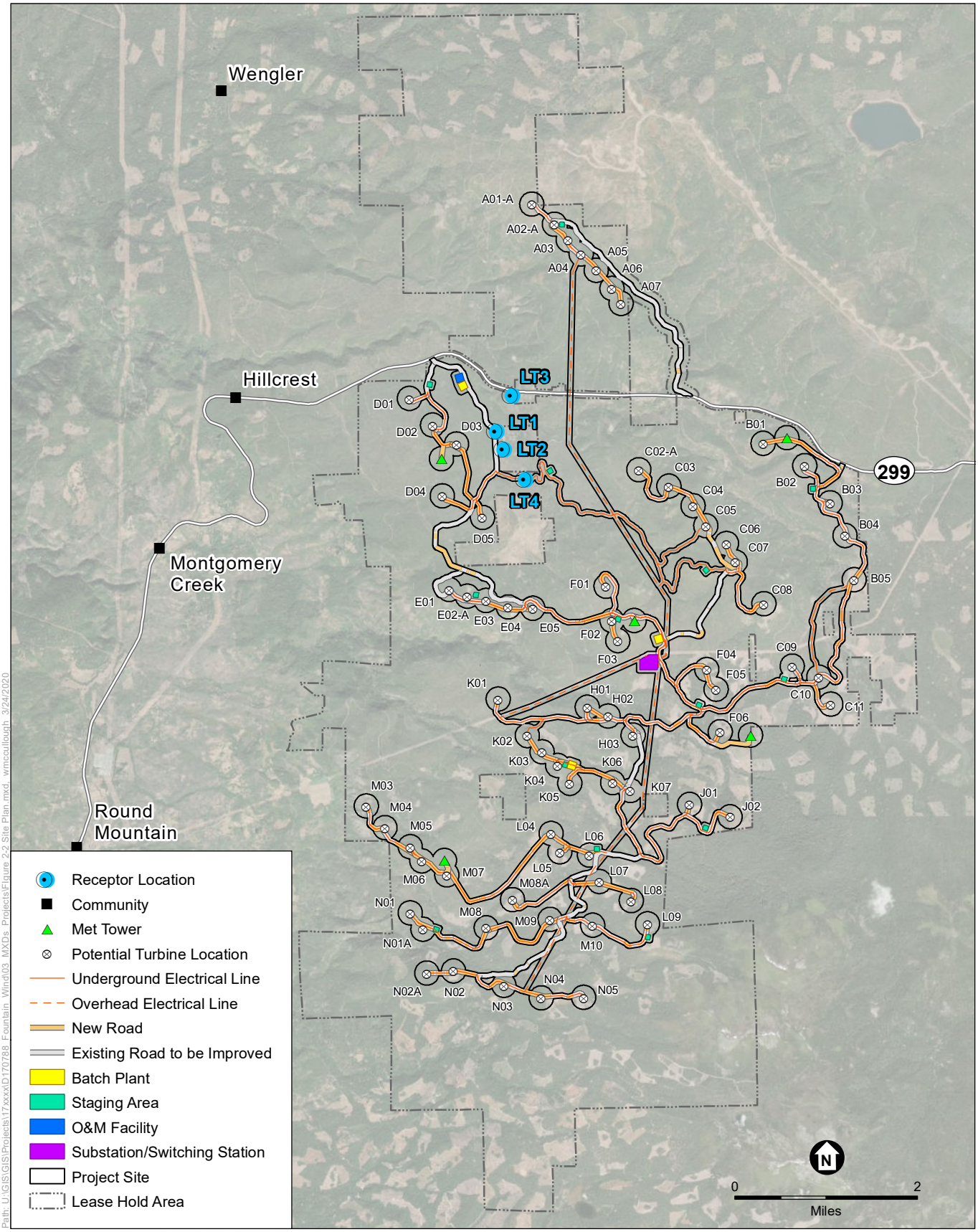
Noise Sources and Levels

The Project Site is located in an unincorporated area of eastern Shasta County, approximately 1 mile west of the existing Hatchet Ridge Wind Project and 6 miles west of Burney. State Route (SR) 299 bisects the Project Site. The private recreational facility and community of Moose Camp is located south of SR 299 and is surrounded by the Project Site. Other surrounding lands are privately owned; many are used for timber harvesting purposes.

Traffic on SR 299 is the primary noise source in the vicinity of the roadway. In areas further from SR 299, the noise environment is primarily comprised of natural sounds, such as wind rustling the leaves of foliage, insects, and birds. The existing noise environment in the area can be characterized by its population density, as population density and ambient noise levels tend to be closely correlated. Areas that are not urbanized are relatively quiet, while areas that are more urbanized are subjected to higher noise levels associated with roadway traffic, industrial activities, and other human activities.

To characterize the noise environment within the Project Site and surrounding area, long-term (24 hours per day over a period of 8 days) noise monitoring was conducted as part of the noise technical report (presented in Appendix G). Long-term noise monitoring was conducted at residential receptor locations nearest to the Project Site in the community of Moose Camp.

Long-term, unattended noise measurements were collected at four locations in the vicinity of the Project Site at locations indicated as LT-1, LT-2, LT- 3, and LT-4 in **Figure 3.13-2**, *Noise Measurement Locations*. Measurements were conducted over an 8-day period from Sunday, August 19, 2018, to Monday, August 27, 2018. The monitoring locations were selected to represent the closest residences to construction/decommissioning and operational elements of the Project. Sites LT-1, LT-2, and LT-3 were selected at distances of about 100 feet from the closest residences, in the worst-case location relative to the proposed turbines. Due to the inaccessibility of the residence to the south (represented by LT-4), measurements were not attempted on this property, but rather were taken adjacently, to be representative of the residence. The long-term noise levels were measured with Larson-Davis 820 Type 1 sound level meters calibrated before and after the surveys. **Table 3.13-2** presents a summary of the noise data collected during the noise monitoring effort.



SOURCE: Stantec

Fountain Wind Project

Figure 3.13-2
Noise Measurement Locations

TABLE 3.13-2
MONITORED NOISE ENVIRONMENTS WITHIN THE PROJECT AREA

Location	Time Period	Hourly L_{eq}		L_{dn}, dBA
		Average, dBA	Range, dBA	
LT-1	Daytime	40	28-49	43-45
	Nighttime	36	32-45	
LT-2	Daytime	38	28-50	42-44
	Nighttime	34	28-42	
LT-3	Daytime	47	39-53	53-54
	Nighttime	46	40-53	
LT-4	Daytime	42	38-49	47-50
	Nighttime	42	38-48	

Ambient noise levels in Table 3.13-2 are presented in the hourly L_{eq} as this is the primary metric utilized in Shasta County noise regulations. As indicated in the data, there is considerable variation in noise levels between test days and times of day at each site. The average hourly L_{eq} values for the daytime hours (7:00 a.m. to 10:00 p.m.) and the nighttime hours (10:00 p.m. to 7:00 a.m.) are shown in Table 3.13-2 along with the average L_{dn} levels for each long-term measurement. At all sites and on all measurement days, noise levels increased substantially (15 to 20 dB) around 8:00 p.m. and then dropped off slowly between 8:00 p.m. and 11:00 p.m. These elevated noise levels occurring between approximately 7:00 p.m. and 11:00 p.m. are thought to be attributable to insects and other natural sounds.

Monitored daytime noise levels were about 4 dBA greater than nighttime noise levels at locations LT-1 and LT-2, but were similar between daytime and nighttime periods at LT-3 and LT-4. The noise environment at LT-1, LT-2, and LT-4 is primarily comprised of natural sounds, such as wind rustling the leaves of foliage, insects, and birds, and vehicular traffic on local logging roads. Noise from occasional traffic on SR 299 is the primary noise source at LT-3, along with evening insect noise.

Infrasound

Scoping comments enquired about and suggested potential impacts of infrasound (i.e., sound waves with frequencies below the lower limit of 20 Hz) and the potential it may have to cause neurological and physiological disorders resulting in feelings of sea sickness, annoyance, fatigue, pressure or tinnitus (ear ringing), sleep disturbance or sleeplessness, headaches, or vibroacoustic disease (Appendix J).

The two aspects of sound that allow for its recognition and perception are frequency or pitch (measured in Hz), and pressure or loudness (measured in dB). Wind turbines make mechanical sounds from their component parts (e.g., the gearbox) and aerodynamic sound (e.g., from air flow around the blades and turbine tower), which is variable and depends on atmospheric and other conditions (Roberts and Roberts, 2013). “Infrasound” is generally inaudible sound with a frequency of less than 20 Hz, which is the “normal” limit of human hearing. Because hearing

becomes gradually less sensitive as frequency decreases, the sound pressure must be sufficiently high for humans to perceive infrasound.

Vibration Background

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Several different methods are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe physical vibration impacts on buildings. Typically, groundborne vibration generated by human activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors to vibration include people (especially residents, the elderly, and sick people), structures (especially older masonry structures), and vibration-sensitive equipment.

Another useful vibration descriptor is known as vibration decibels or VdB. VdB generally are used when evaluating human response to vibration, as opposed to structural damage (for which PPV is the more commonly used descriptor). Vibration decibels are established relative to a reference quantity, typically 1 x 10^{-6} inches per second (FTA, 2018). There are no substantial existing sources of vibration in the study area.

Human Annoyance from Vibration

Caltrans has published and developed a summary of criteria relating to human perception that correlates the potential for perception and annoyance from groundborne vibration. Such human responses are dependent on whether a vibration source is continuous or transient. Transient sources create a single isolated vibration event, such as blasting. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, vibratory pile drivers, and vibratory compaction equipment. **Table 3.13-3** presents a summary of human response to vibration for both continuous and transient sources.

TABLE 3.13-3
HUMAN ANNOYANCE AND BUILDING DAMAGE POTENTIAL FROM VIBRATION

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure.
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected.
0.1	Strongly perceptible	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings.
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures.
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures.

SOURCE: Caltrans, 2013b

Blasting-Induced Vibration

When explosive charges are detonated in rock, the blast has been designed so that most of the energy is used in breaking and displacing the rock mass. However, some of the energy also can be released in the form of transient stress waves, which in turn cause temporary ground vibration. Detonating charges also create rock movement and the release of high-pressure gas, which in turn, induces air-overpressure (blast noise).

The average person is quite sensitive to ground motion, and vibration levels as low as 0.01 inches/second (in/sec) can be detected by the human body. Frequency of motion or cycles per second is a measure of how many times a particle of ground moves back and forth (or up and down) in 1 second. Frequency is expressed in units of Hz.

Noise from blasting or "blast noise" is composed primarily of sound pressures at frequencies below the threshold-of-hearing for humans (16 to 20 Hz). Hence, the common industry term for blast-induced noise is "air-overpressure." As its name implies, air-overpressure is a measure of the transient pressure changes above and below ambient atmospheric pressure.

Air-overpressure measurements are typically expressed in dB units, and when the scale is linear, the unit designation is "dB(L)." Regular acoustical noise measurements taken for the purpose of monitoring compliance with local noise ordinances almost always use weighted scales that discriminate against low frequency noise. Thus, for a similar noise source, A-weighted and C-weighted scales will usually record significantly lower levels of noise.

The regulatory limit defined by the former U.S. Department of the Interior, Bureau of Mines (U.S. Bureau of Mines) for air-overpressure measured with 2-Hz response seismographs is 133 dB(L) (USDI, 2000). Damage to old or poorly glazed windows does not occur until air-overpressure reaches approximately 150 dB(L). Because the decibel scale is a logarithmic ratio, the actual overpressure at the 133 dB(L) limit, is over seven times lower than the threshold damage level at 150 dB(L).

When blasting occurs at large distances from sensitive structures, the primary concern is damage to structures. Structural damage can be classified as cosmetic, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3.13-3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from "Historic and some old buildings" to "Modern industrial/commercial buildings." Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

The annoyance levels shown in Table 3.13-3 should be interpreted with care since vibration may be found to be annoying at lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of

perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to an elevated human reaction, even though there is very little risk of actual structural damage.

Sensitive Receptors

Human response to noise varies considerably from one individual to another. Effects of noise at various levels can include interference with sleep, concentration, and communication; physiological and psychological stress; and hearing loss. Given these effects, some land uses are considered more sensitive to ambient noise levels than others. In general, residences, schools, hotels, hospitals, and nursing homes are considered to be the most sensitive to noise. Commercial and industrial uses are considered the least noise-sensitive. The primary sensitive receptors near the Project Site are residential dwellings in the private Moose Camp recreational area (Figure 3.13-2). The closest residences are located about 2,200 feet from the nearest proposed turbines and more than 2,000 feet from the proposed transmission lines, Roadway construction activities could occur as close as 580 feet from receptor LT-2, the nearest residence. The closest residence to the west access road (represented by LT-1) is located about 300 feet from the center of the road. The closest existing residential areas to the proposed substation location are 1.5 miles to the northwest and southwest.

3.13.1.3 Regulatory Setting

Federal

There are no federal plans, policies, regulations, or laws related to noise that are directly applicable to the Project. However, guidelines have been established to address the potential for groundborne vibration to cause structural damage to buildings. For fragile structures, a maximum limit of 0.25 in/sec PPV is recommended (FTA, 2018).

State

The State of California General Plan Guidelines, published by the Governor's Office of Planning and Research, provide guidance for evaluating the compatibility of a given noise environment for proposed land uses. These land use compatibility standards are developed in terms of the CNEL/L_{dn} metric. Generally, residential uses are considered acceptable in areas where exterior noise levels do not exceed 60 dBA CNEL/L_{dn}. Hospitals are normally acceptable in areas up to 70 dBA CNEL/L_{dn} and normally unacceptable in areas exceeding 70 dBA CNEL/L_{dn}. The guidelines also present adjustment factors that may be used to arrive at noise-acceptability standards reflecting the particular community's noise-control goals, noise sensitivity, and assessment of the relative importance of noise issues.

With respect to vibration, Caltrans recommends use of thresholds that consider the human response to vibration for both continuous and transient sources shown above in Table 3.13-3.

Local

Shasta County General Plan

The Noise Element of the Shasta County General Plan establishes Objective N-1 to protect County residents from the harmful and annoying effects of exposure to excessive noise. The General Plan considers siting of new residential land uses to be "generally acceptable" in noise environments of 60 dBA L_{dn} or less and "conditionally acceptable" in noise environments between 60 to 70 dBA L_{dn}.

Specific policies of the Noise Element that apply to the Project are summarized below:

> **Policy N-b:** Noise likely to be created by a proposed non-transportation land use shall be mitigated so as not to exceed the noise level standards of an hourly L_{eq} of 55 dBA during daytime hours (7 a.m. to 10 p.m.) and 50 dBA during nighttime hours (10 p.m. to 7 a.m.) as measured immediately within the property line of adjacent lands designated as noise-sensitive.
>
> The noise levels specified above shall be lowered by 5 dB for simple tone noises[2], noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings). The County can impose noise level standards, which are more restrictive than those specified above based upon determination of existing low ambient noise levels.
>
> In rural areas where large lots exist, the exterior noise level standard shall be applied at a point 100 feet away from the residence. Industrial, light industrial, commercial, and public service facilities which have the potential for producing objectionable noise levels at nearby noise-sensitive uses are dispersed throughout the County. Fixed-noise sources which are typically of concern include, but are not limited to, the following: HVAC Systems; Pump stations, emergency generators, steam valves, generators, air compressors, conveyor systems, pile drivers, drill rigs, welders, outdoor speakers, cooling towers/evaporative condensers, lift stations, boilers, steam turbines, fans, heavy equipment, transformers, grinders, gas or diesel motors, cutting equipment and blowers. The types of uses which may typically produce the noise sources described above include, but are not limited to: industrial facilities including lumber mills, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, public works projects, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, and athletic fields. For the purposes of the Noise Element, transportation noise sources are defined as traffic on public roadways, railroad line operations, and aircraft in flight. Control of noise from these sources is preempted by Federal and State regulations. Other noise sources are presumed to be subject to local regulations, such as a noise control ordinance. Non-transportation noise sources may include industrial operations, outdoor recreation facilities, HVAC units, loading docks, etc.
>
> **Policy N-c:** Where proposed non-residential land uses are likely to produce noise levels exceeding the performance standards of Policy N-b upon existing or planned noise-sensitive uses, an acoustical analysis shall be required as part of the environmental review process so that appropriate noise mitigation may be included in the project design. The requirements for the content of an acoustical analysis are:

[2] Tone, in acoustics, is sound that can be recognized by its regularity of vibration. A simple tone has only one frequency, although its intensity may vary. Because wind turbines generate sound across a spectrum of frequencies, they would not be considered to generate simple tone noise.

A. Be the financial responsibility of the applicant.

B. Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.

C. Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions and the predominant noise sources.

D. Estimate existing and projected cumulative (20 years) noise levels in terms of L_{dn} or CNEL and/or the standards of [General Plan] Table I, and compare those levels to the adopted policies of the Noise Element.

E. Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element, giving preference to proper site planning and design over mitigation measures which require the construction of noise barriers or structural modifications to buildings which contain noise-sensitive land uses.

F. Estimate the noise exposure after the prescribed mitigation measures have been implemented.

G. Describe a post-project assessment program which could be used to evaluate the effectiveness of the proposed mitigation measures.

Policy N-g: Existing noise-sensitive uses may be exposed to increased noise levels due to future roadway improvement projects as a result of increased traffic capacity and volumes and increases in travel speeds. In these instances, it may not be practical to reduce increased traffic noise levels consistent with those applicable to residential land uses which are specified to be 60 dBA, L_{dn} for outdoor activity areas and 45 dBA, L_{dn} for interior spaces. Therefore, as an alternative, the following criteria may be used as a test of significance for increases in the ambient outdoor activity areas of the noise level of noise-sensitive uses created as a result of a new roadway improvement project:

- Where existing traffic noise levels are less than 60 dB L_{dn}, a +5 dB L_{dn} increase will be considered significant.
- Where existing traffic noise levels range between 60 and 65 dB L_{dn}, a +3 dB L_{dn} increase will be considered significant.
- Where existing traffic noise levels are greater than 65 dB L_{dn}, a + 1.5 dB L_{dn} increase will be considered significant.

Policy N-i: Where noise mitigation measures are required to achieve the standards of Policies N-b and N-g, the emphasis of such measures shall be placed upon site planning and project design. The use of noise barriers shall be considered a means of achieving compliance with the noise standards only after all other practical design-related noise mitigation measures have been integrated into the project.

Shasta County Code

Section 17.88.035 of the Shasta County Code addresses small wind energy systems and allows for them to be permitted with an approved administrative permit, subject to specific requirements, including the noise restrictions of the General Plan Noise Element. Because the Project would not meet the specified requirements defining a “small” wind energy system, this section of the code is not applicable to the Project. The Shasta County Code does not establish quantitative noise

standards and defers to the standards contained within the Shasta County General Plan Noise Element.

3.13.2 Significance Criteria

CEQA Guidelines Appendix G Section XIII identifies considerations relating to noise. See Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area*, as it relates to the County's analysis of the potential noise impacts of this Project. Otherwise, for purposes of this analysis, a project would result in a significant impact to noise or vibration if it would result in:

a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies; or

b) Generation of excessive groundborne vibration or groundborne noise levels.

Criterion a) examines whether project construction and/or operations would generate noise in excess of established noise standards, which are assessed for stationary, mobile, and construction noise sources. The evaluation of the Project relative to this criterion focuses first on contributions in ambient noise levels from stationary sources during Project operation and their relationship to the standards of General Plan Policy N-b. A significant noise impact would be identified if Project stationary sources would result in a noise level that would exceed 55 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.)

Additionally, a noise impact would be identified if operational traffic noise generated specifically by roadway improvements of the Project[3] would substantially increase noise levels at sensitive receivers in the vicinity. Shasta County General Plan Policy N-g defines noise level increases of 5 dB L_{dn} where existing traffic noise levels are less than 60 dB L_{dn}, where existing traffic noise levels range between 60 and 65 dB L_{dn}, a 3 dB L_{dn} increase would be significant and where existing traffic noise levels are greater than 65 dB L_{dn}, a 1.5 dB L_{dn} increase would be significant.

Assessment of operational low frequency noise impacts from turbines applies a threshold for concern for low frequency noise. A significant impact would occur if the C-weighted level exceeds the A-weighted level by 20 dB or more (as applied in the Project-specific traffic study included in **Appendix**) or if the 1/3rd octave band thresholds discussed in Section 3.13.3.1, *Methodology*, are exceeded (Kern County, 2006).

The contribution of the Project to localized increases in traffic-generated noise along roadways improved as part of the Project or roadways used to access the Project Site is considered relative to published measures of substantial increase in transportation noise, as defined General Plan Policy N-g.

[3] No offsite roadway improvements are proposed as part of the Project. Therefore, this analysis pertains only to operational traffic on roads proposed for improvement within the Project Site.

Neither Shasta County nor the State of California specifies a quantitative threshold of significance for the impact of temporary increases in noise due to construction. In lieu of any regulatory guidance, this evaluation uses speech interference as an indicator that construction noise could cause a substantial adverse impact on daytime and evening activities, and sleep interference as an indicator that construction noise could cause a substantial adverse impact on nighttime activities. The speech and sleep interference criteria are based on objective research of speech and sleep interference (as opposed to subjective surveys of annoyance) and can be used to evaluate a project's noise impacts. The speech and sleep interference criteria used in this EIR are defined below:

- **Speech Interference.** A speech interference threshold, in the context of impact duration and time of day, is used to identify substantial increases in noise from temporary construction activities. This analysis assumes noise peaks generated by construction equipment could result in speech interference in adjacent buildings if the noise level in the interior of the buildings exceeds 45 dBA. A typical building can reduce noise levels by approximately 25 dBA with the windows closed[4] (USEPA, 1974). This noise reduction could be maintained only on a temporary basis in some cases, since it assumes windows must remain closed at all times. Assuming a 25 dBA reduction with the windows closed, an exterior noise level of 70 dBA L_{eq} would maintain an acceptable interior noise environment of 45 dBA during the day and evening hours. Noise levels would vary depending on the phase of construction and the types of construction equipment being used.

  In addition to the decibel level of noise, the duration of exposure at any given noise-sensitive receptor is an important factor in determining an impact's significance. Generally, temporary construction noise that occurs during the day for a relatively short period of time would not be significant because most people of average sensitivity who live in suburban or rural agricultural environments are accustomed to a certain amount of construction activity or heavy equipment noise from time to time. The loudest construction-related noise levels would be sporadic rather than continuous because different types of construction equipment would be used throughout the construction process. Therefore, an exterior noise level that exceeds 70 dBA L_{eq} during the daytime is used as the threshold for substantial construction noise where the duration of construction noise exceeds two weeks.

- **Sleep Interference.** Based on available sleep data, an interior nighttime level of 35 dBA is considered acceptable for sleeping (USEPA, 1974). Assuming a 25 dBA reduction with the windows closed, an exterior noise level of 60 dBA would maintain an acceptable interior noise environment of 35 dBA at night. Therefore, a significant impact would occur if the proposed project were to generate exterior noise levels above the 60 dBA L_{eq} sleep interference threshold for one or more nights.

Construction-related vibration from potential blasting activities are assessed based on available reference monitoring data from blasting activities and the California Department of Transportation's recommended vibration limits to avoid structural damage of nearby structures.

[4] Because these estimates were developed in 1974, it is reasonably assumed that older single-paned windows were considered in these attenuation estimates and that greater reductions could be realized with more modern double-paned windows.

3.13.3 Direct and Indirect Effects

3.13.3.1 Methodology

The information and analysis presented in this section are (as noted above) based in part on data provided in Appendix G. The study area for evaluation of noise and vibration impacts from construction consists of a distance of 5,000 feet (approximately 1 mile) without mitigation for the reasons explained in Section 3.13.1.1, *Study Area*.

Stationary Source Operational Noise Impacts

Noise Assessment for Wind Turbines

Shasta County regulations do not specifically address the operational characteristics of large-scale wind turbines. Wind turbines only operate when the wind exceeds a "cut-in" speed, which is typically about 4 meters/second (8.9 miles/hour [mph]). As a result, they do not produce noise continuously. For Shasta County, the noise limits established in Policy N-b of the Noise Element are interpreted to be not-to-exceed levels, or essentially steady-state levels. Because wind turbines may operate day or night, the nighttime limit (50 dBA as measured immediately within the property line of adjacent lands designated as noise-sensitive) is considered as the appropriate level with which to compare the estimated noise levels produced by the Project. As explained in Section 3.13.1.3, the proposed turbines would operate at multiple frequencies and would not generate simple tone noises,[5] nor would their noise consist of speech or music, or recurring impulsive noises. Therefore, no additional adjustments to these standards are required. As shown in Table 3.13-2, hourly average noise levels can reach 50 dBA at the nearest receptors and imposition of noise level standards more restrictive than those specified above would not be warranted.

The closest residences are located approximately 2,200 feet from the nearest turbine sites. Given the long propagation distances and mountainous terrain between the turbines and the closest receptors, turbine sound would be subject to additional attenuation by shielding from intervening terrain, atmospheric absorption, and ground absorption. Three-dimensional modeling (using SoundPLAN Version 8.1) was conducted to account for topography, atmospheric and ground absorption, and the spectral characteristics of the noise sources. Neutral environmental conditions are assessed for CEQA purposes (i.e., no wind or temperature gradients). Turbines would be unlikely to operate during temperature gradients, such as an inversion, which occur during periods of atmospheric stability.[6] The model was run assuming a worst-case condition with simultaneous operation of all wind turbines.

5 Tone, in acoustics, is sound that can be recognized by its regularity of vibration. A simple tone has only one frequency, although its intensity may vary. Because wind turbine generate sound across a spectrum of frequencies, they would not be considered to generate simple tone noise.

6 An air temperature inversion is a reversal of the typical daytime air temperature in the layer of atmosphere closest to the ground. Usually, the temperature of the air during the day decreases as altitude increases. However, with the presence of an atmospheric inversion, there is an increase of air temperature with the increase in altitude, meaning there is warmer, lighter air aloft with a cooler, heavier layer of air next to the ground. When there is little to no wind present, these two air masses will not mix, resulting in a distinct temperature inversion.

Infrasonic Turbine Noise

Neither the State of California nor Shasta County specifically address low frequency noise and infrasonic noise from wind energy or other projects. However, low frequency noise and infrasonic noise from wind energy projects should be explored as part of a complete noise assessment (Waye, 2009). Other criteria can be considered to determine if the Project would exhibit high infrasonic noise generation potential. In general, low frequency noise has been associated with older generation, downwind turbines. For these older turbines, the wake of the tower interacts with the passing blades to generate pulses at the rate the blades pass the tower. Low frequency noise typically is minimized with upwind turbines. Objective sound pressure level guidelines have been inferred from several different sources as described below.

One source of low frequency criteria is the Alameda County Standard Conditions of Permit Approval for Windfarms (Alameda County, 1998). This document uses 70 dBC L_{dn} as the threshold for considering "reasonable complaints." Another source of low frequency criteria within the state is the Kern County Code (Kern County, 2006). Under these criteria, the low frequency noise levels at 50 feet from a residence are given below for 1/3 octave bands centered at 2 to 125 Hz as shown in **Table 3.13-4**. In the infrasonic range (below 20 Hz), the Table 3.13-4 criteria are actually lower than the established threshold of hearing at each frequency by 18 to 37 dB (USEPA, 1973). As a result, achieving the values shown for the Kern County criteria would assure that any infrasonic noise generated by the Project would be sufficiently low in level to avoid any noise impact.

TABLE 3.13-4
KERN COUNTY LOW FREQUENCY NOISE CRITERIA

1/3 Octave Band Center Frequency, Hz	Noise Level Limit, dB
2 to 16	70
20	68
25	67
31.5	65
40	62
50	60
63	57
80	55
100	52
125	50

SOURCE: Kern County, 2006

Onsite Collector Substation and Switching Station Noise

An onsite collector substation and switching station (substation) would increase the voltage of the electricity from the collection system to match the voltage of the existing PG&E line that would transmit the electricity from the Project Site. The basic elements of the substation facilities include a control house, a bank of one or two main transformers, outdoor breakers, capacitor banks, relaying equipment, high-voltage bus work, steel support structures, an underground grounding grid, and overhead lightning-suppression conductors. The primary operational noise sources proposed at the substation are anticipated to be transformers.

Noise impacts from the substation were estimated using reference noise levels for transformers, the number of transformers proposed, and equations predicting unobstructed noise attenuation with distance. Predicted noise levels are then compared to the noise limits established in Policy N-b of the County's General Plan Noise Element.

Corona Noise

The Project would include overhead collector lines at 34.5 kV and a transmission line at 230 kV to match the voltage of the existing PG&E 230 kV line. The short 230 kV line interconnection to the existing PG&E electricity grid system would be installed from the substation. The 34.5 kV collector line would run north to south within the Project Site. The localized electric field near an energized conductor can be sufficiently concentrated to produce a small electric discharge, which can ionize air close to the conductors. This effect is called "corona," and it is associated with all energized electric power lines. Corona can result in the production of small amounts of sound. Corona noise typically is characterized as a hissing or crackling sound, which may be accompanied by a 120-hertz hum. Slight irregularities or water droplets on the conductor and/or insulator surface accentuate the electric field strength near the conductor surface, making corona discharge and the associated audible noise more likely. Therefore, audible noise levels from transmission and collector lines would generally be higher during wet weather conditions.

Noise levels from corona effects were estimated using computer modeling software developed by the Bonneville Power Administration. Resulting corona noise estimates are then compared to the noise limits established in Policy N-b of the Noise Element.

Noise from Operation and Maintenance Activities

Operation and maintenance activities generally would occur during normal workday hours from Monday to Saturday. While turbines would be monitored and controlled using a remote off-site monitoring system, routine on-site maintenance activities would be required and are expected to include verification of torque on tower bolts and anchors and checks for cracks and other signs of stress on the turbine tower and components; and inspection for leakage of lubricants and hydraulic fluids and repainting. Each turbine also would be serviced twice a year, or as needed. Turbine servicing would require maintenance staff to climb towers and service turbine parts by performing activities such as removing the turbine rotor and replacing generators and bearings. Scheduled maintenance may require the use of a crane within the 65- to 95-foot diameter areas around the turbines.

The post-construction scenario would be equivalent to existing conditions, as it includes only a minimal number of 12 employees accessing the Project Site for maintenance and operations.

Maintenance noise levels were calculated using the Federal Highway Administration (FHWA) software (the Roadway Construction Noise Model [RCNM]), assuming operation of a crane and the distance to the nearest sensitive receptors, and not taking into account any noise reduction from intervening shielding by structures or terrain. Resulting noise estimates then were compared to speech interference thresholds cited above for construction noise impacts.

Construction, Decommissioning, and Site Reclamation Noise and Vibration Impacts

During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at 50 feet for equipment likely to be used in the construction of the Project are shown in **Table 3.13-5**, *Typical Noise Levels from Construction Equipment*. Most construction activities at a wind turbine facility generate noise levels in the range of 80 to 85 dBA L_{max} at 50 feet from the source (Appendix G). Hourly average noise levels would also be in the range of 80 to 85 dBA L_{eq} during periods of heavy construction. The types of noise sources that would be associated with construction of the Project are described below. For the purposes of this analysis, it is assumed that Project decommissioning and site reclamation activities would result in similar noise levels as would occur during construction.

TABLE 3.13-5
TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Level (dBA, L_{max} at 50 feet)
Backhoe	80
Concrete mixer	85
Concrete Pump	82
Concrete batch plant	83
Crane	85
Dozer	85
Excavator	85
Air Compressor	78
Front End Loader	80
Grader	85
Paver	85
Rock Drill	85
Scraper	85
Slurry Trenching Machine	82
Soil Mixing Drill Rig	80
Truck (Dump, Delivery)	84
Vibratory Compactor	80
Al other equipment with engines larger than 5 horsepower	85

SOURCE: National Cooperative Highway Research Program, 1999.

Noise from Construction Equipment

Noise levels from construction are estimated based on the reference noise levels presented in Table 3.13-5 and attenuation accounted for using sound level propagation equations. The resultant noise levels were compared to standards identified in the Shasta County General Plan Policy N-b.

Predicted noise levels from helicopter operations also are compared to speech interference thresholds published by the USEPA. Noise generated by construction equipment could result in speech interference in adjacent nearby buildings if the noise level in the interior of the buildings exceeds 45 dBA. Assuming a 25 dBA reduction with the windows closed, an exterior noise level of 70 dBA L_{eq} would maintain an acceptable interior noise environment of 45 dBA during the day and evening hours.

Noise from Construction Trucks

Construction and post-construction traffic volume estimates are provided in the Project's traffic study (**Appendix H**, *Transportation*). Over the up to 24-month construction period, the total number of all trips, including worker commute truck trips and heavy haul truck trips, is estimated to be approximately 93,088 trips (see Section 3.14, *Transportation*). The increase in traffic noise is calculated for both SR 299 as well as for the west, north, and east access roads. Predicted truck traffic noise then is compared to the County's 3 dBA L_{dn} increase or 5 dBA L_{dn} increase thresholds depending on the existing noise levels.

Blasting Noise

Assessment of the noise impact from Project blasting activities uses empirical measurements conducted by Illingworth & Rodkin, Inc. (Appendix G), at a reference distance to estimate the resulting noise levels that would occur at Project-specific distances to residential receptors, and then the estimated noise levels at the residential receptors are compared to the regulatory limit defined by the former U.S. Bureau of Mines for air-overpressure of 133 dB(L).

Helicopter Noise

Noise levels from helicopters that may be used to string the overhead collector lines and the transmission line connection are estimated based on the reference noise level of 100 dBA at a distance of 100 feet (FICON, 1992) and equations to predict unobstructed noise attenuation at the nearest residences for comparison with noise levels documented to result in speech interference outdoors and sleep disturbance indoors, assuming a 15 dBA exterior-to-interior noise reduction with windows partially open.

Blasting Vibration

When blasting occurs at large distances from sensitive structures, the primary concern is cosmetic damage to the structures. Cosmetic damage (e.g., minor cracking in plastered walls) can occur as a result of ground-borne vibration or acoustic overpressures. Vibration from blasting events on the Project Site were calculated using methods established by the former U.S. Bureau of Mines. The U.S. Bureau of Mines studies indicate no observations of "threshold damage" (referred to as cosmetic damage elsewhere in this report), "minor damage" or "major damage" at vibration levels of 0.4 in/sec PPV or less (Siskind et al., 1980). Caltrans recommends a vibration limit of 0.5 in/sec PPV for structurally sound buildings designed to modern engineering standards, and 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern. The more conservative limit (0.3 in/sec PPV) is used in this analysis.

3.13.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the Project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Impact 3.13-1: Operation of the Project could result in the generation of a substantial permanent increase in ambient noise levels in the vicinity of the Project in excess of standards established in the Shasta County General Plan or the applicable standards of other agencies. (*Less-than-Significant Impact*)

Summary of Operational Noise Impacts from All Sources

Operational noise from Project operations would be generated by a number of different sources, some of which would be predominant while others would be intermittent. The predominant noise would be generated by the operation of turbines, which are analyzed below assuming 24-hour per day operation of all turbines simultaneously. Additionally, there would be intermittent noise from operations of the substation, the potential for corona noise from overhead connector and transmission lines during wet weather conditions, and intermittent noise from operations and maintenance activities of up to 12 employees during daytime hours. Noise from each of these sources is analyzed individually below.

Table 3.13-6, *Predicted Contributions of Operational Noise Sources*, tabulates the contribution of each of these sources at the nearest noise sensitive receptors where long-term noise measurements were collected, as analyzed below; totals their contributions into an overall operational contribution; and compares the logarithmically summed total to the noise standards established by General Plan Policy N-b. Note that maintenance activities would only occur during daytime hours and, hence, there are separate totals for daytime noise levels and nighttime noise levels as there are also separate standards for daytime and nighttime noise established by Policy N-b.

While operational noise may, at times, be perceptible to the nearest receptor during the quietest nighttime hours, worst-case operational noise levels would be less than County General Plan standards and the Project would have a less-than-significant impact with respect to generation of a permanent increase in ambient noise levels in the vicinity of the Project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Wind Turbines

The proposed 72-turbine layout is shown in Figure 2-2*, Site Plan*. Based on preliminary design, the Nordex N163/5.X turbine was selected as the worst-case, loudest turbine that could be used at the Project Site. This turbine has a maximum sound power level[7] of 109.2 dBA and a hub height of 118 meters (387 feet).

[7] Sound power level is an engineering specification and is a separate metric from sound pressure level use elsewhere in this analysis. Sound power level is independent of the distance a receiver is from the source and is a property of the source alone. Knowing the sound power level of an idealized source and its distance from a receiver, the sound pressure level at the receiver point can be calculated based on geometrical spreading of sound from the source.

TABLE 3.13-6
PREDICTED CONTRIBUTIONS OF OPERATIONAL NOISE SOURCES

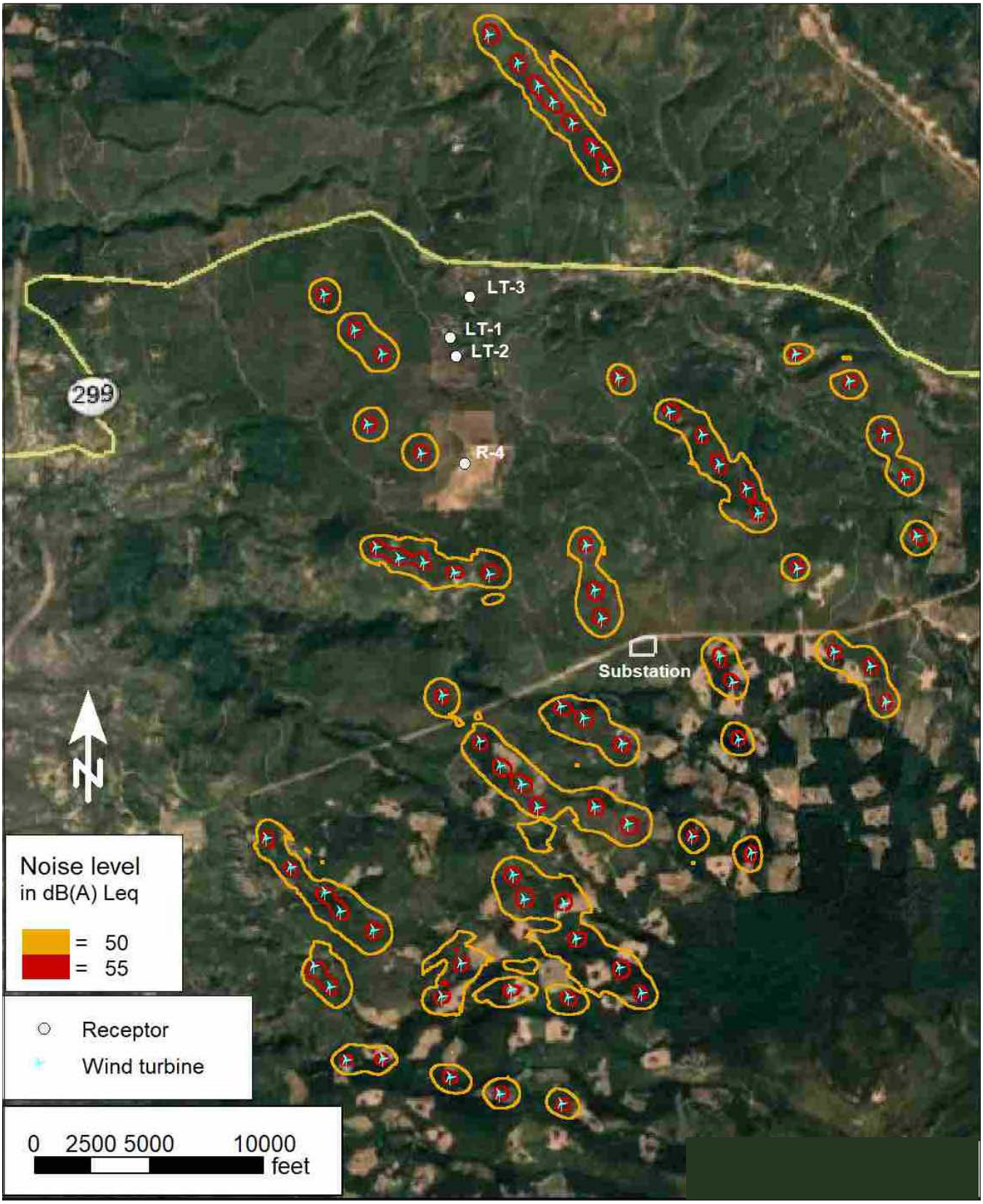
Source	Predicted Noise Level (dBA L_{eq})			
	Receptor LT-1	Receptor LT-2	Receptor LT-3	Receptor R-4
Existing hourly average noise level (daytime / nighttime)	40/36	38/34	47/46	42/42
Wind Turbine Operations[1]	40	40	38	43
Substation Noise[1]	13	13	13	13
Corona Noise[1]	21	21	21	21
Maintenance Activities[2]	38	38	36	41
Total Operational Noise During Nighttime Hours	40	40	38	43
Existing plus Total Operational Contribution During Nighttime Hours	41	41	47	46
Nighttime Standard	50	50	50	50
Total Operational Noise During Daytime Hours	42	42	40	45
Existing plus Total Operational Contribution During Daytime Hours	44	43	48	47
Daytime Standard	55	55	55	55

NOTES:
1 Source operates during daytime and nighttime hours.
2 Source operates during daytime hours only.

SOURCE: Appendix H

The closest residences to any single turbine are located about 2,200 feet away. Given the long propagation distances and terrain between the turbines and the closest receptors, turbine sound would be subject to additional attenuation by shielding from intervening terrain, atmospheric absorption, ground absorption, and variations in temperature and wind.

Three-dimensional modeling was conducted to account for site characteristics and topography assuming a worst-case condition with operation of all wind turbines simultaneously. The results of this modeling effort are shown in the noise level contours presented in **Figure 3.13-3**, *Noise Contours for Turbine Operations*. These contours represent the predicted 50 dBA L_{eq} and 55 dBA L_{eq} sound levels surrounding each turbine or group of turbines. Receptor locations were placed within the model to be representative of the residences facing the closest turbine at a distance of 100 feet from the residential structure, consistent with General Plan Policy N-b. For Receptors LT-1, LT-2, and LT-3, these locations are the same as the ambient measurement locations. The fourth receptor (R-4) is a location representative of the receptor to the south of monitoring location LT-4.



SOURCE: Illingworth & Rodkin, Inc.

Fountain Wind

Figure 3.13-3
Noise Contours for Turbine Operations

The calculated noise levels at each of the nearest existing noise sensitive receptors under this same worst-case scenario are shown in **Table 3.13-7**, *Predicted Sound Pressure Levels at Residential Locations Near Proposed Turbine Sites*, which shows the predicted A-Weighted L_{eq} and L_{dn} levels for each receptor location are indicated in Figure 3.13-2.

TABLE 3.13-7
PREDICTED SOUND PRESSURE LEVELS AT RESIDENTIAL LOCATIONS NEAR PROPOSED TURBINE SITES

Receiver Location	Existing Noise Level L_{eq}, dBA	Predicted Turbine Contribution L_{eq}, dBA	Resultant Nighttime Noise Level L_{eq}, dBA	Shasta County Nighttime Standard (L_{eq})
LT-1	36	40	41	50
LT-2	34	40	41	50
LT-3	46	38	47	50
R-4	42	43	46	50

NOTE: 1. 24-hour L_{dn} metric assumes continuous, simultaneous operation of all turbines 24 hours per day.

SOURCE: Illingworth and Rodkin, 2019.

As indicated in Table 3.13-7, worst-case wind turbine operation would contribute L_{eq} noise levels less than the 50 dBA nighttime noise standard of the Shasta County General Plan at all four of the nearest residential receptor locations.

While noise levels would be consistent with the standards established by the General Plan, turbine operations would result in modest increases over existing average ambient nighttime noise at the nearest receptors, given the relatively low existing nighttime noise levels. However, noise increases at all receptors would range from 1 to 8 dBA L_{eq}, assuming 100 percent operations during nighttime hours. This increase in nighttime ambient noise would be perceptible (5 dBA or greater) at receptor LT-1 and LT-2. More likely assumptions, for example, assuming 50 to 85 percent operations during the 24-hour period, would result in lower Project generated nighttime L_{eq} levels and thus lower noise level increases at residences. Likewise, selection of a turbine with a lower noise level would result in lower Project generated nighttime L_{eq} levels and thus lower noise level increases at residences.

While turbine noise may be perceptible to the nearest receptor during the quietest nighttime hours, worst-case turbine operations would generate noise levels less than County General Plan standards; and therefore the Project would result in a less-than-significant impact with respect to generation of a permanent increase in ambient noise levels near the Project in excess of County General Plan standards.

Infrasonic Turbine Noise Impacts

Operation of wind turbines also can produce low-frequency infrasonic noise. As discussed in Section 3.13.3.1, *Methodology*, while Shasta County has not established exposure standards for ultrasonic noise, an available source of low frequency criteria within the State of California is found within the Kern County Code (Kern County, 2006). Under this criteria, the low frequency noise levels at 50 feet from a residence are shown in Table 3.13-4. In the infrasonic range (below

20 Hz), the Kern County criteria are actually lower than the established threshold of hearing by 18 to 37 dB (USEPA, 1973). As a result, achieving the values shown for the Kern County criteria would assure that any infrasonic noise generated by the Project would be sufficiently low in level to avoid any infrasonic noise impact.

Spectral data for the worst-case wind turbine scenario were used to determine the differences between the A-Weighted and C-Weighted levels at each receptor location as presented in **Table 3.13-8**, *Difference Between A-weighted and C-weighted Predicted Noise Levels*. As shown in the table, the difference between the A-Weighted and C-Weighted levels are anticipated to be 17.7 to 19.5 dB. These differences are below the 20 dB threshold of concern for low frequency noise relative to A-weighted levels. Levels are also 5 dB or more below the Kern County thresholds shown in Table 3.13-4 and the standard condition of approval that has been used in Alameda County (70 dBA, dBC). As a result, low frequency noise that would be generated from the turbines is predicted to be below any of these three available regulations or guidelines, based on the predicted A-weighted sound level limits.

TABLE 3.13-8
DIFFERENCE BETWEEN A-WEIGHTED AND C-WEIGHTED PREDICTED NOISE LEVELS

Receiver	A-Weighted L_{eq}, dBA	C-Weighted L_{eq}, dBC	L_{dn}[1], dBA	L_{dn}[1], dBC	dBC – dBA dB
LT-1	39.5	58.4	46	65	18.9
LT-2	39.5	58.5	46	65	19.0
LT-3	38.2	57.7	45	64	19.5
R-4	43.3	61.0	50	67	17.7

NOTES:
1 Assumes continuous simultaneous operation of all turbines, 24-hr/day.
2 Results were rounded to the nearest decibel. In some cases, this can result in relative changes that may not appear intuitive. For example, the difference between 64.4 (64) and 64.5 (65) is 0.1 (0), not 1.

SOURCE: Illingworth and Rodkin, 2019.

Substation and Switching Station

An onsite collector substation and switching station would increase the voltage of the electricity from the collection system's 34.5 kV to 230 kV to match the voltage of the existing PG&E 230 kV line that would be connected to the substation. The closest existing residential areas (R-4) are 1.5 miles to the northwest from the substation location (see Figure 3.13-3). The basic elements of the substation facilities include a control house, a bank of one or two main transformers, outdoor breakers, capacitor banks, relaying equipment, and overhead lightning-suppression conductors.

The primary operational noise sources proposed at the substation are anticipated to be transformers. A typical transformer is estimated to generate a noise level of 72 dB at a distance of 6 feet during full load with fans and pumps running (Appendix G). With two transformers running simultaneously, the noise level would be 3 dB higher, at 75 dB. Based on noise measurements made at the Bridgeville 115 kV Substation in Humboldt County, California, steady state noise levels in the range of 47 to 54 dBA L_{eq} would be anticipated at the fence line of the

substation. These levels are consistent with those modeled for 230 kV substations (SDGE, 2016). Equipment-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain can provide an additional 5 to 10 dBA or more noise reduction at distant receptors. At a distance of 1.5 miles, substation noise would be less than 15 dBA and inaudible even at the quietest nighttime hours. There would be no impact associated with the generation of substation transformer noise.

Corona Noise

The Project would include 34.5 kV overhead collection lines and a 230 kV transmission connection line. The short 230 kV line interconnection to the existing PG&E 230 kV system would be installed from the substation. The 34.5 kV collection lines would run north to south within the Project Site. Computer modeling software developed by the Bonneville Power Administration was used to calculate audible noise that would be associated with transmission line corona activity. This modeling indicates that, during wet-weather conditions, audible noise levels of up to 46 dBA would occur within the right-of-way for a transmission line operating at 230 kV. Corona noise from the lower voltage collection lines would be lower.

At the closest residence, located more than 2,000 feet from the proposed lines, noise levels from the 230 kV lines would be 25 to 35 dBA lower than the levels within the right-of-way, resulting in levels that would be well below ambient noise levels, and inaudible even at the quietest nighttime hours. There would be no impact associated with the generation of corona noise.

Operation and Maintenance Activities

Operation and maintenance activities generally would occur during normal workday hours from Monday to Saturday and would require up to 12 full time employees. Scheduled maintenance may require the use of a crane within a 95-foot diameter area around the turbines. Permanent access roads would be periodically graded and compacted in order to minimize erosion. Catch basins, roadway ditches, and culverts would be cleaned and maintained regularly.

The addition of 12 vehicles spread throughout the existing logging roadway network within and near the Project Site would not be anticipated to measurably change the noise environment (increase would be less than 1 dBA L_{dn}). Maintenance operations would be located as close as 2,000 feet from existing residences. Maintenance noise levels were calculated using the Federal Highway Administration's Roadway Construction Noise Model. A crane is calculated to generate a maximum instantaneous noise level of 49 dBA L_{max} and 41 dBA L_{eq} at a distance of 2,000 feet, not taking into account any noise reduction from intervening shielding by structures or terrain. Maintenance operations would be occasional at each individual turbine, with servicing occurring only twice a year. Although maintenance operations may occasionally be audible during quiet daytime ambient conditions when located nearest noise sensitive locations, ambient noise levels would not be affected on an hourly or daily average basis. The noise impact from operational and maintenance impacts would be less than significant.

Mitigation: None required.

Impact 3.13-2: Construction, decommissioning, and site reclamation of the Project could result in the generation of a substantial temporary increase in ambient noise levels on and near the Project Site in excess of standards established in the Shasta County General Plan or the applicable standards of other agencies. (*Less than Significant with Mitigation Incorporated*)

The Project construction period would last up to 24 months. Proposed decommissioning of existing facilities and infrastructure and reclamation of the Project Site also would require up to 24 months and conservatively is assumed to generate the same noise levels as during construction. Construction generally would be conducted during daytime hours, typically from 7:00 a.m. to 5:00 p.m. However, there may be circumstances where construction hours would need to be extended earlier or later, such as during the delivery of unusually large loads, and nighttime construction may occur to avoid traffic, adjust for high winds during daylight hours, and/or to stay on schedule. The construction workforce is estimated to include up to 400 construction workers at any given time.

Project construction activities would include timber clearance and harvesting, site grading, widening of existing roads and construction of new access roads, transportation of turbine components, clearing of laydown areas, construction of turbine foundations, assembly and erection of turbines, construction of the substation and O&M Building, installation of the underground and overhead collection system, and installation of the transmission line connection. Helicopters may be used to string the overhead collector and transmission connection lines.

As described in Section 2.4.5.1, *Site Preparation*, blasting may be required in advance of excavation for the installation of trenches, for example, depending on the subsurface conditions. If blasting is necessary, the Applicant would prepare a Blasting Plan that identifies the locations where blasting would be anticipated to be needed and all applicable regulations for blasting procedures. The Blasting Plan also would specify the times and distances where explosives would be permitted to avoid impacts on sensitive environmental receptors and the human environment. This EIR assumes that the Applicant's contractor(s) would comply with the most stringent provisions of applicable federal, State, and local laws governing explosives, and that the plan would address safety measures that avoid or minimize impacts to nearby residents (e.g., from vibration or noise).

While the initial phases of construction would include timber clearance and harvesting, the potential for these activities is part of the existing baseline condition, since the current use of the Project Site is managed forest land. Thus, this activity would not represent a new noise source. The main sources of construction noise that would be associated with the Project are described below.

Off-Road Construction Equipment

During each stage of construction, there would be a different mix of equipment operating and noise levels generated at a given receptor would vary by stage and vary within stages, based on the amount of equipment in operation and the location where the equipment would be operating. Typical construction noise levels at 50 feet for equipment likely to be used in the construction of the Project are shown in Table 3.13-5. Most construction activities at a wind turbine facility generate noise levels in the range of 80 to 85 dBA L_{max} at 50 feet from the source. Hourly average

noise levels would also be in the range of 80 to 85 dBA L_{eq} during periods of heavy construction. Construction-generated noise levels attenuate at a rate of approximately 6 dBA per doubling of the distance between the source and receptor. Shielding by terrain can provide further reductions of up to 20 dBA at distant receptor locations.

The closest residences to Project work areas are located approximately 2,000 feet from turbine construction areas. At this distance, hourly average noise levels from heavy construction activities would be in the range of 48 to 53 dBA L_{eq}, not taking into account any shielding from intervening terrain. These noise levels could, at times, be audible at receptors, particularly if nighttime construction activities are required, but would not be anticipated to cause sleep or speech interference or substantially affect the overall ambient noise levels at these locations. Construction activities at any individual turbine location would be limited to a relatively short period of time as construction proceeds from one turbine site to another throughout the Project Site.

Because substation and O&M Building construction would be located approximately 0.6 mile from the nearest existing receptors on Moose Camp Road (LT-3), construction noise levels from construction of these Project elements would be approximately 45 dBA L_{eq} and would not be distinguishable from average ambient daytime noise levels (47 dBA L_{eq}).

Roadway construction activities could occur as close as 580 feet and 1,170 feet from the nearest residences, LT-2 and R-4, respectively. At a distance of 580 feet, noise from heavy construction activities would be in the range of 59 to 64 dBA L_{eq}, not taking into account any shielding from intervening terrain. At 1,170 feet, noise from heavy construction activities would be in the range of 53 to 58 dBA L_{eq}. Given that nighttime construction may occur to avoid traffic, the potential for nighttime roadway construction would primarily occur at the two SR 299 access points which are over 2,500 feet from the nearest receptor. Roadway construction typically would occur for relatively short periods of time at any specific location as construction proceeds along the roadway. Although construction activities that would be located nearest to the residences would not be expected to cause sleep or speech interferences, noise levels could exceed ambient levels by as much as 20 dBA at LT-2 when construction occurs at the closest point.

Construction Truck Trips

Construction traffic entering the Project Site would include vehicle trips by construction workers, and truck trips for material delivery, removal of harvested timber, and equipment delivery. All traffic would reach the site using SR 299. Three access roads are proposed to coincide with existing logging roads at the intersections with SR 299. Based on the available traffic volumes from Caltrans, SR 299 has an existing peak hour traffic volume of about 320 vehicles per hour with a truck percentage of over 13 percent.

During construction, the Project would employ an estimated 400 construction workers, Project management staff, equipment operators, survey staff, and delivery vehicle drivers during the peak period, with the average number of workers on-site in the range of 325 workers. The material delivery vehicle trips would be spread out throughout the day. The maximum number of aggregate deliveries per day would be approximately 90 deliveries (180 trips), constrained by the loading and unloading times. The maximum number of concrete deliveries per day would be approximately

50 deliveries (100 one-way trips), constrained by the rate that ready mix plants can batch concrete, and the rate the contractor can unload trucks. The estimated total number of construction trips occurring over the up to 24-month construction period is projected to be 93,088 trips.

Construction traffic volumes were provided in the Project's transportation study (Appendix H), which were used to calculate an estimated Project construction-related traffic noise increase of about 2 dBA L_{dn} on SR 299 in the vicinity of the Project Site (Appendix H). This increase would be below the County's 3 dBA L_{dn} and 5 dBA L_{dn} thresholds for noise increases due to permanent Project operations.

Construction traffic peak hour volumes on the existing logging roads are anticipated to increase from 24 to 40 trips on the west access road, 12 to 128 trips on the north access road, and 12 to 273 trips on the east access road which would occur during daytime hours when primary aggregate transport would occur. Assuming a worst-case analysis with 50 percent of these vehicles (both existing and Project construction vehicles) being heavy trucks, the calculated noise levels at a distance of 50 feet from the center of the road would be 58 dBA L_{eq} on the west access road, 63 dBA L_{eq} on the north access road, and 66 dBA L_{eq} on the east access road.

Existing ambient noise levels at receptors along local access roads are below 60 dBA L_{dn}; therefore, the 5 dBA increase threshold established by General Plan Policy N-g would apply. The closest residence to the west access road (represented by LT-1) is located about 300 feet from the center of the road. At this distance, the peak hour noise level generated by the Project's 28 construction-related trips (14 light vehicles and 14 heavy trucks) would be 44 dBA L_{eq}. The existing daytime peak hour noise level at this residence ranges from 43 to 49 dBA Leq (see Appendix G). The resulting peak hour noise levels with combined ambient and Project construction traffic noise levels would be 47 to 50 dBA L_{eq}. This would equate to a 1 to 4 dBA L_{eq} noise increase above existing ambient levels, which would be below the 5 dBA L_{dn} threshold and therefore less than significant.

If construction activities were required during nighttime hours when existing traffic levels are lower, the resulting combined nighttime ambient and Project construction traffic noise level would exceed the ambient nighttime noise level at the closest residence (average of 36 dBA L_{eq}; see Table 3.13-2) by more than the 5 dBA L_{dn} threshold, which would be a significant impact. Construction traffic could be redirected from the west access road to use alternative access routes such as the north and east access roads to avoid construction-related noise near residential uses. There are no noise sensitive receptors adjacent to the north and east access roads, therefore use of these roads, even during night time hours, would not exceed ambient noise standards for residential uses. **Mitigation Measure 3.13-2** (Noise-Reducing Construction Practices) identifies alternative truck routes to reduce noise impacts to receptors located along the west access road to address this potential roadway noise increase.

Helicopter Noise

Helicopters may be used to string overhead collector lines. Helicopter overflights could generate noise levels of up to 100 dBA at a distance of 100 feet. Helicopter overflights and activities would be intermittent and would not be located at a single location for any extended period. Noise levels, would be approximately 74 dBA at 2,000 feet. This noise level would be anticipated

to cause speech interference outdoors (exceed 70 dBA L_{eq}) and sleep disturbance indoors, assuming a 15 dBA exterior-to-interior noise reduction with windows partially open. Therefore, temporary noise from helicopters is identified as a potential significant impact if required for stringing of collector lines. **Mitigation Measure 3.13-2** (Noise-Reducing Construction Practices) identifies restrictions on helicopter operations to reduce this potential significant construction-related impact to a less-than-significant level.

Blasting Noise

Controlled blasting could generate noise levels of up to 94 dBA (L_{max}) at a distance of 50 feet for an event of less than 20 seconds in duration. Blasting events typically occur between one and ten times per day and each blast would be preceded by drilling noise for up to one hour. At the closest residences to the nearest potential blasting location, 2,000 feet from the nearest wind turbine construction area, peak overpressures of about 117 dB(L) would be anticipated, which are well below the 133 dB(L) criteria to avoid damage. Peak overpressure is controlled by charge confinement. The standard procedure for confining the charge is to place the explosives deep in the drilled blast hole and then to backfill the remainder of the hole with crushed rock. Assuming standard blast confinement techniques are used, Project-related damage from acoustic overpressures is not expected for any residence. Although these low frequency overpressures could potentially be audible, the Shasta County noise criteria do not apply to this type of impulsive noise and that is why the 133 dB(L) criteria of the regulatory limit defined by the former US Bureau of Mines is applied. While residents may occasionally hear sounds from blasting events, these sounds would occur on an infrequent basis during construction. These brief intermittent events would not be expected to substantially increase hourly average or daily average noise levels. While blasting typically is conducted during daytime activities, **Mitigation Measure 3.13-2** (Noise-Reducing Construction Practices) identifies restrictions on blasting activities to ensure that they are only conducted during daytime hours,

Impact Summary

In summary, Project construction would result in a potential significant impact if truck delivery of construction materials occurred during nighttime hours via the west access road and, separately, as a result of the proposed use of helicopters to string overhead collector. The implementation of Mitigation Measure 3.13-2 (Noise-Reducing Construction Practices) would reduce this potential significant impact to a less-than-significant level.

Mitigation Measure 3.13-2: Noise-Reducing Construction Practices.

The Project Applicant shall ensure that the following measures are implemented during construction, decommissioning, and site reclamation activities to avoid and minimize construction noise effects on sensitive receptors:

a) Construction vehicle routes shall be located at the most distant point feasible from noise-sensitive receptors.

b) All heavy trucks shall be properly maintained and equipped with noise-control (e.g., muffler) devices, in accordance with manufacturers' specifications, at each work site during Project construction, decommissioning, and site reclamation to minimize heavy truck traffic noise effects on sensitive receptors.

c) Haul trucks and delivery trucks shall prioritize use of the east access road, if available, over the west access road, and shall avoid use of the west access road during nighttime hours.

d) Helicopter use shall be limited to a period of 2 weeks or less such that receptors are not impacted for a substantial period of time.

e) Limit construction operations located within 2,500 feet of residences to daytime hours only.

f) Residences within 2,000 feet of helicopter activity shall be notified of the timeline of proposed operations at least 2 weeks` prior to line stringing operations.

g) Nighttime (10 p.m. to 7 a.m.) helicopter use and blasting shall be prohibited.

Significance after Mitigation: The above construction noise reduction measures would reduce potential impacts related to truck noise along the west access road, reduce the severity of noise from helicopter operations, and would represent best management practices to reduce construction-related noise, in general.

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b) Whether the Project would result in the generation of excessive groundborne vibration or groundborne noise levels.

Impact 14.3-3: Construction, decommissioning, and site reclamation of the Project could generate groundborne vibration. (*Less than Significant with Mitigation Incorporated*)

When blasting occurs at large distances from sensitive structures, the primary concern is the potential for cosmetic damage to structures. Cosmetic damage (e.g., minor cracking in plastered walls) can occur as a result of ground-borne vibration or acoustic overpressures. Vibration from blasting events on the Project Site were calculated using methods established by the former U.S. Bureau of Mines and are presented in **Table 3.13-9**, *Ground Vibration Levels Generated by Blasting*. As discussed in Section 3.13.3.1, *Methodology*, predicted vibrations levels are compared to more conservative limit of 0.3 in/sec PPV published by Caltrans.

TABLE 3.13-9
GROUND VIBRATION LEVELS GENERATED BY BLASTING

Distance (feet)	Blasting Level (in/sec PPV) for Various Explosive Charge Weights per Delay (lbs)		
	175 lbs	350 lbs	700 lbs
2,000	0.098	0.170	0.296
3,000	0.051	0.089	0.155
4,000	0.032	0.056	0.098

Blasting could occur as close as 2,000 feet from existing residential areas. Calculated ground vibration levels are summarized in Table 3.13-9 for a variety of charge weights and distances. Receptors located further from blasting activities would experience lower vibration levels.

As shown in Table 3.13-9, blasting, using a charge weight of 700 lbs/delay[8] within 2,000 feet of sensitive structures, could generate groundborne vibration levels as high as 0.296 in/sec PPV, which would be just below the 0.3 in/sec PPV Caltrans threshold. Consequently, use of charge weights in excess of 700 pounds per delay could result in significant vibration impacts.

Mitigation Measure 3.13-3: Charge Weight Limits on Blasting Activities.

The Project Applicant shall ensure that blasting contractors restrict charge weight per delay such that a performance standard of less than 0.3 in/sec PPV would result at any structures in the vicinity of the blasting area. This performance standard shall be established as a condition of contract and implemented by a licensed blasting contractor in possession of a Federal Explosives License/Permit, issued by the Bureau of Alcohol, Tobacco, and Firearm.

Significance after Mitigation: Structures closest to potential blast areas would be unlikely to experience any level of cosmetic or structural damage, assuming a maximum vibration level of less than 0.3 in/sec PPV. Vibration levels would be lower at locations further from blasting or when lower charge weights are used. Consequently, with the application of Mitigation Measure 3.13-3, blasting activities associated with construction of the Project would have a less-than-significant impact with respect to generation of groundborne vibration that would exceed the criteria established by Caltrans.

3.13.3.3 PG&E Interconnection Infrastructure

As described above in Impact 3.13-1, the onsite collector substation and switching station where the PG&E transmission line interconnect would be located would be approximately 1.5 miles from the closest existing residential area (R-4). The primary operational noise source that would be associated with the proposed transmission line connection at the substation would be corona noise, which would be up to 46 dBA within the transmission line connection right-of-way. At 1.5 miles, the corona noise level associated with the transmission line connection would not be audible. Consequently, there would be no operational impact of the PG&E interconnection infrastructure.

Similarly, the substantial distance between the transmission line connection from the nearest receptor would serve to attenuate construction-related noise and noise from decommissioning and site reclamation. Impact 3.13-2, above, assess potential impacts occurring from construction activities at the nearest receptor located approximately 2,000 feet away. Given that the transmission line connection would be on the order of 7,900 feet away, noise levels from construction, decommissioning, and site reclamation would be expected to be approximately 12 dBA, which would be inaudible. With regard to traffic noise levels along the west access road, the daily truck trips that would be required to deliver the materials for the four to six new transmission poles and associated conductor would not be expected to result in a traffic noise level that would exceed the ambient nighttime noise level at the closest residence by more than

[8] The maximum quantity of explosive charge detonated on one interval (delay) within a blast.

the 5 dBA L_{dn} threshold. The construction impact associated with the PG&E interconnection infrastructure would be less than significant.

3.13.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, the Project would be constructed, operated and maintained, and ultimately decommissioned as proposed south of SR 299, but none of the up to seven turbines proposed to the north of SR 299 or their related infrastructure would be developed. These seven northerly turbines would have been located over 5,000 feet from the nearest receptor (LT-3) and, as indicated in Figure 3.13-3, would contribute substantially less than 50 dBA to the nearest receptors during operations. Given that the primary contributors to both construction-related and operational noise and vibration impacts would be related to turbine locations south of SR 299, both construction-related noise and vibration impacts, and operational noise and vibration impacts of Alternative 1 would be the same as those identified above for the Project, less than significant with implementation of Mitigation Measure 3.13-2 (Noise-Reducing Construction Practices).

Alternative 2: Increased Setbacks

Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within 2,037 feet of a residential property line and within 1,018.5 feet of SR 299, any other publicly-maintained public highway or street, and of Supan Road or Terry Mill Road. Implementation of these setbacks would preclude construction of proposed turbines M03, D05, and B01 based on the residential property line setback, and would preclude construction of turbine KO2 based on the roadway setback. The effect of eliminating these turbines, in particular turbine D05, would reduce the operational and construction-related noise levels at receptor location R-4 compared to those identified for the Project. Impacts would be the same as those identified above for the Project, less than significant with implementation of Mitigation Measure 3.13-2 (Noise-Reducing Construction Practices).

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind turbines and associated transformers or other infrastructure, facilities or structures would be constructed, operated and maintained, or decommissioned on the Project Site. The proposed overhead electrical lines would not be developed; and the onsite collector substation, switching station, and operation and maintenance (O&M) facility would not be constructed, visited pursuant to operations and maintenance activities, or demolished and removed from the Project Site. Laydown areas would not be cleared, no new access roads would be constructed, and no existing roads would be improved or traveled. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to noise or vibration.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs.

§897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect relating to noise or vibration. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.13.4 Cumulative Analysis

The above Project-level analysis indicates that beyond a distance of approximately 3,000 feet, construction-related noise and vibration impacts would be attenuated to ambient levels. Therefore, this distance is also applied to the perimeters of the turbine locations and receptors to determine the geographic scope of potential cumulative impacts. There are six timber harvest plans within the leasehold area that are active or in preparation, but all six of these harvest plans are more than 5,000 feet from the nearest receptor and so are outside of the geographic scope of potential cumulative impacts.

Additionally, there is a Caltrans roadway improvement project on SR 299 scheduled for 2021, approximately 3,000 feet from the nearest turbine and 300 feet from the nearest receptor (LT-3). Construction activities of this Caltrans project could occur simultaneously with the earliest stages of Project construction and, as a linear construction project, may occur proximate to a given roadside receptor for a period of 1 to 2 weeks. As discussed above, construction equipment involved with the Project would generate noise levels of 48 to 53 dBA L_{eq} at 2,000 feet, not taking into account any shielding from intervening terrain and would result in a less-than-significant impact. Receptor LT-3 is located approximately 4,000 feet from the nearest turbine construction areas and would experience noise levels of 42 to 47 dBA L_{eq}. Construction work associated with the Caltrans project at a distance of 300 feet would be expected to generate noise levels of 65 to 70 dBA L_{eq}. Using the upper end of these estimates, the cumulative combination of 47 dBA and 70 dBA L_{eq} would result in a noise level of 70.4 dBA L_{eq}. Therefore, the Project would not contribute considerably to the noise generated by the Caltrans project, regardless if occurring during daytime or nighttime hours. With regard to vibration, the vibration levels that would be associated with construction of the Caltrans project would not be expected to be perceived at a distance of 300 feet. Therefore, the vibration levels that would be associated with the Project blasting activities would not combine with those of the Caltrans project to result in a significant cumulative impact because the cumulative noise and vibration increases would be well below the level of human perception. No significant cumulative effects would result. The cumulative impact would be less than significant.

3.13.5 References

Alameda County, 1998. *Standard Conditions of Approval for Wind Farm Permits*, Item 16, Alameda County. May 1998.

California Department of Transportation (Caltrans), 2009. *Technical Noise Supplement*. November 2009.

Caltrans, 2013a. *Technical Noise Supplement to the Traffic Noise Analysis Protocol*. September 2013.

Caltrans, 2013b. *Transportation and Construction Vibration Guidance Manual*. September 2013.

County of San Diego, 2019. Health and Human Services Agency. *Public Health Position Statement, Human Health Effects of Wind Turbines* February 25, 2019.

Federal Interagency Committee on Noise (FICON), 1992, Federal Agency Review of Selected Airport Noise Analysis Issues. August 1992.

Federal Transit Administration (FTA), 2018. Transit Noise and Vibration Impact Assessment. 2018.

Kern County, 2006. Development Standards and Conditions, Section 19.64.140, Chapter 19.64 Wind Energy (WE) Combining District, Title 19 Zoning, the Ordinance Code of Kern County, California. June 15, 2006.

National Cooperative Highway Research Program, 1999. *Mitigation of Nighttime Construction Noise, Vibrations and Other Nuisances*. 1999.

Roberts, J. D., and M. A. Roberts, 2013. Wind Turbines: Is There a Human Health Risk? Journal of Environmental Health 75:8–17. April 2013.

San Diego Gas and Electric Company (SDGE), 2016. Artesian 230kV Substation Expansion Project Draft Environmental Impact Report, August 2016.

Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding, 1980. Structure Response and Damage Produced by Ground Vibration form Surface Mine Blasting, RI 8507, Bureau of Mines Report of Investigations, U.S. Department of the Interior Bureau of Mines, Washington, D.C. 1980.

U.S. Department of the Interior, Office of Surface Mining, *Controlling the Adverse Effects of Blasting*, Training Module, 2000.

U.S. Environmental Protection Agency (USEPA), 1973. Legal Compilation on Noise, Volume 1. 1973.

USEPA, 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974. Available online at: https://nepis.epa.gov/Exe/ZyPDF.cgi/2000L3LN.PDF?Dockey=2000L3LN.PDF. Accessed March 14, 2019.

Waye, K., 2009. Perception and Environmental Impact of Wind Turbine Noise, Proceedings of Inter Noise 2009, International Institute of Noise Control Engineering, Ottawa, Canada. August 2009.

World Health Organization (WHO), 1999. Guidelines for Community Noise, Geneva, Switzerland. Available online at: http://www.euro.who.int/en/health-topics/environment-and-health/noise/environmental-noise-guidelines-for-the-european-region. Accessed March 25, 2019.

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3.14 Transportation

This section identifies and evaluates issues related to Transportation in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. The information and analysis presented in this section are based in part on data provided in **Appendix H**, *Transportation*. The County independently reviewed this and other materials prepared by or on behalf of the Applicant and determined them to be suitable for reliance on (in combination with other materials included in the formal record) in the preparation of this Draft EIR.

In response to its notice of intention to prepare this Draft EIR, the County received scoping input noting that State Route (SR) 299 is narrow, of steep grade in the Project area, and subject to commercial accidents on a regular basis. Input received also identified a road located within 100 feet of Moose Camp that provides the owner of the Lammer Ranch access to SR 299, and that has provided emergency ingress/egress for residents of Moose Camp since the 1930s; this road was described as "seldom used."

Scoping input also was provided about the potential for the Project to result in impacts to transportation during construction, operation, and maintenance. During construction, potential impacts could result from the number and size of vehicles needed to transport and deliver turbine components and gravel. Delays could adversely affect emergency vehicles trying to get through town; local users of SR 299 and adjoining roads; and commuters heading to Redding for work, entertainment or shopping. Commenters requested that the analysis consider delays during the time to repair SR 299 post-materials delivery, if required. Potential impacts during operation and maintenance were identified as being caused by members of the general public wanting to get up close to the turbines (as they do for the Hatchet Ridge Wind Project), regular traffic to/from the operation and maintenance facility and use of the main road proposed between the two substations, which abuts residential property.

All scoping input received, including regarding Transportation, is provided in Section 4.1 of the Scoping Report, a copy of which is provided in **Appendix J**, *Scoping Report*.

3.14.1 Setting

3.14.1.1 Study Area

For the purposes of the transportation analysis, the Project study area is defined as transportation facilities that would be used to transport workers and materials to/from the Project Site during construction, operation and maintenance, and decommissioning and site restoration. These include roadways located directly adjacent to the Project Site (i.e., SR 299, Moose Camp Road, and three existing, gated logging roads that would be used for Project access) as well as regional facilities that provide access to SR 299, which include Interstate 5 (I-5) approximately 35 miles west of the Project Site, and SR 139 approximately 60 miles east of the Project Site.

3.14.1.2 Environmental Setting

Existing Roadway Network

Regional Access

SR 299 is an east-west state highway that connects I-5 and Redding to the west with SR 139 to the east. In the vicinity of the Project Site, SR 299 consists of one travel lane in each direction, and paved shoulders.

I-5 is a north-south interstate highway that extends from the Mexican border to the Canadian border and provides access for goods movement, shipping, and travel. Access to the Project Site from I-5 is provided via an interchange with SR 299 on the north end of Redding. At this location, I-5 consists of two travel lanes in each direction, and paved shoulders.

SR 139 is a north-south state highway that connects Susanville to the south with the Oregon state border. Access to the Project Site is provided via an interchange with SR 299 in the town of Adin.

Local Access

Three existing access roads currently used for logging that intersect with SR 299 would provide local access to the Project Site. See Figure 2-5*, Road Network*, in Chapter 2, *Description of Project and Alternatives*). The West Access is proposed along a road called G Line, which intersects with SR 299 approximately 37 miles east of the interchange with I-5 in Redding. There is a widened shoulder at this intersection, but no turn lanes. The North Access is approximately 3 miles east of the West Access. This access is proposed along an existing and unnamed logging road that intersects SR 299 just east of Little Hatchet Creek. As with the West Access, there is a widened shoulder at this access, but no turn lanes. The East Access is approximately 2 miles east of the North Access and approximately 8 miles west of Burney. This access is proposed along an existing and unnamed logging road that provides access to the area south of SR 299. As with the other access points, there is a widened shoulder at this access, but no turn lanes.

Traffic Volumes

Annual average daily traffic (AADT) volumes and average peak-hour traffic volumes on SR 299 are shown in **Table 3.14-1**, *SR 299 Traffic Volumes – Existing Conditions*. According to the latest traffic data available from the California Department of Transportation (Caltrans), urban centers on each end of SR 299 record the highest traffic volumes, then diminish significantly in the rural and mountainous areas in between (Caltrans, 2017). Between I-5, in Redding and Plumas Street, in Burney, nine daily and peak-hour count locations are listed.

The highest existing AADT on SR 299 is 21,000 vehicles per day at I-5 in Redding, where the highway has a four-lane freeway alignment. The peak-hour volume is 2,150 vehicles per hour. On the two-lane rural section of SR 299 between Deschutes Road (on the east edge of Redding) and Elm Street (on the west edge of Burney), the peak-hour volume ranges from between 320 and 490 vehicles per hour.

TABLE 3.14-1
SR 299 TRAFFIC VOLUMES – EXISTING CONDITIONS

Location	Milepost (start – end)	Existing AADT	Existing Peak-Hour Volume
I-5 Junction (Redding)	24.8	21,000	2,150
Between I-5 and Hawley Road	24.9 - 25.5	11,600	1,150
Between Hawley Road and Old Oregon Trail	25.5 - 27.2	9,700	940
Between Old Oregon Trail and Deschutes Road	27.2 - 31.5	4,850	490
Between Deschutes Road and Terry Mill Road	31.5 - 53.3	3,650	360
Between Terry Mill Road and Big Bend Road	53.3 - 60.1	2,850	320
Between Big Bend Road and Tamarack Road	60.1 - 73.1	3,000	320
Between Tamarack Road and Elm Street	73.1 - 74.5	3,300	370
Between Elm Street and Plumas Street (Burney)	74.5 - 75.0	8,400	880

SOURCES: Appendix H; Caltrans, 2017.

The three Project access roads are located within the segment of SR 299 between Big Bend Road and Tamarack Road. The AADT and peak-hour volumes for this segment are 3,000 vehicles per day and 320 vehicles per hour, respectively. Heavy vehicle traffic constitutes a notable percentage of the background traffic on this segment of SR 299. At Mile Post 72.6, west of Burney, the heavy vehicle percentage on SR 299 was recorded in 2016 (the latest data available as 13.69 percent (Caltrans, 2016).

Level of Service

Table 3.14-2 shows the existing peak-hour level of service (LOS) for the study roadway segments on SR 299. LOS is a scale used to determine the operating quality of a roadway segment or intersection based on volume-to-capacity ratio (V/C) or average delay experienced by vehicles on the facility. The levels range from A to F, with LOS A representing free traffic flow and LOS F representing severe traffic congestion. Agencies adopt LOS standards that define the level of operations that are acceptable within their jurisdiction. Caltrans, which has jurisdiction of SR 299, has an established standard of LOS C or better (V/C of less than 0.80) for rural highways. See additional discussion in Section 3.14.3.1, *Methodology*.

According to the Highway Capacity Manual (Transportation Research Board, 2000), the base capacity of a freeway segment is 2,300 passenger cars/hour/lane; which, for a four-lane section, would equal 9,200 vehicles per hour. The base capacity of a two-lane rural roadway segment is 2,000 passenger cars/hour/lane which, for a two-lane section, would equal 4,000 vehicles per hour. The V/C was calculated using these capacities, and the 2017 average peak-hour volumes. As shown in the table, the study segments of SR 299 all currently operate with a V/C of less than 0.80, which means that they operate at LOS C or better.

TABLE 3.14-2
SR 299 PEAK-HOUR LEVEL OF SERVICE – EXISTING CONDITIONS

Location	Hourly Capacity	Existing Peak-Hour Volume	V/C	LOS C or better?
I-5 Junction (Redding)	9,200	2,150	0.23	Yes
Between I-5 and Hawley Road	9,200	1,150	0.13	Yes
Between Hawley Road and Old Oregon Trail	9,200	940	0.10	Yes
Between Old Oregon Trail and Deschutes Road	4,000	490	0.12	Yes
Between Deschutes Road and Terry Mill Road	4,000	360	0.09	Yes
Between Terry Mill Road and Big Bend Road	4,000	320	0.08	Yes
Between Big Bend Road and Tamarack Road	4,000	320	0.08	Yes
Between Tamarack Road and Elm Street	4,000	370	0.09	Yes
Between Elm Street and Plumas Street (Burney)	4,000	880	0.22	Yes

SOURCES: Transportation Research Board, 2000; Caltrans, 2017; and EIR Preparers.

Transit

The Burney Express, which is operated by the Redding Area Bus Authority, provides three weekday daily trips in each direction (three westbound, three eastbound) on SR 299. No weekend service is provided. The nearest bus stop to the Project Site is located in Montgomery Creek, approximately 6 miles west of the Project Site (RABA, 2020).

Non-Motorized Transportation

The Shasta County 2010 Bicycle Transportation Plan (Shasta County, 2010) does not identify any existing or planned bicycle facilities on SR 299 in the vicinity of the Project Site. A review of aerial imagery indicates that there are no pedestrian facilities (i.e., sidewalks, off-street trails) in the vicinity of the Project Site.

Railways

The closest railway is a single-track main line operated by Union Pacific that runs generally parallel to I-5, approximately 35 miles west of the Project Site. This line carries both passengers (via Amtrak Coast Starlight) and freight trains.

Airports

The nearest airports to the Project Site are the Fall River Mills Airport, located approximately 25 miles northeast of the site, and the Redding Municipal Airport, located approximately 35 miles southwest.

3.14.1.3 Regulatory Setting

Federal

Transportation of Hazardous Materials

The U.S. Department of Transportation (DOT) is the administering agency for the following regulations:

- Title 49 Code of Federal Regulations (CFR) Sections 171 through 177 (49 CFR §§171–177), which govern the transportation of hazardous materials, the types of materials defined as hazardous, and the marking of transportation vehicles.
- Title 49 CFR 350–399 and Appendices A through G, Federal Motor Carrier Safety Regulations, which address safety considerations for the transport of goods, materials, and substances over public highways.
- Title 49 CFR 397.9, the Hazardous Materials Transportation Act of 1974, which directs DOT to establish criteria and regulations for the safe transportation of hazardous materials.

State

California Department of Transportation

The California Department of Transportation (Caltrans) owns the rights-of-way for state highways, including any on- and off-ramps that provide access to the Project area. Any Project-related work within the state rights-of-way would require a ministerial Encroachment Permit from Caltrans. Caltrans is also the administrating agency for regulations related to traffic safety, including the licensing of drivers, oversize/overweight vehicle limitations, transportation of hazardous and combustible materials, and the safe operation of vehicles.

Local

Shasta County General Plan

The Circulation Element of the Shasta County General Plan contains the following policies applicable to analysis of transportation facilities (Shasta County, 2004):

> **Policy C-6j:** New development shall provide circulation improvements for emergency access by police, fire, and medical vehicles; and shall provide for escape by residents/occupants in accordance with the Fire Safety Standards.
>
> **Policy C-6k:** Shasta County shall adopt the following LOS standards for considering any new roads:
>
> - rural arterial and collectors—LOS C
> - urban/suburban arterial and collectors—LOS C
>
> **Policy C-6l:** New development which may result in exceeding LOS E on existing facilities shall demonstrate that all feasible methods of reducing travel demand have been attempted to reach LOS C. New development shall not be approved unless traffic impacts are adequately mitigated.

Policy C-8b: Working in conjunction with Caltrans, the County shall designate and provide signed truck routes, ensure that adequate pavement depth, lane widths, loading areas, bridge capacities, vertical height of overpasses and utility lines, and turn radii are maintained on the designated truck routes, and prohibit commercial truck traffic from non-truck routes except for deliveries.

Policy C-8c: Adequate truck access to off-street loading areas in commercial and industrial areas shall be provided in all new development applications.

Shasta County Development Standards Manual

The Shasta County Development Standards Manual also sets specific guidelines for the construction of public road improvements and private roads, including design standards addressing slopes, widths, connection to County roads, and others (Shasta County, 1997).

3.14.2 Significance Criteria

A project would result in a significant impact to Transportation if it would:

a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities;

b) Conflict or be inconsistent with CEQA Guidelines Section 15064.3(b);

c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); or

d) Result in inadequate emergency access.

Regarding criterion b), CEQA Guidelines Section 15064.3(b) was adopted in December 2018 by the California Natural Resources Agency. These revisions to the CEQA Guidelines criteria for determining the significance of transportation impacts focus primarily on projects within transit priority areas, and shift the focus from driver delay to reduction of greenhouse gas (GHG) emissions, creation of multimodal networks, and promotion of a mix of land uses. The revisions require lead agencies to evaluate transportation impacts based on vehicle miles traveled (VMT) beginning July 1, 2020. VMT is a measure of the total number of miles driven to or from a development and is sometimes expressed as an average per trip or per person. Shasta County has begun, but has not yet completed, consideration of transportation significance thresholds based on VMT. The County has not yet adopted or put in to practice VMT-based transportation significance thresholds. Where no VMT threshold has yet been adopted, the Office of Planning and Research's Technical Advisory on Evaluating Transportation Impacts in CEQA (OPR, 2018) provides guidance. In areas not near established or incorporated cities or towns, for example, the Technical Advisory notes that "significance thresholds may be best determined on a case-by-case basis." The County, based on its consideration of the potential timing for release of the Fountain Wind Project Draft EIR, determined that a significance threshold to evaluate VMT that would be generated by this Project should be used to evaluate the potential transportation impacts of this Project. For the purposes of establishing a VMT threshold for this Project, the County considered CEQA Guidelines Sections 15064(b)(2) and 15064.7 regarding the development of thresholds of significance and has determined that a performance based threshold consistent with the analysis

of the significance of the Project's GHG emissions would be appropriate. Accordingly, for purposes of this Project, an impact to VMT would be significant if it would conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.

3.14.3 Direct and Indirect Effects

3.14.3.1 Methodology

The information and analysis presented below are based in part on data provided in Appendix H, *Transportation*. Two forms of traffic analysis were conducted for the Project. Operational analyses (i.e., LOS) were conducted for study segments of SR 299 and for the three Project access road intersections for both Project construction and Project operation. In addition, total Project-generated vehicle miles traveled (VMT) was calculated for both Project construction and Project operation. A qualitative analysis of Project decommissioning impacts is provided based on its relative impact to transportation compared with Project construction, which, from a transportation perspective, represents the maximum possible impact.

Highway Level of Service

The methodology used to evaluate existing highway LOS was also used to evaluate highway LOS for the Project. To estimate peak-hour LOS conditions, a review of historical traffic volumes for the segment of SR 299 adjacent to the Project Site was conducted, which found that peak-hour volumes have not changed appreciably over the years. Therefore, it is assumed that the existing 2017 traffic volumes identified in Table 3.14-1 would remain constant during the 18- to 24-month Project construction period as well as for Project operation and decommissioning. Based on the relative sizes of, and distances to Redding and the small towns east of the Project Site, it was assumed that 60 percent of the peak-hour background traffic would be coming to and from the west, while 40 percent would be coming to and from the east on SR 299 (Appendix H). Therefore, of the 320 peak-hour vehicle trips, 192 were assumed to approach the Project Site from the west and 128 were assumed to approach the Project Site from the east.

Intersection Level of Service

The LOS analysis measures delay per vehicle and operational performance. The LOS analysis for the three Project driveways was performed using the traffic engineering industry standard software package Synchro/SimTraffic for a.m. and p.m. peak-hour conditions for periods during and after construction. Traffic volumes for SR 299 at the driveways were developed as described above, while turning movements into and out of the driveway were developed according to the trip generation and distribution methodology described below.

Level of Service Standards

LOS standards are used to evaluate the transportation impacts of long-term growth. In order to monitor roadway operations, cities and counties adopt standards by which the minimum acceptable roadway operating conditions are determined and deficiencies may be identified. Caltrans endeavors to maintain a target LOS D at the transition between LOS C and LOS D on state highways; however, Caltrans acknowledges that this may not always be feasible and

recommends that the lead agency consult with Caltrans to determine the appropriate target LOS (Caltrans, 2002). As stated above in Section 3.14.1.3, *Regulatory Setting,* the LOS standard for County roads is LOS C as set forth in Policy C-6l of the Shasta County General Plan.

Vehicle Miles Traveled

VMT was calculated by multiplying the amount of daily traffic generated by trucks and other vehicles to haul equipment, material, aggregate, turbines, concrete, water and employees on a roadway segment by the length of the segment, then summing all the segments. Then the estimated mileage that would be logged to perform these trips during the up-to 24-month construction period was calculated.

Consistent with the materials delivery assumptions relied upon in the Project-specific traffic study (Appendix H), this analysis assumes that turbine equipment and material would be delivered from the Port of Stockton, approximately 250 miles south of the Project Site. The turbine equipment pick-up location would be finalized prior to construction, upon the selection of the turbine type to be used for the Project; however, the Port of Stockton provides a feasible and realistic turbine delivery location for the purpose of assessing transportation impacts. Otherwise, the VMT estimations were limited to the City of Redding to the west and the town of Burney to the east.

Locally sourced materials such as aggregate and water would likely come from Burney, approximately 6 miles east of the Project Site, or from pits and quarries east of Burney. If the concrete is not batched on-site, there are several concrete plants in Redding about 35 miles west of the Project Site that will likely be the source. The material delivery vehicle trips would be spread out throughout the day. The maximum number of aggregate deliveries per day would be approximately 90 deliveries, constrained by the loading and unloading times. The maximum number of concrete deliveries per day would be approximately 50 deliveries (100 one-way vehicle trips), constrained by the rate that ready-mix plants can batch concrete, and the rate the contractor can unload trucks. The maximum rate of deliveries is approximately six to eight per hour, equivalent to placing a wind turbine foundation during a single work shift.

Construction Trip Generation and Distribution

Construction period trip generation was calculated based on the types of delivery, construction, operations, maintenance and worker vehicles required during the various phases of the Project. Vehicle trips into and out of the Project Site were estimated using the projected number of deliveries, the required types of equipment and material, and the projected number of employees necessary to construct the Project over the estimated construction period. These volumes of trips were calculated using a spreadsheet that lists known phases of construction with corresponding equipment, material and numbers of employees, which are then averaged over the course of the Project.

During construction, the Project would employ an estimated 400 construction workers, project management staff, equipment operators, survey staff, and delivery vehicle drivers during the peak period, with the average number of workers on-site in the range of 325 based on preliminary schedule development. The total number of trips was determined by using the number of

employees in each of the categories listed above, dividing that number by an estimated vehicle occupancy (2.0 for survey crews; 1.5 for all other categories, except for delivery vehicles with an occupancy of 1.0) and multiplying by the number of work days for each employee category.

As a result, the number of work days and total number of trips estimated for each category in the Project-specific traffic study (Appendix H) are:

- 100 days for survey (400 total trips);
- 250 days for construction trades (24,000 total trips);
- 250 days for project management staff (2,500 total trips);
- 200 days for equipment operators (6,267 total trips);
- 250 days for small equipment on flatbed trailers (1,250 total trips); and
- 230 days for deliveries (56,079 total trips).

Thus, over the estimated 24-month construction period, the total number of all trips is estimated to be approximately 93,088 trips. Additional detail related to the construction work tasks and related delivery and construction vehicles is provided in Appendix H.

Constructing the Project would require that several tasks be repeated across the Project Site. Some sequencing of tasks is required, but many tasks may overlap across the site for efficient scheduling. For example, construction of the operations and maintenance facility, substation, switching substation, and underground and overhead collection systems could overlap with other tasks, depending on scheduling and priority of precedent activities. For the purpose of determining the daily volume of traffic, construction time is estimated to take approximately two years, with construction occurring only during the spring, summer and fall (see Appendix H).

Based on the information above, inbound and outbound Project-generated vehicle trips were calculated for the a.m. and p.m. peak hours. Those numbers are shown below in **Table 3.14-3**.

TABLE 3.14-3
PEAK-HOUR PROJECT TRIP GENERATION – PROJECT CONSTRUCTION

Location	A.M. Peak Hour		P.M. Peak Hour	
	Inbound	Outbound	Inbound	Outbound
SR 299 to/from the west				
Pick-up Trucks	104	0	0	104
Heavy Trucks	156	0	0	156
SR 299 to/from the east				
Pick-up Trucks	69	0	0	69
Heavy Trucks	112	0	0	112
Total				
Pick-up Trucks	173	0	0	173
Heavy Trucks	441	0	0	441

SOURCES: Appendix H and EIR Preparers.

Operation Trip Generation and Distribution

After construction of the Project, operations and maintenance traffic would be limited to a few passenger vehicle trips per day. Up to 12 full-time employees would be required for on-site operations of the Project. Many activities would be conducted remotely and on-site personnel would access the site for routine and unscheduled maintenance and repair activities. Therefore, it was conservatively assumed a total of 12 operations and maintenance workers daily would arrive at the Project Site during the a.m. peak hour, and 12 would leave during the p.m. peak hour, traveling both westbound and eastbound on SR 299 depending on the employee's point of origin.

Based on the information above, inbound and outbound Project-generated vehicle trips were calculated for the a.m. and p.m. peak hours. Those numbers are shown below in **Table 3.14-4**.

TABLE 3.14-4
PEAK-HOUR PROJECT TRIP GENERATION – PROJECT OPERATION

Location	A.M. Peak Hour		P.M. Peak Hour	
	Inbound	Outbound	Inbound	Outbound
SR 299 to/from the west				
Pick-up Trucks	8	0	0	8
Heavy Trucks	0	0	0	0
SR 299 to/from the east				
Pick-up Trucks	4	0	0	4
Heavy Trucks	0	0	0	0
Total				
Pick-up Trucks	12	0	0	12
Heavy Trucks	0	0	0	0

SOURCES: Appendix H and EIR Preparers.

3.14.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities.

Impact 3.14-1: The Project could conflict with a program plan, ordinance or policy addressing the circulation system. (*Less-than-Significant Impact*)

Site Clearing and Construction

Highway Level of Service

Temporary increases in traffic due to Project construction have the potential to cause operating conditions (i.e., LOS) to deteriorate on SR 299. **Table 3.14-5** provides the LOS analysis results for the nine study roadway segments of SR 299 for Project construction conditions. As shown in the table, all study roadway segments would continue to operate at an acceptable LOS according to Caltrans' standard (LOS C or better) with the addition of Project construction traffic. As such, the

temporary impact of Project construction on SR 299 would be less than significant. Additional detail is provided in Appendix H.

TABLE 3.14-5
SR 299 PEAK-HOUR LEVEL OF SERVICE – PROJECT CONSTRUCTION

Location	Hourly Capacity	Existing Peak-Hour Volume	Project Construction Peak-Hour Volume	V/C	LOS C or better?
I-5 Junction (Redding)	9,200	2,150	2,670	0.29	Yes
Between I-5 and Hawley Road	9,200	1,150	1,670	0.18	Yes
Between Hawley Road and Old Oregon Trail	9,200	940	1,460	0.16	Yes
Between Old Oregon Trail and Deschutes Road	4,000	490	1,010	0.25	Yes
Between Deschutes Road and Terry Mill Road	4,000	360	880	0.22	Yes
Between Terry Mill Road and Big Bend Road	4,000	320	840	0.21	Yes
Between Big Bend Road and Tamarack Road[a]	4,000	320	840 (W) 682 (E)	0.21 (W) 0.17 (E)	Yes
Between Tamarack Road and Elm Street	4,000	370	732	0.18	Yes
Between Elm Street and Plumas Street (Burney)	4,000	880	1,242	0.31	Yes

NOTE:
[a] Two volumes and v/c are provided for this segment because the Project Site lies within it; Project construction trips would be different depending on whether they are traveling to/from the west or the east of the Project Site.

SOURCES: Transportation Research Board, 2000; Caltrans, 2017; EIR Preparers.

Intersection Level of Service

Temporary increases in traffic due to Project Site preparation (including timber harvesting) and construction have the potential to cause operating conditions (i.e., LOS) to deteriorate on SR 299 where the three Project driveways would provide access to and from the Project Site. **Table 3.14-6** provides the LOS analysis results for the three Project driveways Project construction conditions. As shown in the table, all study roadway segments would continue to operate at an acceptable LOS according to Caltrans' and Shasta County standards (LOS C or better) with the addition of Project construction traffic. As such, the temporary impact of Project construction on operations where the three proposed Project driveways intersect with SR 299 would be less than significant. Additional detail is provided in Appendix H.

TABLE 3.14-6
PEAK-HOUR PROJECT TRIP GENERATION – PROJECT OPERATION

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	Delay (seconds)	LOS	Delay (seconds)	LOS
West Access and SR 299	4.8	A	2.2	A
North Access and SR 299	3.8	A	2.6	A
East Access and SR 299	7.2	A	4.4	A

SOURCES: Appendix H and EIR Preparers.

Transit, Bicycle, and Pedestrian Facilities

As described above in Section 3.14.1.2, *Environmental Setting*, there are no existing or planned bicycle or pedestrian facilities on SR 299 adjacent to the Project Site. Transit service is limited to one bus route that makes only three roundtrip runs per day SR 299 between Redding and Burney, with no bus stops adjacent to the Project Site. Due to the limited provision of alternative transportation facilities, the Project would not result in any conflicts with adopted policies, plans, or programs supporting alternative transportation. Therefore, the impact would be less than significant.

Operation and Maintenance

As shown in Table 3.14-3, the Project's operation and maintenance phase would generate considerably less traffic than the construction phase. Therefore, consistent with the determination for Project construction, the impact on operations where the three proposed Project driveways intersect with SR 299 and on the SR 299 roadway segments would be less than significant for Project operation and maintenance.

Decommissioning and Site Reclamation

Decommissioning and site reclamation impacts would be relatively similar to those identified for construction of the Project, except considerably less intensive in that no concrete batch plant(s), cable delivery, or concrete trucks would be required, and no cable trenching or similar work would occur. Moreover, existing service roads would be used; no new access roads or road widening would be required. As a result, the total number of all trips associated with decommissioning and site restoration would be less than the 93,088 trips estimated for Project construction. Thus, decommissioning of the Project would result in a less-than-significant impact with respect to LOS for roadways.

Mitigation: None required.

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b) Whether the Project would conflict or be inconsistent with CEQA Guidelines §15064.3(b).

Impact 3.14-2: The Project could conflict or be inconsistent with CEQA Guidelines Section 15064.3(b). (*Less-than-Significant Impact*)

As noted above, the California Natural Resources Agency revised CEQA Guidelines Section 15064.3(b) in December 2018 to shift the focus of transportation analyses from driver delay to reduction of GHG emissions based on an evaluation of vehicle miles traveled, or VMT. VMT is a measure of the total number of miles driven to or from a development and is sometimes expressed as an average per trip or per person. The VMT analysis prepared for the Project estimated the total VMT during the two-year construction period to be approximately 4,336,990; VMT during the two-year decommissioning period would be comparable. VMT generated during Project operation would be much less than that generated during Project construction and decommissioning. It was assumed 12 trucks per day would be utilized for operations and maintenance of the proposed project, and that each truck would travel approximately 50 miles per

day from their place of origin to the Project Site for inspection, maintenance and operation, and then travel approximately 50 miles for the return trip. Therefore, the total VMT per day during Project operation is assumed to be 600 for trucks. Per capita daily VMT for the permanent employees at the facility is estimated to be approximately 50. Additional detail on VMT assumptions and calculations for all vehicle and trip types is provided in Exhibit 3 of Appendix H.

As explained in Section 3.14.2, *Significance Criteria*, the County has not adopted VMT significance thresholds and, accordingly, has decided to rely on an established environmental standard that is protective of resources of legislative concern in mandating that lead agencies evaluate VMT, i.e., a GHG emissions threshold. The intent of SB 743 is to encourage land use and transportation planning decisions and investments to reduce VMT and thereby contribute to the reduction of GHG emissions, as required by Assembly Bill 32. Therefore, for purposes of this Project, the Project's impact to VMT would be significant if it would conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs. The evaluation of Impact 3.10-2 in Section 3.10, *GHG Emissions*, concludes that the Project would result in a less-than-significant impact related to a potential conflict with an applicable plan, policy or regulation adopted for the purpose of reducing GHG emissions, and so too would result in a less-than-significant transportation impact relating to VMTs.

Mitigation: None required.

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c) Whether the Project would substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

Impact 3.14-3: The Project would, unless mitigated, substantially increase safety hazards. (*Less than Significant with Mitigation Incorporated*)

The Project would not include a design feature or utilize vehicles with incompatible uses that would create a hazard on the roadways surrounding the Project Site. However, the Project could, unless mitigated, substantially increase hazards to vehicles, bicyclists, and pedestrians traveling on SR 299 due to the proposed use of oversize/overweight vehicles. During Project construction, heavy construction equipment and wind turbine components (e.g., blades, nacelles) would be delivered to (and during decommissioning would be removed from) the Project Site using area roadways, some of which may require transport by oversize/overweight vehicles. The transport of these materials would require transportation permits from Caltrans for oversize/overweight vehicles. Heavy equipment associated with these components would not be hauled to/from the site daily, but rather would be hauled in and out on an as needed basis. The County has determined that the proposed use of oversize vehicles could create a hazard to the public by limiting motorist, bicyclist, and pedestrian views on roadways and by the obstruction of space, which is considered a potentially significant impact.

The need for and number of escorts, California Highway Patrol escorts, as well as the timing of transport, would be at the discretion of Caltrans and Shasta County, and would be detailed in

respective oversize/overweight permits. The Applicant has initiated coordination with the Caltrans' Office of Transportation Permits, and has determined that any specific weight and height limitations would only be determined once a contractor has been selected and a Route Request Permit defining the origin and destination of the equipment/components is requested. Compliance with these permitting and related requirements would reduce potential Project impacts to a less-than-significant level, because they would require the construction contractor to incorporate measures targeted at limiting unnecessary delays and providing safe access through the construction zone for all roadway users (including vehicles, bicyclists, and pedestrians). In appropriate situations, a requirement that a project comply with specific laws or regulations may serve as adequate assurance that no significant impact would result. The County has determined that this is such a situation. Mitigation Measure 3.14-3 would require that all oversize/overweight vehicles used on public roadways during construction obtain required permits and obtain approval of a Construction Traffic Control Plan, as well as identify anticipated construction delivery times, vehicle travel routes, and potential conflicts with other projects generating traffic or delay on SR 299, in advance to minimize the potential hazard to the public associated with limiting motorist, bicyclist, and pedestrian views on roadways and introducing obstructions on SR 299. This would ensure that construction-related oversize/overweight vehicles are in compliance with applicable Vehicle Code sections and Street and Highway Code sections applicable to licensing, size, weight, load, and roadway encroachment of construction vehicles.

Mitigation Measure 3.14-3: Traffic Management Plan.

Prior to the issuance of construction or building permits and prior to the removal of materials from the Project Site during decommissioning, the Applicant shall:

1. Prepare and submit a Traffic Control Plan to Shasta County Public Works Department and the Caltrans offices for District 2, as appropriate, for approval. The Traffic Control Plan must be prepared in accordance with both the Caltrans Manual on Uniform Traffic Control Devices and Work Area Traffic Control Handbook and must include, but not be limited to, the following:

    a. A plan for communicating construction/decommissioning plans with Caltrans, emergency service providers, and residents located in the vicinity of the Project Site.

    b. An access and circulation plan for use by emergency vehicles when lane closures and/or detours are in effect. If lane closures occur, provide advance notice to local fire departments and sheriff's department to ensure that alternative evacuation and emergency routes are designed to maintain response times.

    c. Timing of deliveries to/removals from the Project Site of heavy equipment and building materials;

    d. Directing vehicles, pedestrians, and bicyclists on SR 299 through the construction zone with a flag person;

    e. Providing detours to route vehicular traffic, bicyclists, and pedestrians around lane or shoulder closures, if they occur;

    f. Providing adequate parking for construction trucks, equipment, and workers in the designated staging areas within the Project Site;

g. Placing temporary signage, lighting, and traffic control devices if required, including, but not limited to, appropriate signage along access routes to indicate the presence of heavy vehicles and construction/decommissioning traffic, and the placement of traffic cones to provide temporary left-turn lanes into Project driveways as needed;[1]

h. Preserving access to existing ingress/egress points for all adjacent property at all times; and,

i. Specifying both construction/decommissioning-related vehicle travel and oversize/overweight vehicle haul routes.

2. Obtain all necessary encroachment permits for the work within the road right-of-way or use of oversized/overweight vehicles that will utilize county maintained roads, which may require California Highway Patrol or a pilot car escort. Copies of the approved traffic plan and issued permits shall be submitted to the Shasta County Public Works Department and Caltrans.

3. Consult with the Shasta County Public Works Department and Caltrans to identify any substantial construction activities on SR 299 that may overlap with construction of the Project (e.g., Caltrans SR 299 resurfacing project from Milepost 60.0 to 67.8). Coordinate with the contractor(s) of any identified project(s) to ensure that overlapping construction activities do not cause unnecessary delays on SR 299 or preclude the ability of large vehicles to access the Project Site.

Significance after Mitigation: Less than significant.

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d) Whether the Project would result in inadequate emergency access.

Impact 3.14-4: The Project would, unless mitigated, result in inadequate emergency access. (*Less than Significant with Mitigation Incorporated*)

The Project Site is located in a rural area adjacent to SR 299, with the three Project driveways allowing adequate egress/ingress to the site in the event of an emergency. Additionally, as part of the Project, additional onsite access roadways (internal to the site) would be constructed. During inclement winter months, emergency access could be provided to and through the Project Site via snowcats, ATVs, or helicopter where sufficient clearance is available. Therefore, the development of the Project would not physically interfere with emergency vehicle access or personnel evacuation from the site in these respects.

The Project would not require closures of public roads, which could inhibit access by emergency vehicles. Further, as described above, the Project's proposed use of oversized vehicles during construction and decommissioning would not cause a significant adverse impact on emergency access to or near the Project Site if oversize/overweight vehicle permits and related requirements are complied with. Because Mitigation Measure 3.14-3 includes a plan for communicating

[1] A left-turn lane warrant analysis was conducted for the three Project driveways, which is provided in Appendix H. The analysis found that left-turn lanes would be warranted during Project construction at all three Project driveways during the a.m. peak hour.

construction/decommissioning plans with emergency service providers that operate in the vicinity of the Project Site, and drivers of emergency vehicles can use sirens to clear a path of travel, emergency access would be maintained and response times would be comparable to delay experienced under baseline conditions during other traffic control scenarios that occur on the highway, such as road construction, during Project construction and decommissioning.

Mitigation Measure 3.14-4: Implement the Traffic Management Plan that would be required by Mitigation Measure 3.14-3.

Significance after Mitigation: Less than significant.

3.14.3.3 PG&E Interconnection Infrastructure

As noted in Section 2.4.3, *Project Substation, Switching Station and Interconnection Facilities*, minor modifications or upgrades to the existing 230 kV line may be required to facilitate the Project's interconnection. Upgrades to PG&E facilities are anticipated to include construction and/or reconfiguration of utility line structures and transmission line circuits involving four to six new transmission poles. If required, these new poles would be constructed adjacent to the proposed substation and switching station. These improvements would be contained within the Project Site and would, in and of themselves, result in a less-than-significant impact to Transportation conditions on publicly accessible roadways.

No mitigation would be required specific to the PG&E interconnection infrastructure. As part of the Project, construction, operation, maintenance and decommissioning of the PG&E interconnection infrastructure would result in a less-than-significant impact relating to the potential for a significant conflict with a program plan, ordinance or policy addressing the circulation system and consistency with CEQA Guidelines Section 15064.3(b). If oversized deliveries for the PG&E interconnection infrastructure are required, then deliveries will be described in the Traffic Management Plan and carried forth as described under Mitigation Measures 3.14-3.

3.14.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, construction activities would generate fewer vehicle trips by pick-up trucks and haul trucks than the number estimated for the Project because up to seven fewer turbines and their related infrastructure would be constructed. Similarly, the Decommissioning and Site Reclamation phase would also generate fewer vehicle trips by pick-up trucks and haul trucks than the number estimated for the Project, as the number of turbines and their related infrastructure to be removed and size of the area to be reclaimed would be less than what was identified for the Project. Operation of Alternative 1 would likely result in the same impact as that identified for the Project because no reduction in employee trips to or from the Project Site is anticipated. In sum, the impacts of Alternative 1 on Transportation conditions would be less than or the same as the impacts identified for the Project.

Despite its overall smaller size, Alternative 1 would still substantially increase safety hazards and would, therefore, be required to implement Mitigation Measure 3.14-1.

Alternative 2: Increased Setbacks

Under Alternative 2, construction activities would generate fewer vehicle trips by pick-up trucks and haul trucks than the number estimated for the Project because four fewer turbines and their related infrastructure would be constructed. Similarly, the Decommissioning and Site Reclamation phase would also generate fewer vehicle trips by pick-up trucks and haul trucks than the number estimated for the Project, as the number of turbines and their related infrastructure to be removed and size of the area to be reclaimed would be less than what was identified for the Project. Operation of Alternative 2 would likely result in the same impact as that identified for the Project because no reduction in employee trips to or from the Project Site is anticipated. In sum, the impacts of Alternative 2 on Transportation conditions would be less than or the same as the impacts identified for the Project.

Despite its overall smaller size, Alternative 2 would still substantially increase safety hazards and would, therefore, be required to implement Mitigation Measure 3.14-1.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind project infrastructure would be delivered to the Project site or constructed, operated and maintained, or decommissioned there. No deliveries by oversize/overweight vehicles or other vehicle types and no worker vehicle trips would be made to, from, or within the Project Site relative to baseline conditions. SR 299 and roadways between the Project Site and Redding, Burney, Fall River Mills, and McArthur would not be affected by Project vehicles. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to Transportation.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect related to Transportation. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.14.4 Cumulative Analysis

The geographic area considered in this evaluation of potential cumulative effects is consistent with the study area identified in Section 3.14.1.1 with a particular focus on cumulative projects located within a 6-mile radius of the Project Site. This geographic area was selected based on the professional opinion of the EIR preparers that traffic generated by cumulative projects further than 6 miles from the Project Site would not have a noticeable effect on traffic conditions at study intersections or roadway segments. Potential cumulative effects could result as soon as a Project-related worker or materials delivery begins its trip to the Project Site, and as late as the last Project vehicle to leave during decommissioning and site reclamation. As described in Section 3.14.1, *Setting*, there is no existing significant adverse cumulative condition to which the Project could contribute.

The incremental impacts of the Project, when considered with the incremental impacts of other projects identified in Section 3.1.2.1, *Cumulative Scenario*, would occur primarily during construction and decommissioning, because the Project's operations and maintenance-related traffic would be minimal. Therefore, operation of the Project would result in a less-than-significant cumulative impact.

Potential cumulative construction or decommissioning impacts could result if multiple projects would be generating traffic or transportation demands in the same area at the same time as the Project.

As discussed in Section 3.1.2, *Cumulative Effects Approach*, the cumulative analysis considers a number of different types of cumulative projects, including timber management and harvesting, surface mining and reclamation projects, land use projects identified in either the Shasta County permit system, and other projects within Shasta County with lead agencies other than the County. Due to the rural nature of the Project Site, only one reasonably foreseeable cumulative project was identified within a 6-mile radius of the project site: a Caltrans roadway pavement project scheduled for construction in 2021 on approximately 7 miles of SR 299 between Milepost 60.0 and Milepost 67.8. This project is located along the study roadway segment of SR 299 between Big Bend Road and Tamarack Road (Milepost 60.1 to 73.1) and would occur directly adjacent to the Project Site. Although the precise dates of Project construction activities are unknown at this time, it is possible that the Caltrans pavement project could overlap with Project construction activities. Detailed construction information on the Caltrans project is unavailable at this time, but it would be reasonable to assume that this type of project would require temporary lane closures, which would necessitate the use of temporary traffic controls (e.g., flaggers, traffic cones, signage). These features, in combination with the increased construction traffic generated by the Project, could cause noticeable temporary traffic delays on SR 299, resulting in a potential significant cumulative impact. Furthermore, the Caltrans project could impede access to the Project Site for large trucks hauling materials, as the size of those vehicles may make maneuvers through temporary traffic controls difficult or impossible.

Mitigation Measure 3.14-1 includes a provision that the Applicant and their contractor would coordinate construction plans with any nearby projects with overlapping construction schedules/activities, which would include the Caltrans project described above. With

implementation of Mitigation Measure 3.14-1, the Project's cumulative impact would not be cumulatively considerable.

> **Mitigation Measure 3.14-3:** Implement Mitigation Measure 3.14-1 (Traffic Management Plan).
>
> **Significance after Mitigation:** Less than significant.

3.14.5 References

California Department of Transportation (Caltrans), 2002. Guide for the Preparation of Traffic Impact Studies. Available online at: https://nacto.org/docs/usdg/guide_preparation_traffic_impact_studies_caltrans.pdf. Accessed March 20, 2020.

Caltrans, 2016. Annual Average Daily Truck Traffic on the California State Highway System. Available online at: https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/f0017681-2016-aadt-truck-a11y.pdf. Accessed March 20, 2020.

Caltrans, 2017. 2017 Volumes on California State Highways. Available online at: https://dot.ca.gov/programs/traffic-operations/census/traffic-volumes/2017. Accessed March 20, 2020.

California Governor's Office of Planning and Research (OPR), 2018. Technical Advisory on Evaluating Transportation Impacts in CEQA. Available online at: http://opr.ca.gov/docs/20190122-743_Technical_Advisory.pdf. December 2018.

Redding Area Bus Authority (RABA), 2020. Burney Express Route, Stops, and Schedule. Available online at: https://www.cityofredding.org/departments/redding-area-bus-authority/services/burney-express. Accessed March 19, 2020.

Shasta County, 1997. Shasta County Development Standards Manual. Available online at: https://www.co.shasta.ca.us/docs/libraries/public-works-docs/devstdmanual/sc-development-standards-manual.pdf. Accessed March 19, 2020.

Shasta County, 2004. General Plan Element 7.4, Circulation. Available online at: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/74circ.pdf?sfvrsn=84905afd_0. Accessed March 19, 2020.

Shasta County, 2010. Shasta County 2010 Bicycle Transportation Plan. Available online at: https://www.co.shasta.ca.us/docs/libraries/public-works-docs/docs/2010-sc-bike-plan.pdf?sfvrsn=9542ee89_2. Accessed March 19, 2020.

Transportation Research Board, 2000. Highway Capacity Manual (HCM 2000).

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3.15 Utilities and Service Systems

This section identifies and evaluates issues related to Utilities and Service Systems (including water supplies, wastewater treatment, and solid waste) in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment. The County did not receive any scoping input about these considerations. See **Appendix J**, *Scoping Report*.

Section XIX of the CEQA Guidelines Appendix G environmental checklist, which addresses utilities and service systems, also identifies considerations relating to water and wastewater treatment facilities, stormwater drainage facilities, electric power and telecommunications facilities, natural gas facilities, and regulatory compliance and solid waste. Scoping input and the potential for the Project to result in impacts to these considerations is addressed in Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area.*

3.15.1 Setting

3.15.1.1 Study Area

For the purposes of this analysis, the study area is defined as all relevant utility or service systems (water supply, wastewater, stormwater, solid waste disposal, gas and electrical, and telecommunication utilities) that provide service to the Project Site.

3.15.1.2 Environmental Setting

Water Supply

The Project Site is not currently served by water supply infrastructure. Most water supply in Shasta County comes from surface flows that are subject to existing water rights (Shasta County, 2004). The closest public water supply provider to the Project Site is the Burney Water District, a municipal provider that sources water from deep groundwater wells (Burney Water District, 2020). Groundwater supplies underlying the Project Site are not well defined; however, new onsite well(s) may be used to access local groundwater as the Project's water supply. For more information regarding surface water and groundwater resources, please see Section 3.12, *Hydrology and Water Quality*, and the Project-specific water supply assessment prepared by the Applicant that is provided in **Appendix I**, *Water Supply Assessment*. The County independently reviewed this and other materials prepared by or on behalf of the Applicant and determined them to be suitable for reliance (in combination with other materials included in the formal record) in the preparation of this Draft EIR.

Wastewater Service

Wastewater treatment in Shasta County typically is achieved through on-site disposal systems or community wastewater disposal (Shasta County, 2004). The Project Site is not currently served by wastewater infrastructure; wastewater from the operations and maintenance (O&M) facility

would be processed using an on-site septic system. The closest public wastewater treatment provider to the Project Site is the Burney Water District.

Stormwater Service

Existing stormwater infrastructure at the Project Site predominantly consists of standard culverts that discharge stormwater runoff to intermittent streams along existing access roads throughout the study area. See Section 3.12, *Hydrology and Water Quality*, for more information on stormwater and drainage in the area.

Solid Waste Disposal

Shasta County currently has three landfills in operation: West Central Landfill, Anderson Landfill, and Twin Bridges Monofill. Solid waste and debris produced from the Project during construction would be sent to the Burney Transfer Station, approximately 18 miles northeast of the Project Site, and ultimately would be disposed of or recycled at the Anderson Landfill. The Anderson Landfill is approximately 76 miles away from the Project Site and has a remaining capacity of 10,409,132 cubic yards and a maximum capacity of 16,353,000 cubic yards (CalRecycle, 2019). The Anderson Landfill is permitted to accept construction and demolition waste, in addition to agricultural, industrial, mixed municipal, sludge, biosolids, tires, and wood waste (CalRecycle, 2019).

Energy Service

Pacific Gas & Electric Company (PG&E) provides electricity and natural gas service to Shasta County and would provide electricity to the Project Site. The Project would connect to existing PG&E infrastructure in addition to an existing 230 kV transmission line, which would be located directly adjacent to the proposed switching station. See Figure 2-2, *Site Plan*, for more details. See Section 3.7, *Energy*, for more information on PG&E infrastructure.

Telecommunication Utilities

There are two cellular telecommunications towers located near the Project Site. The International Communications Group, Inc., cell tower is located south of the Project Site and the Hatchet Mountain cell tower, which is owned by the State of California, is located north east of the Project Site. Both are located in unincorporated Shasta County (Cell Reception, 2020).

3.15.1.3 Regulatory Setting

Federal

No federal regulations governing utilities and service systems apply to the Project.

State

California Public Utilities Commission

The California Public Utilities Commission (CPUC) regulates services and utilities and assures California's access to safe and reliable utility infrastructure and services. The essential services

regulated include, electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies. The CPUC implements CEQA for utility construction by PG&E and the other public utilities under its jurisdiction, and regulates the location and relocation of power lines by investor-owned utilities, such as PG&E.

Z'Berg-Nejedly Forest Practice Act of 1973

The Z'Berg-Nejedly Forest Practice Act of 1973 (Pub. Res. Code §§4511–4360.2) and its implementing regulations, the Forest Practice Rules (14 Cal. Code Regs. §895 et seq.), govern the management of privately-owned forestlands in California, including regarding the disposal of related refuse, litter, trash and debris. See Rule 934.5, which establishes the following performance standard in connection with waste disposal: "Non-biodegradable refuse, litter, trash, and debris resulting from timber operations, and other activity in connection with the operations shall be disposed of concurrently with the conduct of timber operations" (14 Cal. Code Regs. §934.5).

Porter-Cologne Water Quality Control Act

The State of California's Porter-Cologne Water Quality Control Act (Water Code §13000 et seq.) grants authority over water quality regulation to the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs). The Central Valley RWQCB serves the Project Site. The Central Valley RWQCB prepares and updates the Water Quality Control Plan (Basin Plan) for the Central Valley, which covers about 60,000 square miles or nearly 40 percent of the State. Additionally, the Central Valley RWQCB issues National Pollutant Discharge Elimination System (NPDES) permits and Waste Discharge Requirements in accordance with the Clean Water Act NDPES program. See Section 3.12, *Hydrology and Water Quality*, which describes the Porter-Cologne Water Quality Control Act in more detail.

Sustainable Groundwater Management Act

On September 16, 2014, Governor Jerry Brown signed into law a three-bill legislative package, composed of Assembly Bill (AB) 1739 (Dickinson), Senate Bill (SB) 1168 (Pavley), and SB 1319 (Pavley), collectively known as the Sustainable Groundwater Management Act (SGMA). SGMA requires governments and water agencies of "high" and "medium" priority basins to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge. As described in Section 3.12, *Hydrology and Water Quality*, the closest defined groundwater basins to the Project Site are Burney Valley Groundwater Basin and Dry Burney Valley Basin beyond the ridge to the east of the Project Site: Neither is a "high" or "medium" priority basin, or a basin in a condition of critical overdraft.

NPDES Construction General Permit

Construction activities disturbing 1 acre or more of land, as proposed for the Project Site, are subject to the permitting requirements of the NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (Construction General Permit) and must apply for Construction General Permit coverage. For all new projects, applicants must electronically file permit registration documents using the Stormwater Multiple Applications and Report Tracking Systems (SMARTS), and must include a Notice of Intent (NOI), risk assessment, site map, and stormwater pollution prevention plan (SWPPP) to be covered by the

General Construction Permit prior to beginning construction. The risk assessment and SWPPP must be prepared by a State-Qualified SWPPP Developer (QSD). See Section 3.12, *Hydrology and Water Quality*, for more detailed discussion relative to water quality.

California Integrated Waste Management Act

The Integrated Waste Management Act of 1989 (Pub. Res. Code §40050 et seq.), as amended, required each local agency to divert 50 percent of all solid waste generated within the local agency's jurisdiction by January 1, 2000. This diversion requirement remains relevant as the basis for subsequent requirements summarized below. This law requires local agencies to maximize the use of all feasible source reduction, recycling, and composting options before using transformation (incineration of solid waste to produce heat or electricity) or land disposal. The Act also resulted in the creation of the State agency now known as CalRecycle.

Under the Integrated Waste Management Act, local governments develop and implement integrated waste management programs consisting of several types of plans and policies, including local construction and demolition ordinances described in more detail below. The Act also set into place a comprehensive statewide system of permitting, inspections, and maintenance for solid waste facilities, and authorized local jurisdictions to impose fees based on the types and amounts of waste generated.

AB 341

AB 341 (Chesbro, 2011), declares that it is the policy goal of the State that not less than 75 percent of solid waste generated be source reduced, recycled, or composted by the year 2020, and annually thereafter. However, it does not permit CalRecycle to establish or enforce a diversion rate on a city or county that is greater than the 50 percent diversion rate established in the Integrated Waste Management Act.

Title 22 California Code of Regulations Division 4.5

Title 22 of the California Code of Regulations, Division 4.5, discusses an array of requirements with respect to the disposal and recycling of hazardous and universal wastes. Specific standards and requirements are included for the identification, collection, transport, disposal, and recycling of hazardous wastes. Additional standards are included for the collection, transport, disposal, and recycling of universal wastes, identified in Section 66273.9 of Title 22 of the California Code of Regulations. Requirements include recycling, recovery, returning spent items to the manufacturer, or disposal at an appropriately permitted facility. Division 4.5 of Title 22 also provides restrictions and standards relevant to waste destination facilities, and provides authorization requirements for various waste handlers.

Title 22 also regulates the treatment and use of recycled water. It lists 40 specific allowed uses of disinfected tertiary recycled water (such as irrigating parks), 24 specific allowed uses of disinfected secondary recycled water (such as irrigating animal feed and other unprocessed crops), and seven specific allowed uses of undisinfected secondary recycled water (such as industrial uses). Certain Project-related construction activities that could utilize recycled water include dust suppression, batch concrete, emergency fire suppression, washing, and other activities.

2016 California Green Building Standards Code

As amended, California's Green Building Standards Code (CALGreen; 24 Cal. Code Regs., Part 11) requires that nonresidential building projects recycle and/or salvage for reuse a minimum of 65 percent of the nonhazardous construction and demolition waste, or meet a local construction and demolition waste management ordinance, whichever is more stringent (24 Cal. Code Regs. §5.408.1). Additionally, 100 percent of trees, stumps, rocks, and associated vegetation and soils resulting primarily from land clearing must be reused or recycled unless contaminated by disease or pest infestation (24 Cal. Code Regs. §5.408.3).

The 2016 version of the code increased the minimum diversion requirement for nonhazardous construction and demolition waste to 65 percent from 50 percent (in the 2013 and earlier versions) in response to AB 341. Therefore, some local ordinances still list minimums that are less stringent than (and therefore overridden by) the statewide requirement.

California Water Code Section 10910

Water Code Section 10910 discusses water supply planning to support existing and planned future uses. It states that any project "subject to the California Environmental Quality Act pursuant to Section 21080.1 of the Public Resources Codes, shall identify any water system that is, or may become as a result of supplying water to the project identified pursuant to this subdivision, a public water system, as defined in Section 10912, that may supply water for the project. If the city or county is not able to identify any public water system that may supply water for the project, the city or county shall prepare the water assessment required by this part after consulting with any entity serving domestic water supplies whose service area includes the project site, the local agency formation commission, and any public water system adjacent to the project site."

Local

Shasta County General Plan

The Public Facilities and Water Resources and Water Quality elements of the Shasta County General Plan (2004) contain information regarding landfill facilities, solid waste disposal, water supply, and wastewater treatment for Shasta County. The Public Facilities element does not contain objectives or policies that would be applicable to the Project or inform the analysis of potential impacts of the Project. The following objectives and policies from the Water Resources and Water Quality element would apply:

Objectives:

***W-9*:** Institute effective measures to protect groundwater quality from potential adverse effects of increased pumping or potential sources of contamination.

Policies:

***W-a*:** Sedimentation and erosion from proposed developments shall be minimized through grading and hillside development ordinances and other similar safeguards as adopted and implemented by the County.

***W-c*:** All proposed land divisions and developments in Shasta County shall have an adequate water supply of a quantity and a quality for the planned uses. Project proponents

shall submit sufficient data and reports, when requested, which demonstrate that potential adverse impacts on the existing water users will not be significant. The reports for land divisions shall be submitted to the County for review and acceptance prior to a completeness determination of a tentative map. This policy will not apply to developments in special districts which have committed and documented, in writing, the ability to provide the needed water supply.

Shasta County Department of Resource Management Environmental Health Division

The Shasta County Environmental Health Division (EHD) provides permits and inspections designed to protect public health and the environment in Shasta County. The water well program was developed to protect the health, safety, and general welfare of the public and the environment, by ensuring that groundwater used by the County will not be polluted or contaminated. Well permits are required for construction, destruction (abandonment), deepening, and repairs of all wells in the County. Work resulting in drilling may only be performed by a C-57 licensed driller/contractor.

In August 2019, EHD implemented the revised Local Agency Management Program (LAMP) for onsite wastewater Treatment Systems (OWTS), which requires a permit for the installation of a new or replacement septic tank and leach field. A permit application must be submitted along with a complete site plan, fees, and soil test data. The EHD is also the Local Enforcement Agency (LEA) for all solid waste matters in Shasta County.

3.15.2 Significance Criteria

CEQA Guidelines Appendix G Section XIX identifies considerations relating to utilities and service systems. See Section 3.1.4, *Environmental Considerations Unaffected by the Project or Not Present in the Project Area*, as it relates to the County's analysis of the potential impacts of this Project to the considerations suggested in CEQA Guidelines Appendix G Section XIX. Otherwise, for purposes of this analysis, a project would result in a significant impact to Utilities and Service Systems if it would:

a) Not have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years;

b) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments; or

c) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals.

3.15.3 Direct and Indirect Effects

3.15.3.1 Methodology

The analysis of direct and indirect impacts on utilities and service systems is based on a review of the Shasta County General Plan guidelines, goals, and policies, as well as other applicable federal, state, and local regulations. The evaluation of impacts was based upon the likelihood of

the Project to increase demand, alter, or interfere with existing utilities and service systems, and/or result in the construction of additional utilities and service systems.

3.15.3.2 Direct and Indirect Effects of the Project

a) Whether the Project would have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years.

Impact 3.15-1: The Project would have sufficient water supplies available to serve the Project for the reasonable and foreseeable future development during normal, dry, and multiple dry years. (*Less-than-Significant Impact*)

The Project would require up to 49 acre-feet of water for site clearing and construction and 5.6 acre-feet of water per year for O&M. For purposes of comparison, an average California household uses between 0.5 acre-foot and 1 acre-foot of water per year for indoor and outdoor use (Water Education Foundation, 2020). Decommissioning requirements are assumed to be comparable to construction requirements.

During construction, operation and maintenance, and decommissioning, water would be purchased from the Burney Water District and trucked onsite. The Burney Water District operates a public water system and sewer system in the unincorporated town of Burney. Burney Water District is an independent special district formed as a county water district under California Water Code Section 30000 et seq. and serves a population of 3,154 from 1,267 service connections (Appendix I).

Although groundwater supplies in this area are not well understood, the Shasta County General Plan reports that "Shasta County has not experienced a level of growth and development resulting in groundwater overdrafting" (Shasta County, 2004). The Sierra Pacific Mill, located near Burney but outside of the Burney Water District service area, withdraws 500,000 gallons per day (1.5 acre-feet per day) from onsite wells within the Burney Creek Valley Groundwater Basin, which the district also uses (Shasta County, 2004, Table W-4; DWR, 2004, 2020a). The Burney Creek Valley Groundwater Basin, Goose Valley Basin, and Dry Burney Creek Valley Basin are the closest DWR 118-desginated groundwater basins to the Project Site. Each is listed as "Very Low Priority" on the SGMA Basin Prioritization Dashboard (DWR, 2020b; Appendix I).

The current production capacity of the three Burney Water District wells is 4,600 gallons per minute (gpm), or 7,420 acre-feet per year (afy), if operated continuously. Because the Project would only temporary require 49 acre-feet of water for construction and would require only up to 5.6 afy for the operation and maintenance period, the estimated annual demand for the Project represents a negligible use compared with existing production capacity.

The Project would not result in additional reasonably foreseeable future development in the area, as it would provide electricity to the regional grid and would not indirectly induce local population growth.

Because the Project is proposed in a rural setting and would not be served by a public water system, a Water Supply Assessment has been prepared for the Project in accordance with Water Code Section 10910 (c)(4). See Appendix I, Water Supply Assessment, for details regarding the definition of a public water system. As described in detail above and further discussed in the Water Supply Assessment, it is expected that the Burney Water District would have sufficient supplies available to serve the lifespan of the Project even in dry and multiple dry years. Therefore, the impact would be less than significant.

Mitigation: None required.

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b) Whether the Project would result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments.

Impact 3.15-2: The Project could result in a determination by a wastewater treatment provider that it has inadequate capacity to serve the Project's projected demand in addition to the provider's existing commitments. (*Less-than-Significant Impact)*

As described above, the majority of water used during construction and decommissioning would be for activities related to fire protection and dust suppression, and would not require treatment as wastewater because this water would be applied to the ground (or to facilities, and later run off to the ground) and most would infiltrate or evaporate. Additional runoff generated by other construction activities or increases in impervious surfaces would be managed and controlled by the SWPPP. During construction, portable toilets would be used by construction workers and would be treated on a regular basis by a licensed contractor with capacity to dispose of sanitary wastewater pursuant to applicable regulations.

Wastewater would also be processed during maintenance and operation from the O&M facility, which would use an onsite septic system. The onsite septic system would be installed in accordance with the rules and regulations of the Shasta County Department of Resource Management's Environmental Health Division. A permit would be required prior to the installation of a new or replacement septic tank and leach field. The Applicant would apply for an Onsite Wastewater Treatment System Permit with the Environmental Health Division and provide a completed site plan, fee, and soil test data.

Because it would be regulated by an Onsite Wastewater Treatment System permit, the Project would not result in a significant reduction on wastewater treatment capacity within Shasta County. Therefore, the Project would not result in a determination by a wastewater treatment provider that it has inadequate capacity to serve the Project's projected demand in addition to its existing commitments; therefore, a less-than-significant impact would occur.

Mitigation: None required.

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c) Whether the Project would generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals.

Impact 3.15-3: The Project could generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals. (*Less-than-Significant Impact)*

During site preparation and construction, approximately 10,000 pounds (5 tons) of solid waste would be generated per week, consisting of construction debris such as scrap wood and metal. The Anderson Landfill has a permitted throughput of 1,850 tons per day (CalRecycle, 2019), and the Project's contribution of approximately 1 ton per day would be a negligible increment during the construction period.

Regarding total permitted capacity of the landfill, this weight estimate is converted to cubic yards by assuming that half of the total weight is scrap metal at 1,000 pounds per cubic yard and the remaining half scrap lumber at 300 pounds per cubic yard (WasteCap Resource Solutions Inc., 2011). Based on these values, the estimated volume of solid waste generated during construction would be 22 cubic yards per week or up to approximately 2,112 cy for a duration of 24 months. During operation, solid waste generation would be significantly less than 1 cubic yard per week, consisting mainly of office trash and paper waste.

All solid waste would be collected by the contractor during construction or by Burney Waste Disposal Inc. during operation. Waste would be transported to the Burney Transfer Station and ultimately recycled or disposed of at the Anderson Landfill in accordance with federal, state, and local solid waste regulations. Decommissioning would generate the same amount of solid waste as construction (approximately 22 cubic yards per week or up to 2,112 cy for a duration of 24 months).

Prior to operation of the Project, the Applicant would prepare a Draft Decommissioning Plan that details a restoration plan and how Project facilities and infrastructure would be removed. The Draft Decommissioning Plan would include plans and procedures for facility dismantling and removal, including disposal and recycling, and would be developed in compliance with standards and requirements at the time of site decommissioning. The Anderson Landfill has an estimated ceased operation date of 2093 with a maximum permitted throughput of 1,850 tons/day, and a remaining capacity of approximately 10,409,132 cubic yards, as of 2015 (the most recent date for which published data was available as of June 24, 2020). The Project would not generate solid waste or debris in an amount that would exceed the capacity of local infrastructure, or impair the attainment of solid waste reduction goals.

Consistent with the requirements of the Z'Berg-Nejedly Forest Practice Act of 1973, all non-biodegradable refuse, litter, trash, and debris resulting from timber harvesting operations would be disposed of concurrently with the conduct of timber operations. In addition, biodegradable waste, consisting of 100 percent of trees, stumps, rocks, and associated vegetation and soils resulting from land clearing would be reused and/or recycled unless contaminated with disease or pest infestation, consistent with the California Green Building Standards Code. In compliance with the California Green Building Standards Code and AB 341, approximately 65 percent of all

nonhazardous construction and demolition waste would be recycled or salvaged for reuse at an appropriate facility. Therefore, the Project would not impair the attainment of these solid waste reduction goals, and the impact would be less than significant.

Mitigation: None required.

3.15.3.3 PG&E Interconnection Infrastructure

The Project would tap into the existing PG&E 230 kV line via an aboveground line tap located directly adjacent to the switching station. Minor modifications or upgrades to the existing 230 kV line may be required to facilitate the Project's interconnection. Upgrades to PG&E facilities are anticipated to include construction and/or reconfiguration of utility line structures and transmission line circuits involving four to six new transmission poles. If required, these new poles are anticipated to occur adjacent to the proposed substation and switching station. The Applicant would construct the switching station and PG&E would construct the electrical connections to its facility. PG&E ultimately would own and operate the switching station and interconnection components.

Although these modifications would result in alterations of an existing electrical facility, the Project would not disrupt service or result in alteration due to an increase in need or lack of capacity. The PG&E interconnection infrastructure for the Project would not result in the need for new or relocated utilities or service systems, would not generate its own water demand that could result in insufficient supplies, and would not result in substantial solid waste generation. The amount of water required and waste generated during construction of these facilities is included in the totals for the Project as a whole and, for the reasons explained in Section 3.15.3.2, *Direct and Indirect Effects of the Project*, impacts would be less than significant.

3.15.3.4 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Alternative 1 would consist only of Project components located south of SR 299. This would include approximately 4,086 acres located south of SR 299, and exclude approximately 378 acres, including seven turbines and associated infrastructure, located north of SR 299. For the purposes of this analysis, it can be assumed that water, wastewater, and hazardous materials–related requirements would be slightly reduced relative to the Project; and that the number of workers and durations of construction, O&M, and decommissioning and site restoration would be substantially the same as for the Project. Impacts related to water and wastewater services would be the same as the Project (less than significant).

It also can be reasonably assumed that solid waste generated during construction and decommissioning would be incrementally less than the Project because there would be less to construct, and therefore, less to remove. The Anderson Landfill would still maintain capacity during construction, O&M, and decommissioning of Alternative 1. Stormwater drainage would

not be required north of SR 299 and Alternative 1 would not result in a need for additional stormwater drainage facilities to serve the Alternative further from what is proposed in the Project. The impact and ground disturbance related to the overhead and underground collector system, access roads, and laydown areas also would be reduced and the impact would remain less than significant.

Alternative 2: Increased Setbacks

Alternative 2 would exclude construction of proposed turbines M03, D05, B01, and K02 based on the setbacks mentioned in Section 2.5.3.3, *Alternative 2: Increased Setbacks*. These setbacks would result in no temporary turbine construction areas, access roads, and/or crane roads for these four turbine work areas. It reasonably can be assumed that the water, wastewater, and hazardous materials would be slightly less than the Project. Stormwater drainage in the form of culverts and ditches along access roads would be reduced, but would not result in the need for additional stormwater drainage facilities. The impact and ground disturbance related to the overhead and underground collector system, access roads, and laydown areas also would be reduced and the impact would remain less than significant for utilities and service systems under Alternative 2.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind project infrastructure would be delivered to the Project site or constructed, operated and maintained, or decommissioned there. No groundwater well, water storage tank, or septic system would be installed onsite, no construction-related or other refuse would be removed from the site. No electric power would be needed at the Project Site, or delivered to the regional grid from the Project Site. Ground clearance would not occur for laydown areas; utility line rights-of-way; or the collector substation, switching station, or O&M facility. No new roads would be constructed within the Project Site, and none of the existing roads would be improved. Existing stormwater drainage patterns on the site would not be affected. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to Utilities and Service Systems.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effect related to Utilities or Service Systems. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.15.4 Cumulative Analysis

The geographic scope of cumulative impact analysis for utilities and service systems includes the service areas of each of the relevant utility or service systems including water supply, wastewater, stormwater, solid waste disposal, electrical, and telecommunication utilities that provide service to the Project site and/or could be affected by the Project. This geographic extent is appropriate because increases in demand are generally limited to the service area of the utility purveyor or service provider. The majority of the less-than-significant impacts on utilities and service systems would result from temporary construction lasting 18 to 24 months. None would require mitigation or be significant and unavoidable. The following impacts are all determined to be less than significant and are discussed cumulatively below.

As discussed above in the context of Impact 3.15-1, the Project would use groundwater sourced from onsite wells or an off-site provider likely to be Burney Water District, which draws water from the Burney Creek Valley Groundwater Basin. None of the groundwater basins in the Burney area are in an overdraft condition. The effects of the existing Hatchet Ridge Wind Project and other industrial groundwater users such as the Sierra Pacific Mill in Burney are accounted for in the baseline conditions (i.e., no overdraft). None of the other reasonably foreseeable projects described in Section 3.1.2.1, *Cumulative Scenario*, would be located within the same groundwater basins that may be used for Project water sources; therefore, no significant cumulative impact would occur. (Less than Significant)

As discussed above in the context of Impact 3.15-2, the majority of workers during construction would be local, so the Project would not cause a population increase that could increase demand for wastewater treatment capacity. Direct Project wastewater treatment needs would be served by a licensed contractor with capacity to dispose of sanitary wastewater pursuant to Shasta County EHD regulations (during construction) and by an onsite septic system (during operation and maintenance and decommissioning). Therefore, the Project would have no contribution to potential cumulative impacts on wastewater treatment capacity. (No Impact)

As discussed above in the context of Impact 3.15-3, the Anderson Landfill has a significant amount of remaining capacity to serve the Project (over 10 million cubic yards out of a total maximum capacity of 16 million cubic yards). The Project would generate approximately 22 cubic yards per week during construction and less than 1 cubic yard per week during operation, all of which either would be recycled or disposed of at the Anderson Landfill. Several of the other reasonably foreseeable projects described in Section 3.1.2.1 also could be served by Anderson Landfill. The Dignity Health North State Pavilion Project, which could be a large solid waste generator, would dispose of waste at the Richard W. Curry Sanitary Landfill, as would all projects within the City of Redding (City of Redding, 2019). No major development in the area of Shasta County in which the Project Site is located is foreseeable that would cause daily or total demand for landfill services to exceed the capacity of Anderson Landfill. Therefore, no significant cumulative impact would occur. (Less than Significant)

3.15.5 References

Burney Water District, 2020. Services, Payments and Rates. Available online at: https://www.burneywater.org/services-payments-and-rates. Accessed March 21, 2020.

California Department of Resources Recycling and Recovery (CalRecycle), 2019. SWIS Facility Detail—Anderson Landfill, Inc. Available online at: https://www2.calrecycle.ca.gov/swfacilities/Directory/45-AA-0020.

California Department of Water Resources (DWR), 2004. Burney Creek Valley Groundwater Basin. Available online at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/2003-B118-Basin-Descriptions/B118-Basin-Boundary-Description-2003---5_048.pdf

DWR, 2020a. Water Management Planning Tool, Bulletin 118 Basin Boundaries. Available online at: https://gis.water.ca.gov/app/boundaries/. Accessed March 28, 2020.

DWR, 2020b. Sustainable Groundwater Management Act SGMA Basin Prioritization Dashboard. Burney Creek Valley (5-048). Available online at: https://gis.water.ca.gov/app/bp-dashboard/final/#. Accessed June 18, 2020.

Cell Reception, 2020. Cell Towers in the City of Burney. Available online at: http://www.cellreception.com/towers/details.php?id=1222923 and http://www.cellreception.com/towers/details.php?id=1013532.

City of Redding, 2019. Dignity Health Redding North State Pavilion Project Draft Environmental Impact Report, Section 5.16, Utilities and Service Systems. Available online at: https://drive.google.com/drive/folders/1uTIPs7hyi1wXAcXAKGIy2-5aL2m6sXvF.

Shasta County, 2004. Shasta County General Plan, as amended through September 2004, Section 6.6, Water Resources. Available online at: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/66water.pdf.

WasteCap Resource Solutions, Inc., 2011. Construction and Demolition Debris Weight to Volume Conversion. Available online at: http://syracuselandbank.org/wp-content/uploads/2014/07/CD-weight-to-volume-calculation-Waste-Cap-from-other-sources.pdf.

Water Education Foundation, 2020. What's an Acre-foot? Available online at: https://www.watereducation.org/general-information/whats-acre-foot. Accessed June 24, 2020.

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3.16 Wildfire

The California Department of Forestry and Fire Protection (CAL FIRE) has assigned a "Very High Fire Hazard Severity Zone" rating throughout Shasta County (Shasta County, 2016). Round Mountain, Montgomery Creek, and Burney all are listed as communities at risk by CAL FIRE's Office of the State Fire Marshal (CAL FIRE, 2019a). This section identifies and evaluates issues related to wildfire in the context of the Project and alternatives. It includes information about the physical and regulatory setting and identifies the criteria used to evaluate the significance of potential impacts, the methods used in evaluating these impacts, and the results of the impact assessment.

The Shasta County Fire Department provided initial input and recommendations related to fire prevention for the County's environmental review process shortly after the CUP application was filed for the Project (Shasta County Fire Department, 2018). Later, in response to the issuance of notice of intention to prepare this Draft EIR, the County received scoping input noting that existing conditions are windy and the terrain is steep (up to 25 percent grade), and that there is a history of lightning strikes and fires, both natural and human-caused, in the area. Options for ingress and egress are limited. Furthermore, the existing forest, which was planted after the Fountain Fire, is mostly pine. Trees are approximately 20 to 30 feet tall and grow 3 to 4 feet apart, deer brush and manzanita grow in the understory, and years' worth of pine needles cover the forest floor. Input as to potential impacts and mitigation measures also was received.

All scoping input received, including regarding Wildfire, is provided in Section 4.1 of the Scoping Report, a copy of which is provided as **Appendix J**, *Scoping Report*.

3.16.1 Setting

3.16.1.1 Study Area

The study area comprises the Project Site and the surrounding areas that could be affected by wildland fire as a result of the Project or an alternative. Information provided in this section is based on existing publications, including CAL FIRE's Shasta-Trinity Unit (SHU) 2018 Strategic Fire Plan, the Shasta County Community Wildfire Protection Plan, and the Shasta County General Plan. The Project would be located within SHU Battalion 2, as defined in CAL FIRE's SHU 2018 Strategic Fire Plan, which describes the areas surrounding the Project Site that could be affected by wildland fire. Battalion 2 generally is located south of the Pit River arm of Shasta Lake, east of Interstate 5 (I-5) and the City of Redding, north of Whitmore Road, and west of Hatchet Mountain. During the fire season, the CAL FIRE Shasta Trinity Unit has access to 19 engines, 3 dozers, 12 hand crews, 1 air tactical plane, and 2 air tankers (CAL FIRE, 2018).

3.16.1.2 Environmental Setting

Fire History and Historical Fire Regime

Shasta County has experienced several major fires in the last 30 years. The largest and most recent fire was the Carr Fire in 2018, which burned a total of 229,651 acres; this occurred outside

of the study area and to the west of Redding (the Project Site is located east of Redding) (CAL FIRE, 2020). Within the "Timber East" area of the county, large fires have included the 1998 Burney Fire (3,264 acres), the 1992 Fountain Fire (60,290 acres), the 2012 Ponderosa Fire (27,676 acres), and the 2014 Eiler Fire (32,416 acres) (CAL FIRE, 2018). The Fountain Fire originated approximately 1.5 miles away from the Project Site at Round Mountain. As seen in this portion of Shasta County's fire history, with heavy fuel loading, hot temperatures, critically low humidity, and strong north winds, the study area has the potential to face a major wildfire threat (Shasta County, 2016).

The continued urbanization of the Shasta-Trinity Unit's wildland areas is expected to significantly increase both the ignition potential of and damage from wildfires. About 90 percent of major fires in the county have human-related ignition sources include burning of debris, equipment use, vehicle, and arson. Lightning causes the remaining 10 percent of wildfires in Shasta County (Shasta County, 2018). Periodic droughts contribute to the increase in fires due to drier than normal fuel conditions. The heavy fuel loading, hot temperatures, critically low humidity, and strong north winds characteristic of Shasta County contribute to the ongoing major wildfire potential (Shasta County, 2016).

Wildfire Behavior and Fire Hazard Mapping

Wildfire behavior is dependent on a number of biophysical (climate, topography, and vegetation) and anthropogenic (human-influenced) factors. The biophysical variables include fuels (vegetation composition, cover, and moisture content), climate (weather, wind velocity and humidity), topography (slope and aspect), and ignition sources (e.g., lightning). Anthropogenic variables consist of human activities (e.g., arson, smoking, and power lines) and management (wildfire prevention and suppression efforts). These factors are described below.

Temperature, Humidity, and Precipitation

Shasta County's climate generally is characterized by warm, dry summers and cool, wet winters. The average temperature and precipitation vary greatly within the watershed due to elevation ranges from 340 to 7,300 feet above sea level. Elevations within and near the Project Site range from approximately 3,000 to 6,600 feet (Stantec and Pacific Wind Development, LLC, 2018). The average high temperatures in July range from 80°F (at high elevations) to 99°F in the valley. The average low temperatures in December range from 21°F to 55°F. Relative humidity during the summer months is usually less than 30 percent during the day and rises to about 50 percent at night. Winter humidity usually exceeds 50 percent (Shasta County, 2016). Humidity affects the moisture level of vegetation (fuels), and low humidity levels lead to dry fuels that can ignite more easily and burn more quickly than when humidity levels are high (NPS, 2017).

Moderate to heavy amounts of snowfall are common above 3,000 feet. As described in Section 3.12, *Hydrology and Water Quality*, annual total precipitation (including rain and snow) measured at Round Mountain (3 miles west of the Project Site) is 63 inches on average (WRCC, 2020a). By contrast, the annual average precipitation measured in Burney (approximately 6 miles east of the Project Site) is just 28 inches, with annual totals of less than 11 inches in some recent drought years (WRCC, 2020b). Thus, eastern portions of the county, including some eastern

locations within the Project Site, are likely to receive considerably less precipitation due to rain shadow effects associated with the mountainous terrain, and when drought conditions are present in Shasta County, total annual precipitation can be relatively very low.

Wind

Winds are generally out of the west, southwest 5 to 12 miles per hour (mph). Occasionally light east winds occur in the morning, and winds then shift to a west/southwest direction in the afternoon and can reach speeds of 15 to 20 mph, generally up slope and up canyon. North wind events occur periodically throughout the fire season and can reach the 10 to 40 mph range with associated higher gusts. These winds frequently switch to the northeast and strengthen after dark, with occasional stronger winds reaching 50 mph in the Hillcrest/Round Mountain area between 2:00 am and sunrise (CAL FIRE and Shasta County Fire, 2018).

Topography

Topography and elevation vary greatly in the study area, which consists of several mountainous ridgelines, rugged and steep terrain, and elevations above 3,000 feet (CAL FIRE and Shasta County Fire, 2018). Within the Project Site, steep slopes are present along the North Fork of Little Cow Creek, on the south side of Lookout Mountain, along Cedar Creek, along the South Fork of Montgomery Creek, and along the North Fork of Montgomery Creek. Terrain type has a strong influence over fire behavior, and steep terrain can encourage the spread of fire when other factors such as fuels also are present. Fires can spread quickly up vegetated slopes because fuels are pre-heated by rising hot air from the active fire below (NPS, 2017).

Fuels

Fuels are made up of various components of vegetation, live and dead, that occur on a given site. Wildfire is a natural component in the evolution of vegetation of Shasta County. As described in Section 3.4, *Biological Resources*, the majority of the Project Site includes mixed conifer forests including ponderosa pine, white fir, and douglas fir. The size of these trees varies depending on whether the forest burned or was recently logged. The density of understory varies but is composed of mostly understory shrub and herbaceous vegetation that helps create ladder fuels and difficult firefighting conditions (Shasta County, 2016). Chaparral and woodland are found interspersed among the mixed conifer forest.

The SHU 2018 Strategic Fire Plan classifies the forested area east of Redding, where the study area is located, as “Timber East,” a mixed species conifer forest mostly managed for timber production. Slash (coarse and fine woody debris generated during logging operations) and brush (undergrowth) are part of the fuel component. Fire behavior fuel model 9 (Hardwood or Long Needle Pine Timber Litter) and National Fire Danger Rating System (NFDRS) fuel model U are used in this area. Fire behavior fuel model 9 is described in the following way: “Fires run through the surface litter faster than in model 8 and have longer flame lengths. Both long-needle conifer and hardwood stands are typical. Closed stands of long-needled pine like ponderosa, Jeffrey, and sugar pine and hardwood stands of oak, madrone and tanoak are grouped in this model. Concentrations of dead-down woody material will contribute to possible torching of trees, spotting, and crowning” (Anderson, 1982). Out of the Timber group fuel models, fuel model 9 is

ranked in the middle (between fuel model 8 and fuel model 10) in terms of the rate of fire spread and flame length.

Fuel model U is described as follows: "Closed stands of western long needled pines where ground fuels are primarily litter and small branchwood. Grass and shrubs are absent except in natural openings" (National Wildfire Coordinating Group, 2015). These fuel models describe typical conditions over large areas, and location-specific conditions can vary within areas assigned these models. However, overall, they accurately describe the fuel types in the study area.

At lower elevations outside of the Project Site, stands are often composed of ladder fuels, creating the potential for the initiation of crown fires.[1] Vegetation along the southwest area of Battalion 2 (i.e., closer to Redding) include grass and oak woodland up to 1,000 to 1,500 feet in elevation. Vegetation within the elevations of 1,000 to 2,000 feet consists of predominantly chaparral or dense shrubland habitat (i.e., manzanita), which typically occurs on steep hillsides and are prone to burning intensely. The chaparral brush then transitions into mixed conifer and oak in the communities of Hillcrest and Oak Run (CAL FIRE and Shasta County Fire, 2018). The mixed conifer habitat extends along steep slopes, including evergreen oaks, such as Interior live oak or Canyon live oak, and pines, such as Foothill pine or Ponderosa pine. Thus, there is some potential for fires ignited offsite to spread to the Project Site or nearby areas at similar elevations.

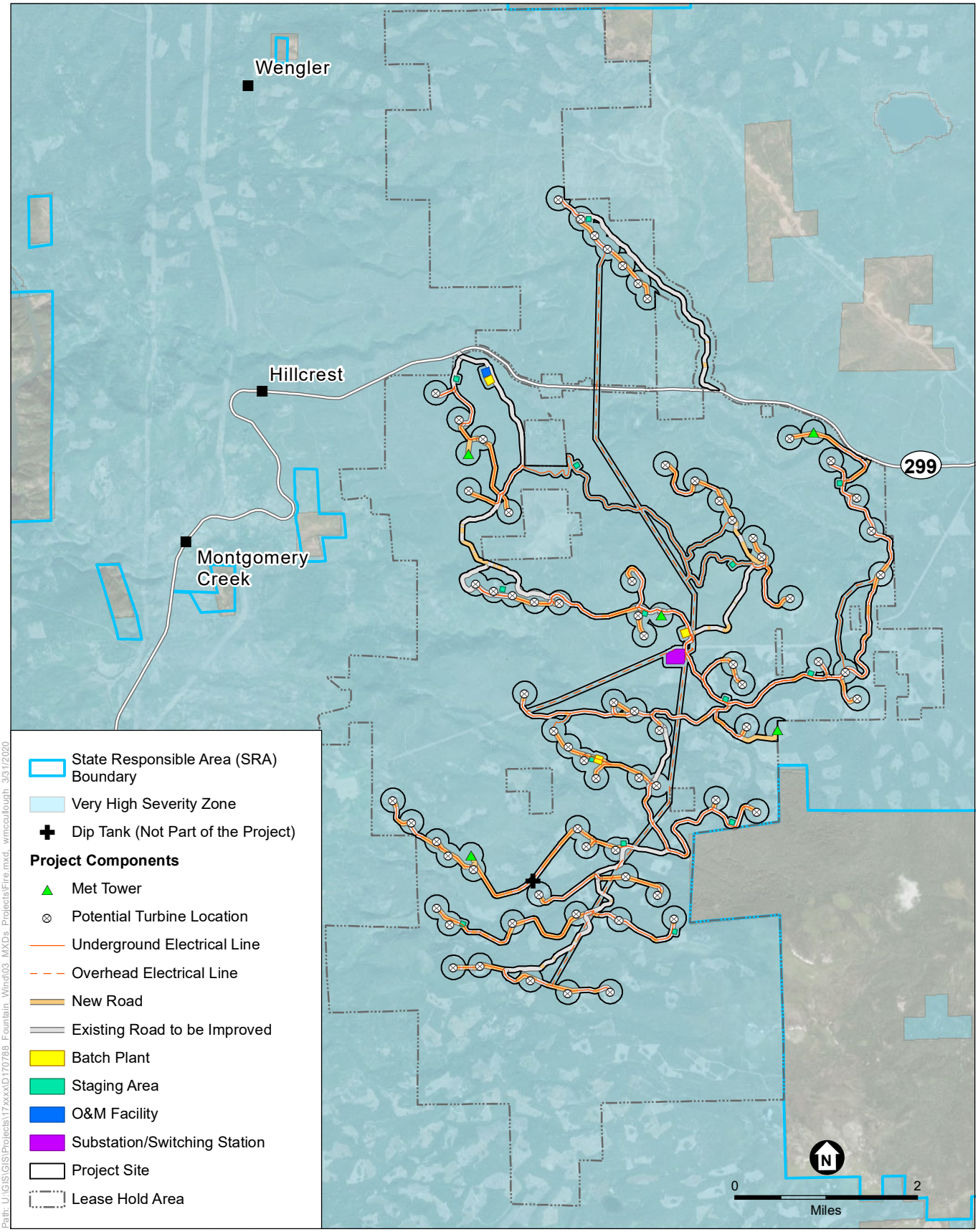
CAL FIRE Hazard Severity Zones

CAL FIRE has adopted Fire Hazard Severity Zone (FHSZ) mapping for State Responsibility Area (SRA) throughout the state. These maps rate wildfire hazards as "moderate," "high," or "very high" based on fuel loading, slope, fire weather, and other relevant factors. As shown in **Figure 3.16-1**, *CAL FIRE Fire Hazard Severity Zones*, the entire Project Site is within an SRA that is mapped as a very high FHSZ. No part of the Project Site would be located within a Local Responsibility Area (LRA).

California Public Utilities Commission–Designated Wildlife Hazard Zones

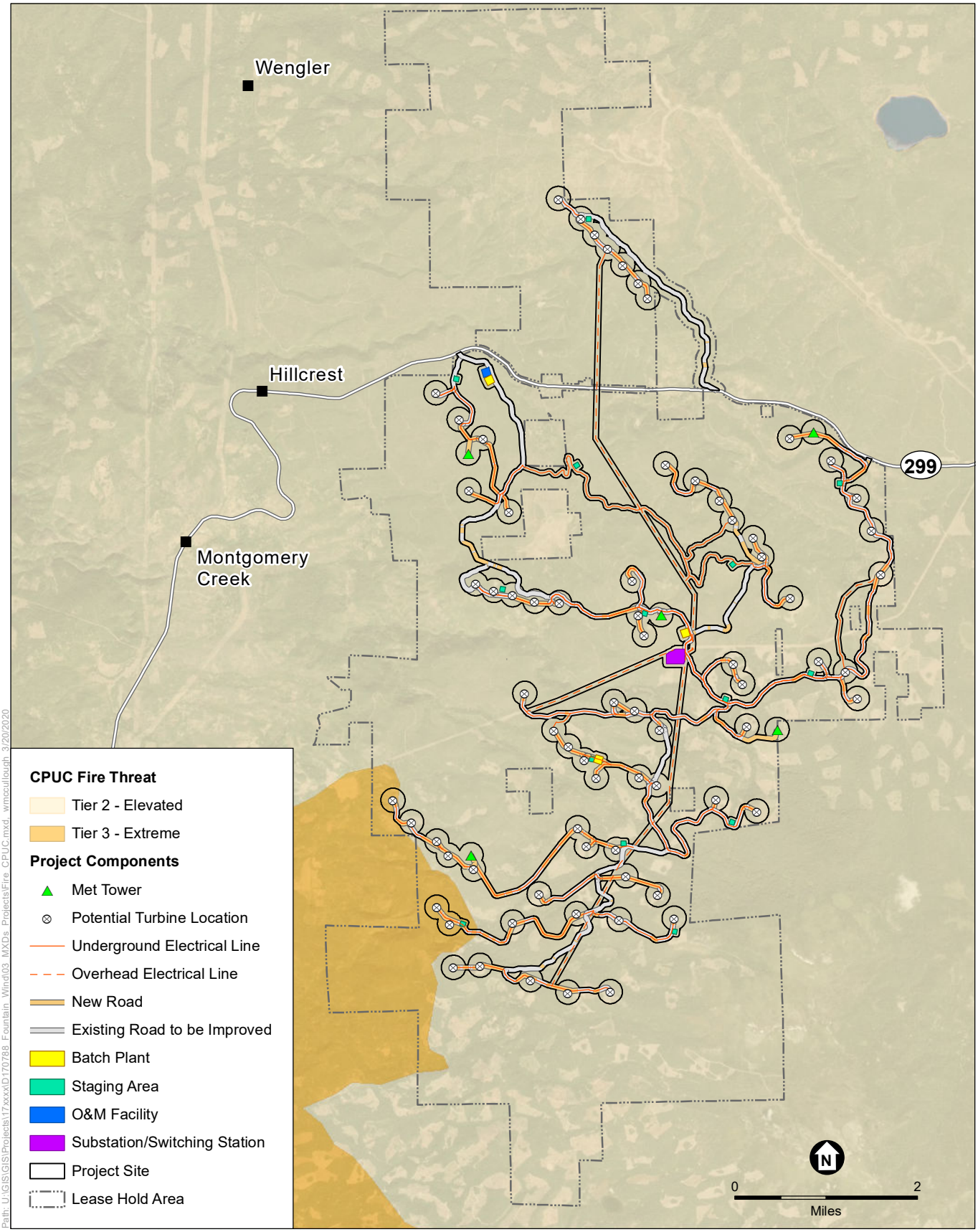
In response to Fire Safety Rulemaking of the California Public Utilities Commission (CPUC), the CPUC mapped high fire threat areas where more stringent inspection, maintenance, vegetation clearance, and wire clearance requirements (as required by CPUC General Orders 95, 165, and 166, described below) would be implemented due to the elevated risk for a devastating wildfire and damage to electrical lines. The CPUC High Fire Threat District Map identifies three tiers of elevated risk for fires associated with utilities. As shown in **Figure 3.16-2**, *CPUC Fire Threat*, the entire Project Site is located within Tier 2 Fire Threat District except for turbine locations M03, N01, and N01A which are within a Tier 3 fire district. Tier 2 areas are defined as areas "where there is an elevated risk (including likelihood and potential impacts on people and property) from wildfires associated with overhead utility power lines. Tier 3 areas are defined as areas "where there is an extreme risk (including likelihood and potential impacts on people and property) from utility associated wildfires" (CPUC, 2020).

[1] Crown fires are fires that burns in the crowns of trees and shrubs, and are usually ignited by a surface fire. Crown fires are common in coniferous forests and chaparral-type shrublands.



Fountain Wind Project

Figure 3.16-1
CalFire - Fire Hazard Severity Zones



Fountain Wind Project

Figure 3.16-2
CPUC Fire Threat

Factors Contributing to Impacts from Wildfire

Land Use Planning and Population

Land use in the Project Site is exclusively managed forest lands. Surrounding the Project Site, land use includes mostly managed forest lands and scattered rural communities, including Moose Camp (75 people, adjacent to the Project Site), Montgomery Creek (163 people, 2 miles west of the Project Site), and Round Mountain (155 people, 5 miles southwest of the Project Site). Each of these communities is located within a Wildland-Urban Interface (WUI) Intermix area, defined as an area with greater than 6.18 houses per square kilometer and greater than or equal to 50 percent cover of wildland vegetation (USFS, 2015). Therefore, the Project Site is located adjacent to an area designated as a WUI Intermix. Burney, while not considered a WUI Intermix area, is the largest town in the Project vicinity with a population of just over 3,000. It is located approximately 5.5 miles east of the Project Site.

Transportation and Emergency Access

As described in Section 3.14, *Transportation*, the primary road within the Project Site is State Route (SR) 299, which has one travel lane in each direction and paved shoulders. In the event of an evacuation from any of the communities listed above, SR 299 would be the primary evacuation route. Moose Camp residents would typically use Moose Camp Road for egress to SR 299, but if necessary could use G Line Road, which runs through the Project Site, for alternative access to SR 299. No other communities would use roads internal to the Project Site for evacuation.

Impact of Wildfire on Air Quality

As wildfires burn fuel, large amounts of carbon dioxide, black carbon (a pure carbon component of fine particulate matter typically present in soot), brown carbon (along with black carbon, a heat-trapping substance that contributes to climate change), and ozone precursors are released into the atmosphere. Additionally, wildfires emit a substantial amount of volatile and semi-volatile organic materials and nitrogen oxides that form ozone and organic particulate matter. These emissions can lead to harmful exposures for first responders, nearby residents, and populations in regions that are farther from wildfire (NOAA, 2018). Exposure to these pollutants can cause asthma attacks, coughing, and shortness of breath. Chronic exposure to these pollutants can increase the risk of developing chronic health conditions such as heart disease, diabetes, and cancer (Hamers, 2018; Milman, 2018). The pollutants that contribute to adverse human health effects are described in more detail in Section 3.3, *Air Quality*. The pollutants that contribute to climate change are described in Section 3.10, *Greenhouse Gas Emissions*.

Hydrology, Drainage, and Landslide Potential

As described in detail in Section 3.12, *Hydrology and Water Quality*, there are approximately 8 miles of streams, creeks, and intermittent streams within the Project Site. Multiple surface waters generally flow from east to west/northwest through the Project Site. While the Project Site is located in an area of minimal flood risk, there is potential for flood flows within the Project Site to be flashy in the winter months, with substantial surface runoff flowing across the Project Site toward streams that ultimately feed into the Sacramento River. Timber harvesting activities

in the region have affected surface waters through delivery of silt, sediment, and increasing turbidity through runoff; therefore, it can be expected that vegetation losses due to fire may also result in erosion potential and contribute silt and sediment to local waters.

As described in Section 3.9, *Geology and Soils*, the Shasta County General Plan mentions that landslides are known to occur throughout the county, and are especially prevalent in its northern and eastern areas. Available geologic mapping shows no landslide deposits within the Project Site (Dupras, 1997). However, according to topographic maps provided by the U.S. Geological Survey (USGS), the Project Site includes relatively steep slopes (USGS, 2018a, 2018b) where landslides, debris flows, or rock falls could occur.

3.16.1.3 Regulatory Setting

Federal

National Fire Plan

The National Fire Plan (NFP) was created to address fire protection strategies for rural communities. Together, the USDA Forest Service and the Department of the Interior are working to successfully implement key points outlined in the NFP, including firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability (USDA, 2002).

National Cohesive Wildland Fire Management Strategy

The Federal Wildland Fire Management Policy is intended to provide strategic consistency among federal agency fire management programs. The *Guidance and Implementation of Federal Wildland Fire Management Policy* (USFS et al., 2009) replaces the *Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy* (National Association of State Foresters et al., 2003) and clarifies changes that have occurred since 2003, while providing revised direction for consistent implementation of the *Review and Update of the 1995 Federal Wildland Fire Management Policy* (USDOI, 2001).

North American Electric Reliability Corporation Standards

To improve the reliability of regional electric transmission systems, the North American Electric Reliability Corporation (NERC) developed a transmission vegetation management program for all transmission lines operated at 200 kilovolts (kV) and above, and to lower voltage lines designated by the Regional Reliability Organization as critical to the reliability of the regional electrical system. Developed in 2006, requirements of the program govern clearances between vegetation and any overhead, ungrounded supply conductors must be identified and documented, while considering transmission line voltage; effects of ambient temperature on conductor sag under maximum design loading; fire risk; line terrain and elevation; and effects of wind velocity on conductor sway. The clearances identified must be no less than those set forth in Institute of Electrical and Electronics Engineers Standard 516-2003.

State

2018 Strategic Fire Plan for California

Developed by the Board of Forestry and Fire Protection (the Board), the Strategic Fire Plan outlines goals and objectives to implement CAL FIRE's overall policy direction and vision. The 2018 Plan demonstrates CAL FIRE's focus on: (1) fire prevention and suppression activities to protect lives, property, and ecosystem services; and (2) natural resource management to maintain the State's forests as a resilient carbon sink to meet California's climate change goals and to serve as important habitat for adaptation and mitigation.

Through the Strategic Plan, CAL FIRE implements and enforces the policies and regulations set forth by the Board and carries forth the mandates of the Governor and the Legislature (CAL FIRE and Shasta County Fire, 2018). The plan focuses on promoting interagency coordination, participating in the development of regional and local planning efforts, sharing risk assessment data, integrating fuels management practices across jurisdictions, and providing the appropriate level of resources and preparedness to enable fire suppression activities and post-fire recovery at the unit level. The goals and objectives of the Plan would not directly apply to the Project.

Unit Plans are developed and updated in order to implement the programs and goals of the 2018 Strategic Fire Plan. The 2018 Shasta-Trinity Unit Strategic Fire Plan outlines strategies for how the Shasta-Trinity Unit will implement and meet the goals in the overall Strategic Fire Plan (CAL FIRE and Shasta County Fire, 2018). The Shasta-Trinity objectives focus on coordination with relevant stakeholders, increasing communication and planning coordination within communities, and improving the prescribed burning program. The goals and objectives would not be directly applicable to the Project.

California Public Utilities Commission General Orders

The California Public Utilities Commission (CPUC) regulates private investor-owned utilities in the state of California, including electric power companies like PG&E as well as natural gas, telecommunications, and water companies. Rules established by the CPUC are called "General Orders" or "GOs." PG&E's construction of the electrical connections to its infrastructure (as described in Section 2.4.3, *Project Substation, Switching Station and Interconnection Facilities*. Would be subject to the CPUC General Orders summarized below because PG&E is an investor-owned utility. Aspects of the Project to be constructed by the Applicant, such as the switching station and collector lines) would not be subject to the General Orders because the Applicant is not an investor-owned utility.

General Order 95

CPUC General Order 95 applies to construction and reconstruction of overhead electric lines. The replacement of poles, towers, or other structures is considered reconstruction and requires adherence to all strength and clearance requirements of this order. CPUC Decision 17-12-024 created enhanced requirements under Rule 18A, Rule 35, and Rule 38, which apply to overhead electric lines located in Tier 2 or Tier 3 High Fire Threat Districts (HFTDs). The CPUC has promulgated various rules to implement the fire safety requirements of General Order 95, including the following (CPUC, 2018):

- Rule 18A, which requires utility companies take appropriate corrective action to remedy Safety Hazards and General Order 95 nonconformances. Additionally, this rule requires that each utility company establish an auditable maintenance program.
- Rule 31.2, which requires that lines be inspected frequently and thoroughly.
- Rule 35, which requires that vegetation management activities be performed in order to establish necessary and reasonable clearances. These requirements apply to all overhead electrical supply and communication facilities that are covered by this General Order, including facilities on lands owned and maintained by state and local agencies.
- Rule 38, which establishes minimum vertical, horizontal, and radial clearances of wires from other wires.

General Order 165

General Order 165 establishes requirements for the inspection of electric distribution and transmission facilities that are not contained within a substation. Utilities must perform "Patrol" inspections, defined as a simple visual inspection of utility equipment and structures that is designed to identify obvious structural problems and hazards, at least once per year for each piece of equipment and structure. "Detailed" inspections, where individual pieces of equipment and structures are carefully examined, are required every 5 years for all overhead conductor and cables, transformers, switching/protective devices, and regulators/capacitors. By July 1 of each year, each utility subject to this General Order must submit an annual report of its inspections for the previous year under penalty of perjury (CPUC, 2017a).

General Order 166

General Order 166 Standard 1.E requires that Investor Owned Utilities (IOUs)2 such as PG&E develop a Fire Prevention Plan, which describes measures that the electric utility will implement to mitigate the threat of power line fires generally. Additionally, this standard requires that IOUs outline a plan to mitigate power line fires when wind conditions exceed the structural design standards of the line during a Red Flag Warning[3] in a high fire threat area. Fire Prevention Plans created by IOUs are required to identify specific parts of the utility's service territory where the conditions described above may occur simultaneously. Standard 1 also requires that utilities prepare an emergency response plan. PG&E's Emergency Response Plan, prepared in compliance with Standard 1, is described below. Standard 11 requires that utilities report annually to the CPUC regarding compliance with General Order 166 (CPUC, 2017b). In compliance with Standard 1.E of this General Order, PG&E adopted a Fire Prevention Plan on September 30, 2017.

PG&E Company Emergency Response Plan

PG&E's Company Emergency Response Plan describes and formalizes PG&E's in-place plans and protocols for response to emergencies. The identifies potential hazards, available resources to respond to emergencies, internal communication protocols, and operational structure. Additionally, PG&E's Wildfire Safety Operations Center operates 24-hours a day during wildfire season (PG&E, 2018).

2 Investor-owned utilities (IOUs) are private electricity and natural gas providers. The CPUC oversees IOUs.

3 A Red Flag Warning is issued by the National Weather Service to alert fire departments of the onset, or possible onset, of critical weather and dry conditions that could lead to rapid or dramatic increases in wildfire activity.

PG&E Fire Prevention Plan

PG&E prepared a Fire Prevention Plan in compliance with CPUC Decision 12-01-032 (Fire Safety Order), Standard 1.E of General Order 166, and Senate Bill 1028. The Fire Prevention Plan summarizes PG&E's fire prevention and safety procedures and programs which include, but are not limited to: fire threat and risk area mapping, fire prevention pre-planning, enhanced fire detection efforts, building resiliency (including a wood pole test and treat program), operational practices to reduce the risk of fires, overhead inspections and patrols, fire prevention outreach and training programs, as well as pro-active responses to fire incidents (PG&E, 2017).

PG&E's operational practices consider environmental conditions such as vegetation type, vegetation moisture content, relative humidity, temperature, and wind conditions. Considering these variables, PG&E created Utility Standard S1464, "Fire Danger Precautions in Hazardous Fire Areas," which includes operational requirements for working and operating in areas that are considered high fire risk during the fire season (these areas are designated in Attachment 3 to the Fire Prevention Plan as either "Extreme" or "Very High" fire danger). According to Attachment 3, the Project is proposed in an area rated as "Very High." Utility Standard S1464 requires that crews working in these areas in the fire season carry firefighting equipment; prohibits personnel traveling in these areas from burning, welding, blasting, smoking, and driving off cleared road; and restricts testing any section of line that relays until the line has been patrolled and all trouble cleared.

California Emergency Response Plan

Pursuant to the Emergency Services Act (Government Code §8550 et seq.), California has developed an Emergency Plan to coordinate emergency services provided by federal, State, and local governmental agencies and private persons. The plan is administered by the State Office of Emergency Services (OES). OES coordinates the responses of other agencies, including the United States Environmental Protection Agency, California Highway Patrol, California Department of Fish and Wildlife, the Regional Water Quality Control Boards (RWQCBs) (for this Project, the Central Valley RWQCB), the local air districts (for this Project, the Shasta County Air Quality Management), and local agencies. The State Emergency Plan defines the "policies, concepts, and general protocols" for the proper implementation of the California Standardized Emergency Management System (SEMS). The SEMS is an emergency management protocol that agencies within the State of California must follow during multi-agency response efforts.

Fire Protection in California Fire Code and Public Resources Code

The California Fire Code is contained within Title 24, Part 9 of the California Code of Regulations. Based on the International Fire Code, the California Fire Code is created by the California Buildings Standards Commission and regulates the use, handling, and storage requirements for hazardous materials at fixed facilities. Similar to the International Fire Code, the California Fire Code and the California Building Code use a hazards classification system to determine the appropriate measures to incorporate to protect life and property.

The California Public Resources Code includes fire safety provisions that apply to SRAs during the time of year designated as having hazardous fire conditions. During the fire hazard season,

these regulations restrict the use of equipment that may produce a spark, flame, or fire; require the use of spark arrestors on equipment that has an internal combustion engine; specify requirements for the safe use of gasoline-powered tools in fire hazard areas; and specify fire-suppression equipment that must be provided on-site for various types of work in fire-prone areas. Additional codes require that any person who owns, controls, operates, or maintains any electrical transmission or distribution line must maintain a firebreak clearing around and adjacent to any pole, tower, and conductors that carry electric current as specified in Pub. Res. Code §§4292 and 4293. Section 4292 requires that a 10-foot zone around the base of poles be cleared of all flammable vegetation. The State's Fire Prevention Standards for Electric Utilities (14 Cal. Code Regs. §§1250–1258) provide specific exemptions from electric pole and tower firebreak and electric conductor clearance standards and specifies when and where standards apply.

Pub. Res. Code §4119 authorizes CAL FIRE or its authorized agent to inspect properties to determine whether they comply with state forest and fire laws, regulations, or use permits. Section 4427 limits the use of any motor, engine, boiler, stationary equipment, welding equipment, cutting torches, tarpots, or grinding devices which may generate a spark or flame if the equipment is located on or near forested land or land covered in bush or grass. Section 4427 establishes requirements such as clearing flammable material within 10 feet of the area of operation, as well as carrying of fire response equipment such as a shovel, backpack pump water type fire extinguisher.

Pub. Res. Code §4428 limits industrial operations by requiring certain firefighting equipment to be used when operating internal combustion engines on or near land covered by forest bush or grass between April 1 and December 1 of any year, or other times when ground litter and vegetation could sustain combustion and facilitate the spread of fire. Section 4428 requires that such work provide and maintain the following tools:

- A sealed box of tools containing a backpack pump-type fire extinguisher filled with water, two axes, two McLeod fire tools, and a shovel for each worker onsite must be in near the operating area in a manner that would be accessible in the event of a fire.
- At least one serviceable chainsaw or timber felling tools must be provided and maintained.
- Each passenger vehicle must be equipped with a shovel and an ax, and every other vehicle or tractor must have a shovel.

Pub. Res. Code §4431 requires users of gasoline-fueled internal combustion-powered equipment located within 25 feet of forest, brush, or grass to keep firefighting tools at the immediate location of use. The Director of Forestry and Fire Protection administers and specifies the type and size of fire extinguisher necessary to provide at least minimum assurance of controlling fire caused by use of portable power tools under various climatic and fuel conditions. In addition, Section 4442 restricts the use and operation of any internal combustion engine that uses hydrocarbon fuels on any forest, brush, or grass areas unless the engine is equipped with a spark arrestor, as defined in Pub. Res. Code §4442(c) and pursuant to §4443.

Defensible Space and the Fire Safe Regulations

State law requires a minimum clearance (defensible space) of 100-feet around structures (Pub. Res. Code §§4290, 4291). Implementing regulations (the "Fire Safe Regulations") provide

related requirements to be implemented in a SRA including road standards for fire equipment access (14 Cal. Code Regs. §1273 et seq.); standards for signs identifying streets, roads, and buildings (14 Cal. Code Regs. §1274 et seq.); requirements for minimum private water supply reserves for emergency fire use (14 Cal. Code Regs. §1275 et seq.); and requirements for fuel breaks such as defensible space and greenbelts (14 Cal. Code Regs. §§1272, 1276 et seq.).

Forest Practice Act and the Forest Practice Rules

The Z'Berg-Nejedly Forest Practice Act of 1973 (Pub. Res. Code §§4511–4360.2) and its implementing regulations, the Forest Practice Rules (14 Cal. Code Regs. §895 et seq.), govern the management of privately owned forestlands in California, including with respect to wildfire. For example, Rule 938.4 governs smoking and matches (14 Cal. Code Regs. §938.4) and Rule 938.7 governs blasting and welding (14 Cal. Code Regs. §938.7).

Local

Shasta County General Plan

Shasta County General Plan Element 5.4, Fire Safety and Sheriff Protection, "discusses conditions and issues relevant to the protection of public health and safety from fire damage" (Shasta County, 2018). The following applicable objectives and policies guide County planning with regard to fire safety.

Objectives:

***FS-1*:** Protect development from wildland and non-wildland fires by requiring new development projects to incorporate effective site and building design measures commensurate with level of potential risk presented by such a hazard and by discouraging and/or preventing development from locating in high risk fire hazard areas.

***FS-2*:** Protection of life and property from crime by encouraging new development projects to incorporate effective defensible space design techniques.

Policies:

***FS-a*:** All new land use projects shall conform to the County Fire Safety Standards.

***FS-b*:** Known fire hazard information should be reported as part of every General Plan amendment, zone change, use permit, variance, building site approval, and all other land development applications subject to the requirements of the California Environmental Quality Act (CEQA).

Shasta County Fire Safety Standards

The Shasta County Board of Supervisors has adopted Fire Safety Standards for development projects in Shasta County. The standards meet or exceed the State's standards and are inclusive of "State Responsibility Area Fire Safe Regulations." These development standards address access, road widths, bridges, building construction, and hydrant and water systems and include a section on mitigation measures. All standards would be administered and implemented by the County Fire Warden, any designees, and as otherwise authorized by the Board of Supervisors by adoption of the standards (Shasta County, 2017).

Western Shasta Community Wildfire Protection Plan

The Western Shasta Resource Conservation District (WSRCD) has established a Community Wildfire Protection Plan (CWPP) for areas within Battalion 2. The goal of the CWPP is to reduce the destruction and associated costs from wildfire by creating shaded fuel breaks, increase homeowner and fire department access and egress, watershed restoration and public information and education on developing Firewise Communities. Several shaded fuel breaks along county roads and SR 299 East surrounding the communities of Oak Run, Hillcrest, Montgomery Creek, and Round Mountain have been initiated by WSRCD (Shasta County, 2016). However, according to Map 1 in the CWPP, only a small southern portion of the Project Site would be located within the CWPP designated area in Cow Creek. The majority of the northern portion of the Project Site would be undesignated within the CWPP (Shasta County, 2016).

Shasta County Multi-Jurisdictional Hazard Mitigation Plan

The Shasta County Multi-Jurisdictional Hazard Mitigation Plan (SCHMP) includes resources and information to assist in planning for hazards. The SCHMP provides a list of actions that may assist participating jurisdictions in reducing risk and preventing loss from future hazard events, and addresses wildfire hazards (Shasta County and City of Anderson, 2017).

3.16.2 Significance Criteria

A project proposed to be located in or near state responsibility areas or lands classified as very high fire hazard severity zones would result in a significant impact related to wildfire if it would:

a) Substantially impair an adopted emergency response plan or emergency evacuation plan;

b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations or a significant risk of loss, injury or death from a wildfire or the uncontrolled spread of a wildfire;

c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment; or

d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

3.16.3 Direct and Indirect Effects

3.16.3.1 Direct and Indirect Effects of the Project

a) Whether the Project would substantially impair an adopted emergency response plan or emergency evacuation plan.

Impact 3.16-1: The Project would, unless mitigated, substantially impair an adopted emergency response plan or emergency evacuation plan. ***(Less than Significant with Mitigation Incorporated)***

There are no specifically designated evacuation routes described in the Community Wildfire Protection Plan or the Shasta County General Plan. However, because the Project would be

developed in a rural area, the number of access roads to and exit routes from the site is limited. The main access road and potential evacuation route would be SR 299, which bisects the Project Site. The three Project driveways, as described in Section 2.1.1.1, *Access Roads*, and in Section 3.14, *Transportation*, would allow adequate egress/ingress to and through the Project Site in the event of an onsite emergency. Additional onsite access roadways also would be constructed within the Project Site, which would provide additional access for firefighting purposes and serve as man-made, maintained firebreaks.

The Project would not require closures of public roads, which could inhibit access by emergency vehicles. However, the presence of oversized construction vehicles on local roads (such as SR 299, or G Line Road in the event of an emergency requiring use of that road to evacuate Moose Camp) could cause blockage that may impede other traffic if a wildfire were to occur in the area during the construction or decommissioning periods, resulting in a potentially significant impact.

The implementation of Mitigation Measure 3.14-3 (provided in Section 3.14) would ensure that emergency access would be maintained during construction and decommissioning and thus would reduce this impact to less than significant.

> **Mitigation Measure 3.16-1a:** Implement Mitigation Measure 3.14-3 (Traffic Management Plan)
>
> **Significance after Mitigation:** Less than significant.

Mitigation Measure 3.14-3 would ensure that the Project's proposed use of oversized vehicles during construction and decommissioning would not cause a significant adverse impact on emergency access to or near the Project Site. The Traffic Management Plan would require consultation with emergency service providers, Caltrans, and residents in the vicinity and would specify timing of oversized vehicle travel. Advance notices would also be given to local fire departments and to the sheriff's department to ensure that response times could be maintained. Additionally, all oversize load permits and related requirements would be complied with. Mitigation Measure 3.14-3 would reduce the impact to emergency response and evacuation plans to less than significant with mitigation incorporated.

As described in Section 3.16.1.3, *Regulatory Setting*, the 2018 Strategic Fire Plan for California outlines overarching goals for CAL FIRE, and the 2018 Shasta Trinity Unit Strategic Fire Plan identifies strategies for unit implementation of the statewide plan. Also as described in the Regulatory Setting, the CWPP would not apply to those areas of the Project Site that it does not encompass. Furthermore, the CWPP does not explicitly outline any emergency response or evacuation plans. Because these plans do not directly apply to the Project, the Project would not conflict with or impair the implementation of either of these plans.

As described in Section 3.16.1.1, the CAL FIRE Shasta-Trinity Unit has access to firefighting aircraft which drop either fire retardant or water in strategic locations to fight spreading fires. Firefighting aircraft need to fly at low elevations (between 150 feet and 500 feet from the ground) to have accurate drops of retardant or water (CAL FIRE, 2019b; AHSAFA, 2020). Within the

Project Site, peaks and buttes present existing obstacles for aerial firefighting. Near the Project Site, the Hatchet Wind Project includes vertical turbines that are approximately 420 feet tall. These turbines are existing vertical structures that could be obstacles for aerial firefighting. As described in Section 2.4.1, *Wind Turbine Generators*, the turbines could have heights of up to 679 feet. Some research on the impact of wind turbines on aerial firefighting concludes that wind turbines "do not cause aircraft concern in aviation operations for [firefighting]" and that "Where vertical obstructions exist in the airspace around a fire such as power lines, weather masts, radio and television transmission towers, tall trees and wind turbines, a dynamic risk assessment is undertaken prior to the aircraft being committed to fire-bombing operations" (Commonwealth of Australia, 2015).

Due to the spacing between rows of turbines, aerial firefighting operations are likely to have enough space even with the proposed Project to continue aerial firefighting operations within the Project Site. However, due to the height of the turbines, construction and operation of the Project could interfere with aerial firefighting operations, a potentially significant impact. To ensure that impacts related to aerial firefighting during construction and operation are reduced to less than significant, implementation of **Mitigation Measure 3.16-1b** (Pre-Construction Coordination with CAL FIRE) would be required.

> **Mitigation Measure 3.16-1b: Pre-Construction Coordination with CAL FIRE**
>
> Prior to construction, the Applicant shall provide GIS files or other maps of the Project layout to CAL FIRE to facilitate aerial fire-fighting planning. The Applicant shall notify CAL FIRE of any changes to the Project layout or any maintenance that would require the use of helicopters or the use of equipment not previously identified on maps provided to CAL FIRE that could present a new, previously unidentified vertical obstacle to aerial firefighting.
>
> **Significance after Mitigation:** With implementation of Mitigation Measure 3.16-1b, CAL FIRE would have the information necessary to plan for aerial firefighting with the Project in place. This would allow CAL FIRE to identify locations for retardant or water drops within the Project Site and would allow for the planning of flight plans around the Project Site. With the implementation of Mitigation Measure 3.16-1b, impacts would be reduced to a less-than-significant level.

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b) Due to slope, prevailing winds, and other factors, whether the Project would exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations or a significant risk of loss, injury or death from a wildfire or the uncontrolled spread of a wildfire.

Impact 3.16-2: The Project would, unless mitigated, exacerbate wildfire risks and expose people to pollutant concentrations or a significant risk of loss, injury or death from a wildfire or the uncontrolled spread of a wildfire. (*Less than Significant with Mitigation Incorporated*)

The Project is not intended for and would not be used for human occupation; therefore, no occupants would be exposed to increased risks associated with wildfire. However, the Project Site

is located near existing communities. Therefore, the following analysis focuses on the potential for Project Site preparation, construction, operation and maintenance (O&M), and decommissioning to increase the exposure of the occupants of these communities to wildfire risks.

As discussed in Section 3.16.1, *Environmental Setting*, and shown on Figure 3.16-1, the entire Project is located within a very high fire hazard severity zone. Approximately 4,353 acres of the Project Site are located in a CPUC Tier 2 Fire Threat District and 110 acres are located within a Tier 3 Fire Threat District. The primary fire hazards from Project activities during construction and decommissioning would involve the use of vehicles and equipment. Heat or sparks from vehicles and equipment could ignite dry vegetation and cause a fire, particularly during drier, warmer conditions.

Additionally, construction activities that could result in sparks, such as blasting, welding, or grinding, have a greater likelihood of creating a source of ignition. For example, the Ranch Fire in 2018 was determined by CAL FIRE to have been caused by an individual hammering a metal stake into concrete (Sacramento Bee, 2019).

The Project would result in increased vehicle activity on local and regional roads due to trucks and vehicles delivering equipment to the site, which could result in an increased potential for ignitions. Therefore, depending on the time of year (as seasonality may affect climate conditions, prevailing winds, and vegetation/fuels) and the location of construction activities, the increase in sources of potential ignition associated with Project construction or decommissioning could exacerbate the risk of wildfire in the area. As discussed in the Environmental Setting, wildfires release large amounts of air pollutants, which can lead to harmful exposure for first responders, nearby communities, and populations that are located farther away. Therefore, due to the increase in potential sources of ignition, Project construction and decommissioning could increase the risk of surrounding communities' exposure to pollutant concentrations from wildfire and the uncontrolled spread of wildfire to a level that is substantially higher than existing than baseline conditions, which would result in a potentially significant impact.

To ensure that wildland fire impacts during construction and decommissioning are reduced to less than significant, implementation of **Mitigation Measure 3.16-2a** (Fire Safety) would be required. The implementation of a Project-specific Fire Prevention Plan would reduce potential sources of ignition and require immediate and effective suppression measures. The plan would specify that when the National Weather Service issues a Red Flag Warning (an alert that high winds and dry conditions could lead to rapid or dramatic increases in wildfire activity), the Applicant and its contractor must cease all non-emergency work to respond to changes in fire risk. Additionally, the plan would prepare work crews with emergency suppression equipment and plans to respond quickly to any onsite incidents caused by construction activities.

The implementation of Mitigation Measure 3.16-2a would reduce the potential for an onsite ignition during construction by limiting the types of acceptable work during Red Flag Warnings, requiring that vegetation clearances be maintained, and ensuring that potential ignitions sources are minimized. Additionally, Mitigation Measure 3.16-2a would provide the construction crews

with the training and tools necessary to respond quickly to a potential fire, preventing the spread of fire. The incorporation of a Project-specific Fire Prevention Plan would reduce the risk of the spread of wildfire from Project construction and decommissioning to near baseline conditions. This would reduce Project impacts to a less-than-significant level.

The Project would include the O&M of up to 72 turbines, underground and aboveground collector systems, and a substation and switching station. Project O&M would increase the potential for accidental ignition due to mechanical failures such as turbine overload, the overheating of moving parts, a collector line failure, or a structure fire involving the substation. Sparks created by any of these mechanical failures could ignite surrounding flammable material. Additionally, due to the height of the turbines, lightning strikes also could result in the ignition of a fire within the turbine.

In accordance with applicable firebreak clearance requirements (Pub. Res. Code §4292; 14 Cal. Code Regs. §1254), the Applicant would trim or remove flammable vegetation in the area surrounding power lines to reduce potential fire and other safety hazards. Also, in accordance with tree and power line clearance requirements (Pub. Res. Code §4293; 14 Cal. Code Regs. §1256), the Applicant would regularly inspect vegetation and trim trees to manage fire and safety hazards and ensure electrical reliability for all Project collector lines constructed overhead. As described in Section 2.4.1, *Wind Turbine Generators*, a 15-foot gravel ring would be placed around the base of the foundation of turbines and maintained free of vegetation and an area of between 65 and 95 feet in diameter (depending on site conditions) would be removed from timber production and maintained as low-growing vegetation.

As described in Section 2.4.2.2, *Overhead Collector System*, an approximately 80-foot-wide corridor would be maintained around the overhead collector system and cleared of tall woody vegetation. Additionally, as described in Section 2.4.4.2, *Temporary Construction and Equipment Areas*, prior to operation, the Applicant would prepare a Vegetation Management Plan that would outline vegetation management procedures to be implemented onsite pursuant to all applicable state regulations listed above pertaining to electrical systems, and would include vegetation management for all other components of the Project as well.

Compliance with the above operational and vegetation clearance requirements would reduce the risk of exposing surrounding communities to exacerbated risk of the uncontrolled spread of a wildfire during Project operation. However, operation of the Project would introduce new energy facilities and activities that could result in sparks or flames that could result in a wildfire that could spread beyond the Project site. This risk would create a potentially significant impact with regard to the spread of wildland fire.

Mitigation Measure 3.16-2a requires that a Fire Prevention Plan be developed and implemented during the Project's construction, operation, and decommissioning periods. Mitigation Measure 3.16-2a requires that maintenance activities include appropriate fire prevention measures. Additionally, Mitigation Measure 3.16-2a requires that the Fire Prevention Plan identify meteorological monitoring systems to identify fire-prone conditions, requires inspection of turbines and electrical infrastructure, and requires a protocol for disabling reclosers and de-

energizing the electrical distribution system. **Mitigation Measure 3.16-2b** would require that all turbines be equipped with fire detection and prevention technology compatible with manufacturers operating requirements, and will be maintained in good working order throughout the life of the Project. Finally, **Mitigation Measure 3.16-2c** would require that the Applicant create and coordinate an emergency response plan with local emergency responders.

The implementation of these mitigation measures would reduce the risk of ignition resulting from operation of the Project to near baseline levels by requiring Project turbines to be fitted with fire detection equipment, fire extinguishment equipment, and an automatic shutdown system. The incorporation of these features into turbine design would reduce the potential of a fire igniting within a turbine. Additionally, implementation of these measures would provide the full-time operation workers with the tools and training necessary to respond to a potential fire and prevent it from spreading.

Therefore, the implementation of Mitigation Measures 3.16-2b and 3.16-2c would reduce the risk of such an ignition spreading wildfire and/or wildfire-related pollution to surrounding communities. With the implementation of Mitigation Measure 3.16-2a, Mitigation Measure 3.16-2b, and Mitigation Measure 3.16-2c, impacts would be less than significant.

Mitigation Measure 3.16-2a: Fire Safety.

The Applicant and/or its contractors shall prepare and implement a Project-specific Fire Prevention Plan (FPP) to prevent an exacerbation of wildfire risk during both the Project construction and operation and maintenance phases. Prior to construction, the Applicant shall contact and consult with the Shasta Trinity Unit of CAL FIRE and the Shasta County Fire Department to determine the appropriate amounts of fire equipment to be carried on the vehicles and appropriate prevention measures to be taken. The Applicant shall submit verification of its consultation with the appropriate fire departments to Shasta County. The Applicant shall submit a draft FPP to the Shasta County Department of Resource Management, Planning Division for approval when the building permit application is submitted. The County shall have an opportunity to make comments on and revisions to the FPP, which the Applicant shall incorporate into a revised FPP for approval. The Applicant shall make the approved FPP available to all construction crew members prior to construction of the Project. The FPP shall list fire safety measures including fire prevention and extinguishment procedures, as well as specific emergency response and evacuation measures that would be followed during emergency situations; examples are listed below. The FPP also shall provide fire-related rules for smoking, storage and parking areas, usage of spark arrestors on construction equipment, and fire-suppression tools and equipment. The FPP shall include or require, but not be limited to, the following:

- Prior to construction, the Project applicant shall designate primary and alternate Fire Coordinators such that a Fire Coordinator is present at all times during Project construction. The Fire Coordinator shall be responsible for ensuring that crews have sufficient fire suppression equipment, communication equipment, shall lead and coordinate fire patrols, ensure that the required clearances are followed onsite, and ensure that all crew members receive training on the FPP and its components.

- For vehicles within control of the contractor, the contractor shall require vehicle drivers to conduct a visual inspection of the vehicle for potential sparking risks prior to operation of the vehicle. This inspection should include, but not be limited to a

check of tire pressure and an inspection for chains or other vehicle components that could drag while driving. For subcontractors or vendors where vehicles are not within the control of the contractor, the contractor or Applicant shall develop a standard brochure to send to vendors that shall provide educational materials about fire risks associated with vehicles and shall provide an inspection checklist.

- The Applicant and/or its contractors shall have water tanks, water trucks, or portable water backpacks (where space or access for a water truck or water tank is limited) sited/available in the study area for fire protection.
- During construction of the Project the Applicant and/or its contractors shall implement ongoing fire patrols during construction hours and for 1 hour after the end of daily construction and hotwork.
- All construction crews and inspectors shall be provided with radio and/or cellular telephone access that is operational within the Project Site to allow communications with other vehicles and construction crews. All fires shall be reported immediately upon detection.
- Require that all internal combustion engines, stationary and mobile, be equipped with spark arresters in good working order.
- Require that light trucks and cars with factory-installed mufflers be used only on roads where the roadway is cleared of vegetation.
- Require that equipment parking areas and small stationary engine sites are cleared of all extraneous flammable material.
- Include a fire conditions monitoring program to monitor meteorological data during construction and operation.
- Include a monitoring and inspection protocol for turbines and electrical infrastructure.
- Include protocol for disabling re-closers and de-energizing portions of the electrical collection and transmission systems
- Prohibit smoking in wildland areas, with smoking limited to paved areas or areas cleared of all vegetation.
- All construction vehicles shall have fire suppression equipment.
- The Applicant shall ensure that all construction workers receive training on the implementation of the FPP including how to conduct a fire patrol, proper use of fire-fighting equipment and procedures to be followed in the event of a fire, vegetation clearance and equipment usage requirements, turbine, and electrical equipment inspections.
- As construction may occur simultaneously at several locations, each construction site shall be equipped with fire extinguishers and fire-fighting equipment sufficient to extinguish small fires.
- The Applicant shall enforce a requirement that construction personnel park any vehicles within roads, road shoulders, graveled areas, and/or cleared areas (i.e., away from dry vegetation) wherever such surfaces are present at the construction site.

- The Applicant and its contractor shall cease all non-emergency work during Red Flag Warning events.
- The Applicant shall coordinate the finalization of road improvements (i.e. frequency of grading and vegetation clearance) with CAL FIRE and other emergency responders to ensure that sufficient ingress and egress exists onsite.
- Prior to the initiation of construction, a designated inspector from the County and/or Shasta County Fire Department shall inspect the Project Site to ensure that sufficient fire suppression equipment is present onsite, that the required vegetation clearances have been cleared, that a crew member training program has been created, that construction vehicles are equipped with fire suppression equipment, that spark arrestors are installed on construction equipment, that a fire conditions monitoring program has been developed, that a monitoring and inspection protocol has been developed, that a disabling and re-closing protocol has been developed, and that CAL FIRE was appropriately consulted regarding road improvements and ingress and egress.
- During construction, the Applicant shall maintain and provide upon request by the County, CAL FIRE a weekly FPP compliance report that demonstrates the following: fire patrols have been conducted following construction, any new construction workers have received training on the implementation of the FPP, that non-emergency work is being halted appropriately during Red Flag Warnings, and that sufficient fire suppression equipment is present onsite.

Successful implementation of Mitigation Measure 3.16-2a (Fire Safety) would be demonstrated by the development of an FPP in consultation with local fire authorities which is documented and submitted to Shasta County for review, any revisions, and final approval. Additionally, successful implementation of Mitigation Measure 3.16-2a would require that the Applicant and its contractor comply with all components of the FPP, that ignition from Project construction activities is promptly reported to the fire department(s) with jurisdiction, and that when it is safe to do so, any Project-caused ignition is suppressed immediately.

Mitigation Measure 3.16-2b: Nacelle Fire Risk Reduction.

Turbines shall be equipped with fire detection and prevention technology compatible with the manufacturer's operating requirements and will be maintained in good working order throughout the life of the Project. Turbines with electrical equipment in the nacelle shall have safety devices to detect electrical arc and smoke that use the best available technology for fire detection and suppression within turbines. The turbine design shall include the following components:

1. Early fire detection and warning systems;
2. Automatic switch-off and complete disconnection from the power supply system; and
3. Automatic fire extinguishing systems in the nacelle of each wind turbine.
4. Additionally, turbines shall include lightning protection equipment such as grounding equipment, and a lightning measurement system.

Should any of these devices report an out-of-range condition, the device shall command a shutdown of the turbine and disengage it from the electrical collection system, and send a notice through the SCADA. The entire turbine shall be protected by current-limiting switchgear installed at the base of the tower.

In the event of a lightning strike, an electrical inspection shall be conducted on the affected turbine to identify and address any damage to the turbine or electrical system that could result in subsequent fire risk.

Mitigation Measure 3.16-2c: Emergency Response Plan.

Prior to the submission of the building permit application, the Applicant shall prepare an emergency response plan to be reviewed and approved by Shasta County Planning, CAL FIRE, and the Shasta County Fire Department. Following approval of the plan, the Applicant and/or its contractors shall implement the requirements in the plan during all phases of construction and operation, as applicable. The emergency response plan shall describe the likely types of potential accidents or emergencies involving fire that could occur during both construction and operation, and shall include response protocols for each scenario. The plan shall include key contact information and a description of key processes, in the event of an emergency in order to alert relevant responders of the emergency, and how to control the emergency. The plan shall include crew member training in response, suppression, and evacuation. The training shall be coordinated by the designated Fire Coordinators. Prior to construction, the Applicant shall submit to the County a compliance report demonstrating that all crew members have been trained. As new construction crews or operation workers are brought onsite, the Applicant shall submit additional compliance reports demonstrating that they have been received training on the emergency response plan. This plan may be combined with the Fire Prevention Plan (FPP).

Significance after Mitigation: Implementation of Mitigation Measure 3.16-2a (Fire Safety), Mitigation Measure 3.16-2b (Nacelle Fire Risk Reduction), and Mitigation Measure 3.16-2c (Emergency Response Plan) would require the Applicant and its contractors to implement fire safety measures to prevent fire and be prepared to respond immediately if a fire should ignite, and would require collaboration with area fire protection agencies to reduce the risk of wildfire ignition and spread. This impact would be reduced to a less-than-significant level.

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c) Whether the Project would require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.

Impact 3.16-3: The Project would require the installation and maintenance of Project-related infrastructure (such as roads and power lines) that may exacerbate fire risk, and the installation and maintenance of fire suppression infrastructure (such as vegetation clearances and emergency water sources) that may result in temporary or ongoing impacts to the environment. (*Less-than-Significant Impact)*

As described in Section 2.4.4.1, *Access Roads*, existing roads would be used to the extent possible, but new roads are proposed as part of the Project. As described under Impact 3.16-2, the

vehicle activity on these new roads could result in a significant increased potential for ignitions by introducing new potential sources of ignition into vegetated areas that previously were at minimal risk from human-caused ignitions. The transportation-related aspects of Mitigation Measure 3.16-2a would reduce the increase in fire risk from new roads by requiring controls such as visual inspections for ignition sources (e.g., dragging chains) and carrying adequate fire suppression equipment.

The Project's overhead electrical collector systems are described in Section 2.4.2 and would include 34.5 kV collector lines installed on wood poles up to 90 feet tall and wire heights between approximately 20 to 30 feet above the ground (with greater wire clearances as needed). An approximately 80-foot-wide corridor would be maintained free of taller woody vegetation during operation. This vegetation clearance is consistent with or greater than guidance for clearance around power lines (e.g., CPUC General Order 95). The risk of ignition from these collector lines would be low because there would be a low risk of objects such as downed trees striking the lines or poles based on this minimum clearance. As a result, impacts would be less than significant.

The vegetation clearances that would be maintained around roads, collector lines, turbines, and other Project components would aid in reducing wildfire risk and facilitating emergency suppression of fires should they occur, consistent with defensible space guidelines. Because these clearances are part of the Project description, their construction and ongoing maintenance is analyzed as part of the Project where applicable throughout this EIR (e.g., in Section 3.4, *Biological Resources*, as relevant to wildlife habitat that would be removed to maintain clearances). Similarly, the water storage tank at the O&M facility is analyzed as part of the Project and the environmental impacts of the entire O&M facility are analyzed throughout this document on a resource-by-resource basis. No additional analysis of these fire prevention and suppression components of the Project is warranted in this impact discussion.

Mitigation: None required.

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d) Whether the Project would expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

Impact 3.16-4: The Project would, unless mitigated, expose people or structures to significant risks, including adverse water quality effects or downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes. (*Less than Significant with Mitigation Incorporated*)

The Project does not propose and would not require the construction of any housing; therefore, it would not expose people to increased risk associated with flooding, landslides, or post-fire slope instability as a result of locating housing near such existing risks. The following analysis focuses on the potential for the Project to result in post-fire downstream flooding, runoff, or landslides on nearby, downstream and downslope communities such as Moose Camp, Montgomery Creek, and Round Mountain.

As discussed under criterion b), implementation of the Project could increase wildfire risk as a result of increased sources of ignition. The implementation of Mitigation Measure 3.16-2a (Fire Safety), Mitigation Measure 3.16-2b (Nacelle Fire Risk Reduction), and Mitigation Measure 3.16-2c (Emergency Response Plan) would reduce potential sources of ignition and would prepare work crews to respond to incidents caused by construction equipment.

Post-fire conditions influence surface water quality because water flowing through burned areas is likely to carry increased levels of sediment, organic debris, and chemicals (such as residuals from fire suppressants), contributing to degradation of water quality and aquatic resources (Shasta County, 2016). Additionally, post-fire conditions can increase the potential for erosion and flooding due to the loss of vegetation that holds soils in place, causing increased erosion, and the loss of the water-absorbing properties of soils, causing increased runoff.

As identified in Section 3.12, *Hydrology and Water Quality*, criterion c), the implementation of a storm water pollution prevention plan (SWPPP) and best management practices (BMPs) related to erosion control would reduce potential impacts during construction related to drainage patterns to a less-than-significant level. Additionally, following construction, drainage patterns on-site would be relatively similar to existing conditions. Therefore, because the Project would implement fire prevention and suppression measures as well as erosion control and stormwater pollution prevention measures, the Project would not, as a result of post-fire conditions, result in changes to runoff or drainage patterns which could cause adverse water quality impacts or exacerbate downslope or downstream flooding and thereby expose people or structures to associated risks.

Additionally, as discussed in Section 3.9, *Geology and Soils*, under Impact 3.9-3, there are steep slopes and soil types within the Project Site where landslides could occur. In the event that a fire were to be ignited on the Project Site and were to spread outside of the Project Site, if significant amounts of vegetation were burned, the resultant change in drainage and soil stability could result in landsliding in downstream or downslope areas.

Implementation of Mitigation Measure 3.16-2a (Fire Safety), Mitigation Measure 3.16-2b (Nacelle Fire Risk Reduction), and Mitigation Measure 3.16-2c (Emergency Response Plan), would reduce the potential for the Project to result in the uncontrolled spread of wildfire and, therefore, would reduce the potential for landslides as a result of post-fire conditions to a less-than-significant level.

> **Mitigation Measure 3.16-4:** Implement the Fire Safety measures that would be required by Mitigation Measure 3.16-2a; implement the Nacelle Fire Risk Reduction measures that would be required by Mitigation Measure 3.16-2b; and implement the Emergency Response Plan that would be required by Mitigation Measure 3.16-2c.
>
> **Significance after Mitigation:** With implementation of these measures, the risk of flooding, mudslides, and slope instability associated with post-fire conditions would be addressed with a detailed Fire Prevention Plan, fire risk reduction measures in turbines, and an emergency response plan. Therefore, this impact would be less than significant.

3.16.3.2 PG&E Interconnection Infrastructure

Minor modifications or upgrades to the existing 230 kV line may be required to facilitate the Project's interconnection. Upgrades to PG&E facilities are anticipated to include construction and/or reconfiguration of utility line structures and transmission line circuits involving four to six new transmission poles. If required, these new poles would be constructed adjacent to the proposed substation and switching station. The modifications to the PG&E infrastructure would primarily include updating existing infrastructure. These upgrades would likely replace existing equipment with new equipment; this upgrade could slightly reduce the risk of equipment failure. However, the reconfiguration of a transmission line circuit and addition of transmission circuit and poles could result in an increase in fire risk associated with the construction of the modifications and associated transmission line failures resulting in sparks such as downed lines, bird strikes, vegetation contact, arc flashes, and equipment failure. Therefore, the modifications to the PG&E interconnection facilities could increase the risk of wildfire due to the increased risk of ignition during construction and operation of the infrastructure.

Given the inherent potential for ignition risk associated with power lines, it is anticipated that PG&E's Fire Prevention Plan would be applied to the PG&E interconnection facilities, as required by CPUC GO 166. The implementation of operational risk management programs identified in PG&E's Fire Prevention Plan and Wildfire Safety Plan would reduce the risk of an ignition during operation. Relevant programs include enhanced weather monitoring, Utility Standard S1464, the Wood Pole Test and Treat Program, Pro-Active Responses to Fire Incidents, enhancements to PG&E's Storm Outage Prediction Model, the Wildfire Reclosing Disable Program, and the implementation of the PSPS program (PG&E, 2018). Additionally, vegetation along the 230 kV PG&E line would be managed in compliance with NERC Standard FAC-003, Transmission Vegetation Management. The Project also would also be subject to the CPUC vegetation management and clearance requirements (GO 95, GO 165, and GO 166) as well as the portions of the Public Resources Code that identify clearance requirements and requirements for work in SRAs. Compliance with the above operational and vegetation clearance requirements would effectively manage the risk of exposing surrounding communities to exacerbated risk of the uncontrolled spread of a wildfire during construction and operation of the PG&E infrastructure.

Mitigation Measure 3.16-1a (implementation of the Traffic Management Plan described in Mitigation Measure 3.14-3) may be required specific to the PG&E interconnection infrastructure if oversized loads are required for delivery of PG&E equipment which loads could substantially impair emergency ingress or egress. Mitigation Measure 3.16-2b (Nacelle Fire Risk Reduction) would not be required, because the potential impact it would address would be specific to the wind turbines. Mitigation Measure 3.16-2a (Fire Safety) and Mitigation Measure 3.16-2c (Emergency Response Plan) would be required for the PG&E infrastructure to reduce a potential significant impact related to exacerbation of wildfire risks associated with the use of vehicles and equipment during construction, operation, and maintenance of the infrastructure.

3.16.3.3 Direct and Indirect Effects of Alternatives

Alternative 1: South of SR 299

Under Alternative 1, the seven turbines proposed north of SR 299 and approximately 1.5 miles of overhead transmission line would not be constructed, and the 378 acres north of SR 299 would continue to be managed for timber production. Under this alternative, the footprint of construction would be reduced, thereby slightly reducing the potential for a construction- or decommissioning-related ignition. Additionally, the reduction of turbines and associated electrical infrastructure during operation would slightly decrease the potential for an ignition during operation.

However, the overall the risk of wildland fire introduced by Alternative 1 would be substantially similar to the risk introduced by the Project. Keeping the northern part of the Project Site under timber production also may decrease the risk of wildland fire slightly as that portion of the Project Site would be harvested and thinned, preventing excessive fuel build up in the area of the Project Site north of SR 299. While Alternative 1 would reduce the risk of wildland fire slightly when compared to the Project, impact conclusions and mitigation requirements would be the same as for the Project.

Alternative 2: Increased Setbacks

Under the Alternative 2, four fewer turbines would be constructed. This reduction in the number of turbines would be slightly reduced relative to the Project's impacts to wildland fires slightly. Additionally, increasing the setbacks of the turbines from residential properties would provide some additional protection to surrounding communities by increasing the area between residences and the turbines in the event that a turbine fire were to occur. Although Alternative 2 would reduce impacts to wildland fire slightly, impact conclusions and mitigation requirements would be the same as for the Project.

No Project Alternative

If the No Project Alternative is implemented, none of the proposed wind turbines or associated transformers, meteorological towers or other infrastructure, facilities, or structures would be constructed, operated and maintained, or decommissioned on the Project Site. The proposed overhead and underground electrical collector system and communications lines would not be developed; and the onsite collector substation, switching station, and O&M facility would not be constructed. Laydown areas would not be cleared, no new access roads would be constructed, and no existing roads would be improved. No blasting or welding would occur. Project-related trucks and other delivery vehicles, cranes and other equipment, and worker vehicles would not be present on the Project Site. The Project Site would continue to be operated as managed forest timberlands. Because there would be no change relative to baseline conditions, the No Project Alternative would create no impact related to Wildfire.

The Project Site is zoned for timber production. Pursuant to regulations implementing the California Timberland Productivity Act (Government Code §51100 et seq.; 14 Cal. Code Regs. §897[a]), there is a legal presumption that "timber harvesting is expected to and will occur on

such lands." The regulations further specify that timber harvesting on such lands "shall not be presumed to have a Significant Adverse Impact on the Environment" (14 Cal. Code Regs. §898). Therefore, the No Project Alternative, including anticipated timber harvesting, is not presumed to result in a significant adverse individual or cumulative effects. CAL FIRE would review any future timber harvesting proposal to evaluate any potential project-specific, site-specific environmental impacts.

3.16.4 Cumulative Analysis

Depending on the pathway of migration for a wildfire, the geographic scope for cumulative effects related to wildfires would be the air basin, watershed boundary, or extent of adjacent wildlands. Cumulative wildfire hazards could arise at any point during Project site preparation and construction, O&M, or decommissioning.

Potential cumulative projects (including those identified in Section 3.1.2.1, *Cumulative Scenario*) could involve fire ignition causes (such as smoking, vehicle or equipment use, campfires, or electrical power) that could contribute to a cumulative risk of wildfire in the area. Specifically, ongoing impacts of the Hatchet Ridge Wind Project and of past fires would combine with the incremental impacts of the Project, mining projects, and nearby timber harvesting to contribute to the existing cumulative impacts related to wildland fire. One of the cumulative projects (project #10, Landvest Helicopter Dip Tank Installation, in Table 3.1-5, *Other Potentially Cumulative Projects within Shasta County*) would increase fire suppression readiness in the general area by installing helicopter dip tanks to aid in fire suppression. One dip tank currently is proposed within the Project Site where shown in Figure 3.16-1, *CAL FIRE Fire Hazard Severity Zones*. Two other dip tanks are proposed to be installed approximately 20 miles north of the Project Site, west of the community of Pondosa and southeast of the community of Bartle.

The Project would result in a less-than-significant impact regarding the interference with adopted emergency response or evacuation plans. Although the Project would not accommodate occupants, it is located near existing communities. Therefore, the Project has the potential to expose these communities to wildfire risks. As noted in Section 3.16.3, *Direct and Indirect Effects*, the Project Site is located in a very high fire hazard severity zones as well as Tier 2 and Tier 3 CPUC Fire Threat Districts. To ensure that potentially significant wildland fire impacts are reduced to a less-than-significant level during construction, operation, and decommissioning, Mitigation Measure 3.16-2a (Fire Safety), Mitigation Measure 3.16-2b (Nacelle Fire Risk Reduction), and Mitigation Measure 3.16-2c (Emergency Response Plan) would be implemented.

A very large part of Shasta County has been designated as being within a very high fire hazard severity zone (CAL FIRE, 2007, 2009). Since 2000, Shasta County has been subject to a number of large, severe fire events, such as the Carr Fire, Delta Fire, and Hirz Fire (2018). Given the vulnerability of the county to large severe fires, and the presence of other projects near the Project Site that also could be sources of ignition, a significant cumulative impact exists with regard to wildfire.

Section 2.5.3, *Pre-Construction Preparation*, notes that the Project includes access roads and vegetation clearance provisions. The Project would be required to comply with state and federal requirements related to vegetation clearance and fire prevention measures. Additionally, the implementation of Mitigation Measure 3.16-2a (Fire Safety) would ensure that a detailed construction and operation fire prevention plan exists. Mitigation Measure 3.16-2b (Nacelle Fire Risk Reduction) requires that turbines be equipped with fire detection and prevention technology compatible with the manufacturer's operating requirements and will be maintained in good working order. Mitigation Measure 3.16-2c (Emergency Response Plan) requires the development of an emergency response plan in coordination with CAL FIRE. These mitigation measures would reduce Project-specific impacts to a less-than-significant level. With the access roads, vegetation clearance provisions, emergency suppression equipment, etc., that would be incorporated into the Project, its incremental impact would not be cumulatively considerable because the risk of Project-related wildfire ignition would be substantially reduced and ignitions that may occur on the Project Site or due to Project-related vehicle access would be suppressed quickly.

Also as noted in Section 3.16.3, the Project would not include any housing or structures and so would not expose people or structures to any increased level or risk associated with flooding, landslides, or post-fire slope instability. The analysis also notes that the Project would not result in changes to drainage patterns. Additionally, as mitigated, the Project would reduce the risk of the spread of fire to near baseline conditions. Therefore, the potential for post-fire flooding or landslides would be less than significant. Based on this, the Project's incremental less-than-significant impact would not cause or contribute to a significant cumulative impact related to these considerations.

3.16.5 References

American Helicopter Services & Aerial Firefighting Association (AHSAFA), 2020. Aerial Firefighting Tutorial. Available online at: https://www.ahsafa.org/?page_id=52.

Anderson, H. E., 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. Available online at: https://www.fs.fed.us/rm/pubs_int/int_gtr122.pdf.

California Department of Forestry and Fire Protection (CAL FIRE), 2019a. Communities at Risk List [filtered to include only Shasta County]. Available online at: http://osfm.fire.ca.gov/fireplan/fireplanning_communities_at_risk?filter_field=county_name&filter_text=Shasta. Accessed May 23, 2019.

CAL FIRE, 2019b. Firefighting Aircraft Recognition Guide. Available online at: https://www.fire.ca.gov/media/4950/aviation-guide-2019-access.pdf.

CAL FIRE and Shasta County Fire, 2018. Shasta-Trinity Unit 2018 Strategic Fire Plan. Available online at: http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fpppdf1624.pdf. May 10, 2018.

California Department of Forestry and Fire Protection (CAL FIRE), 2007. Fire Hazard Severity Zones in State Responsibility Areas, Shasta County. Adopted November 7, 2007. Map. Scale 1:150,000.

CAL FIRE, 2008. Very High Fire Hazard Severity Zones in Local Responsibility Areas, Shasta County. Adopted May, 2008. Map. Scale 1:150,000.

California Public Utilities Commission (CPUC), 2020. CPUC Fire Safety Rulemaking Background. Available online: https://www.cpuc.ca.gov/FireThreatMaps/ Accessed July 1, 2020.

CPUC, 2018. General Order Number 95, Rules for Overhead Electric Line Construction, Amended May 31, 2018, by D18-05-042 in R.18 and R80.1-A2.

CPUC, 2017a. Decision 17-12-024- Order Instituting Rulemaking to Develop and Adopt Fire Threat Maps and Fire-Safety Regulations. Rulemaking 15-05-006. Issued December 21, 2017.

CPUC, 2017b. General Order Number 165, Inspection Requirements for Electric Distribution and Transmission Facilities, Amended December 14, 2017, by D17-12-024 in R.15.05-006.

CPUC, 2017c. General Order Number 166, Standards for Operation, Reliability, and Safety During Emergencies and Disasters, Amended December 14, 2017, by D17-12-024 in R.15.05-006.

Commonwealth of Australia, 2015. Select Committee on Wind Turbines, Final Report. Available online at: https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Wind_Turbines/Wind_Turbines/Final_Report.

Dupras, D., 1997. Geology of Eastern Shasta County. California Geological Survey. Map. Scale 1:100,000.

Hamers, L., 2018. "Wildfires Are Making Extreme Air Pollution Even Worse in the Northwest U.S." Science News 194(4), August 18, 2018. Available online at: https://www.sciencenews.org/article/wildfires-are-making-extreme-air-pollution-even-worse-northwest-us. Accessed August 20, 2019.

Milman, O., 2018. "Wildfire Smoke: Experts Warn of 'Serious Health Effects' Across Western US." The Guardian, August 2, 2018. Available online at: https://www.theguardian.com/world/2018/aug/02/wildfire-events-air-quality-health-issues-in-western-us. Accessed August 23, 2019.

National Association of State Foresters, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, Bureau of Indian Affairs, U.S. Department of Agriculture, and National Wildfire Coordinating Group (National Association of State Foresters et al.), 2003. Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy. June 20, 2003. Available online at: https://www.sierraforestlegacy.org/Resources/Community/SmokeManagement/AirQualityPolicy/FedWldFireMgmtPolicy.pdf.

National Oceanic and Atmospheric Administration (NOAA), 2018. The Impact of Wildfires on Climate and Air Quality. Available online at: https://www.esrl.noaa.gov/csd/factsheets/csdWildfiresFIREX.pdf. Accessed June 24, 2020.

National Park Service (NPS), 2017. Wildland Fire Behavior. Available online at: https://www.nps.gov/articles/wildland-fire-behavior.htm. Accessed June 24, 2019.

National Wildfire Coordinating Group, 2015. National Fire Danger Rating System Fuel Model. Available online at: https://www.nwcg.gov/sites/default/files/stds/standards/nfdrs-fuel-model_v1-0.htm. Accessed March 30, 2020.

Pacific Gas and Electric Company (PG&E), 2018. Company Emergency Response Plan. October 31, 2018.

PG&E, 2019. Pacific Gas and Electric Company Amended 2019 Wildfire Safety Plan. February 6, 2019. Amended February 14, 2019 and April 25, 2019. Available online: https://www.cpuc.ca.gov/SB901/

PG&E, 2017. Appendix D. Fire Prevention Plan- Electric Annex to the CERP. September 30, 2017.

Sacramento Bee, 2019. "California's largest wildfire was caused by a hammer, Cal Fire says." June 6, 2019.

Shasta County, 2016. Shasta County Communities Wildfire Protection Plan 2016. Available online at: http://www.westernshastarcd.org/Docs/ShastaCWPPs-2016.pdf.

Shasta County, 2017. Shasta County Development Standards–Chapter 6, Fire Safety Standards. Available online at: https://www.co.shasta.ca.us/docs/libraries/public-works-docs/devstdmanual/sc-development-standards-manual.pdf. Revised June 27, 2017.

Shasta County, 2018. General Plan Element 5.0, Public Safety Group. Available online at: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/docs/54firesafety.pdf?sfvrsn=204962bd_0. Updated December 11, 2018.

Shasta County Fire Department, 2018. Email from James Zanotelli to Bill Walker on February 1, 2018.

Shasta County and City of Anderson, 2017. Shasta County and City of Anderson Multi-Jurisdictional Hazard Mitigation Plan. Available online at: https://www.co.shasta.ca.us/docs/libraries/public-works-docs/hmp-documents/shasta-county-hazard-mitigation-plan-november-2017.pdf?sfvrsn=b54ee689_2. November 16, 2017.

Stantec and Pacific Wind Development, LLC, 2018. Environmental Initial Study, Fountain Wind Project Pacific Wind Development, LLC. Prepared in co-ordination with and for Shasta County Department of Resource Management Planning Division. June 28, 2019. Available online at: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/projects/fountain-wind-project/initial-study/initial-study.pdf.

U.S. Department of Agriculture (USDA), 2002. FY 2002 Budget Justification. Available online: https://srwp.opennrm.org/assets/06942155460a79991fdf1b57f641b1b4/application/pdf/NFP_final32601.pdf

U.S. Department of Interior (USDOI), 2001. Review and Update of the 1995 Federal Wildland Fire Management Policy. Available online: https://www.doi.gov/sites/doi.gov/files/uploads/2001-wfm-policy-review.pdf. January 2001.

U.S. Forest Service (USFS), 2015. The 2010 Wildland-Urban Interface of the Conterminous United States. June 2015. Available online: https://www.fs.fed.us/nrs/pubs/rmap/rmap_nrs8.pdf Accessed June 17, 2020.

U.S. Forest Service, U.S. Bureau of Land Management, Bureau of Indian Affairs, U.S. Fish and Wildlife Service, and National Park Service (USFS et al.), 2009. Guidance for Implementation of Federal Wildland Fire Management Policy. February 13, 2009. Available online at: https://www.nifc.gov/policies/policies_documents/GIFWFMP.pdf.

U.S. Geological Survey (USGS), 2018a. The National Map—US Topo. Hatchet Mountain Pass Quadrangle, California–Shasta County, 7.5-Minute Series. Map. Scale 1:24,000.

USGS, 2018b. The National Map—US Topo., Burney Mountain West Quadrangle, California–Shasta County, 7.5-Minute Series. Map. Scale 1:24,000.

Western Regional Climate Center (WRCC), 2020a. Round Mountain, California Total of Precipitation (Inches), Period of Record 1970 to 2010. Available online at: https://wrcc.dri.edu/WRCCWrappers.py?sodxtrmts+047581+por+por+pcpn+none+msum+5+01+F. Accessed June 24, 2020.

WRCC, 2020b. Burney, California Total of Precipitation (Inches), Period of Record 1948 to 2015. Available online at: https://wrcc.dri.edu/WRCCWrappers.py?sodxtrmts+041214+por+por+pcpn+none+msum+5+01+F. Accessed June 24, 2020.

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CHAPTER 4
Comparison of Alternatives

This section compares the environmental advantages and disadvantages of the Project and alternatives evaluated in detail in this Draft EIR. This comparison is based on the analysis of environmental impacts of the Project provided in Chapter 3, *Environmental Analysis*, and the descriptions of the Project and alternatives provided in Chapter 2, *Description of Project and Alternatives*. This comparison is designed to satisfy the requirements of CEQA Guidelines §15126.6(d), which states:

> *The EIR shall include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project. A matrix displaying the major characteristics and significant environmental effects of each alternative may be used to summarize the comparison. If an alternative would cause one or more significant effects in addition to those that would be caused by the project as proposed, the significant effects of the alternative shall be discussed, but in less detail than the significant effects of the project as proposed.*

4.1 Comparison Methodology

The following methodology was used to compare alternatives in this Draft EIR:

Step 1: Identification of Alternatives. The alternatives development and screening process described in Section 2.5.1, *Alternatives Development and Screening*, was used to identify potential alternatives to the Project. Among the many potential alternatives initially considered, the No Project Alternative (described in Section 2.5.3.1); Alternative 1, South of SR 299 (described in Section 2.5.3.2); and Alternative 2, Increased Setbacks (described in Section 2.5.3.3), were carried forward for detailed environmental review. No other reasonable feasible alternatives meeting most of the basic objectives of the Project were identified that would substantially reduce or eliminate the potentially significant environmental impacts of the Project.

Step 2: Determination of Environmental Impacts. Potential environmental impacts of the Project and each of the alternatives were identified and analyzed in detail in Chapter 3, including potential direct, indirect, and cumulative impacts related to construction, operation and maintenance, and decommissioning and site restoration.

Step 3: Comparison of Project with Alternatives. Environmental impacts of the Project were compared to those of the No Project Alternative, Alternative 1, and Alternative 2 to make a preliminary determination of the Environmentally Superior Alternative.

4.2 Comparison of Alternatives

If the No Project Alternative were selected, none of the proposed wind turbines and associated facilities or infrastructure would be constructed, operated and maintained, or decommissioned on the Project Site. No Federal Aviation Administration–approved lighting would be present; none of the proposed ground clearance or subsurface disturbance would occur; and no electrical or communications lines would be installed on the Project Site. No new access roads would be constructed, existing culverts would not be improved. The Project Site would continue to be operated as managed forest timberlands subject to authorizations of California Department of Forestry and Fire Protection, the Regional Water Quality Control Board, and other regulatory agencies.

Because the No Project Alternative would avoid all potential impacts of the Project and Alternatives 1 and 2, the No Project Alternative is not included in **Table 4-1**, *Summary of Impacts of the Project and Alternatives*. For Alternatives 1 and 2, Table 4-1 provides a comparative analysis for each of the resource areas and concludes whether the Alternatives would cause impacts that would be substantially the same as, or increased or reduced relative to the Project.

4.3 Environmentally Superior Alternative

The CEQA Guidelines define the environmentally superior alternative as that alternative with the least adverse impacts to the project area and its surrounding environment. The No Project Alternative is considered the environmentally superior alternative for CEQA purposes because it would avoid all impacts of the Project. However, the No Project Alternative would fail to meet the basic objectives of the Project, including but not limited to: locating a commercially financeable wind energy project with the capacity to provide up to 216 megawatts to the Northern California grid (NP15) in close proximity to an existing Pacific Gas and Electric Company transmission line (see Section 2.3, *Project Objectives*).

Because the environmentally superior alternative is the No Project Alternative, the EIR also must identify an environmentally superior alternative from among the other alternatives.

Determining an environmentally superior alternative can be difficult because of the many factors that must be balanced. For example, Alternative 2 could be preferred because, relative to the Project, it would further remove wind project infrastructure from residential property lines and from all roads, not just public ones. Slightly fewer roads and less below-ground and above-ground infrastructure would be constructed, operated and maintained, and decommissioned and removed from the Project Site. Similarly, the Project could be preferred because, relative to either Alternative 1 or Alternative 2, it would generate the greatest amount of renewable energy, and thus would offset the most metric tons of carbon dioxide emissions generated by fossil fuels and provide greater assistance to the State toward meeting the renewable energy generation targets set in Senate Bill 100.

Additional information received in or developed during the agency and public review period for the Draft EIR, or during the project approval process, could affect the balancing of the respective benefits and consequences of the alternatives. Accordingly, it would be premature to designate an Environmentally Superior Alternative at this stage.

TABLE 4-1
SUMMARY OF IMPACTS OF THE PROJECT AND ALTERNATIVES

EIR Section	Resource Area	Project	Alternative 1, South of SR 299	Alternative 2, Increased Setbacks
3.2	Aesthetics	Impact 3.2-1: The Project, in particular the form, color, movement, and nighttime lighting of the proposed turbines, would have a substantial adverse effect by substantially reducing visual character, visual quality, and the quality of scenic vistas for tourists, recreationists, or residents. While the implementation of recommended Mitigation Measure 3.2-1 would reduce the potential significance of impacts, impacts would not be reduced below established thresholds of significance (Significant and Unavoidable). The Project would result in a less than significant impact relating not only to the potential to damage to scenic resources within a state scenic highway (Impact 3.2-2), but also to the potential to create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area (Impact 3.2-3). (Less than Significant Impact)	Under Alternative 1, the up-to-seven turbines north of SR 99 (turbine numbers A01 through A07) would not be constructed, resulting in incrementally fewer obstructions in the visual landscape and incrementally fewer safety lights. Depending on the specific viewing location, this alternative could reduce aesthetic impacts; however, from certain locations, clustering of turbines south of SR 299 could reduce the coherence between the Hatchet Ridge project and the proposed Project, creating an appearance of multiple separate wind energy generation projects encroaching in the foothills. Any increase or decrease in the aesthetic impacts created by Alternative 1 would not be significant. Therefore, depending on the viewing location, Alternative 1 could either slightly increase or reduce aesthetic impacts. Impacts would be substantially similar to the Project impact conclusions and mitigation requirements would remain the same. **Equal to the Project**	Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within three times the height of the turbine (i.e., within 2,037 feet) of a residential property line and within 1.5 times the height of the turbine (i.e., within 1,018.5 feet) of State Route 299, any other publicly-maintained public highway or street, and of two private roads (Supan Road and Terry Mill Road). This would result in four of the Project turbines (M03, D05, B01 and K02) not being constructed. The resulting spacing of the turbine strings could reduce from key observation points 1, 2, and 3 the visibility and visual impact of turbines from SR 299 and regarding views from KOPs near SR 299. Although this alternative would reduce the overall visual impact of the wind energy development compared to the Project, impact conclusions and mitigation requirements would remain the same. **Less than the Project**
3.3	Air Quality	Impact 3.3-2c: Construction, decommissioning, and site reclamation activities would generate PM_{10} emissions that would result in a cumulatively considerable net increase of PM_{10}, for which the Project region is non-attainment of California Ambient Air Quality Standards (CAAQS). The implementation of recommended Mitigation Measure 3.3-2c would reduce the severity of the impact, but not below established threshold of significance. (Significant and Unavoidable) Impact 3.3-1, Impact 3.3-2b: Construction, decommissioning, and site reclamation activities would generate NO_x and other emissions that could obstruct implementation of the Northern Sacramento Valley Planning Area 2018 Plan to attain the ozone CAAQS by resulting in a violation of an ozone air quality standard, and thereby would be inconsistent with the intent of the 2018 Plan and result in a cumulatively considerable net increase in regional ozone emissions. The implementation of recommended Mitigation Measures 3.3-1a and 3.3-1b would reduce the potential significance of these impacts below established thresholds. (Less than Significant with Mitigation Incorporated) The Project would result in various less than significant impacts, including with respect to its construction, decommissioning, and site reclamation activities and the generation of ROG emissions that could result in a cumulatively considerable net increase of ozone (Impact 3.3-2a); its operation, which would generate pollutant emissions that would not result in a cumulatively considerable net increase of criteria pollutants (Impact 3.3-2d and 3.3-3); its emission of Toxic Air Contaminants (Impact 3.3-4); and its potential to create objectionable odors (Impact 3.3-5). (Less than Significant Impact)	Under Alternative 1, construction activities, including timber harvesting, would generate fewer vehicle trip and equipment emissions than the number estimated for the Project because up-to-seven fewer turbines and related infrastructure would be constructed. Similarly, the decommissioning and site reclamation phase also would generate fewer vehicle trip and equipment emissions than the amounts estimated for the Project because fewer turbines and related infrastructure would be developed and the size of the area to be reclaimed would be smaller than what was identified for the Project. Although the impacts would be reduced relative to the Project, the impact conclusions and mitigation requirements would remain the same. **Less than the Project**	Under Alternative 2, construction activities, including timber harvesting, would generate fewer vehicle trip and equipment emissions than the number estimated for the Project because up-to-four fewer turbines and related infrastructure would be constructed. Similarly, the decommissioning and site reclamation phase would generate fewer vehicle trip and equipment emissions than the amounts estimated for the Project because fewer turbines and related infrastructure would be developed and the size of the area to be reclaimed would be smaller than for the Project. Although the impacts would be reduced relative to the Project, the impact conclusions and mitigation requirements would remain the same. **Less than the Project**
3.4	Biological Resources	Operation of the Project would result in significant unavoidable Project-specific and cumulative impacts -potentially including mortality and injury- to eagles and other raptors (including goshawk) as well as to bats, including special-status bat species, via collision with power lines or operating wind turbine generators, or electrocution from energized components. See Impact 3.4-3, Impact 3.4-8, Impact 3.4-13, and Impact 3.4-18. Mitigation measures including monitoring and potential adaptive operational techniques are identified at the Project-specific level; however, even with mitigation incorporated, remaining impacts would be Significant and Unavoidable. Because no additional reasonable, feasible mitigation measures are available to address cumulative impacts that, if implemented, would reduce the Project's contribution below the established level of significance. Therefore, cumulative impacts would remain Significant and Unavoidable. Mitigation measures have been identified, the implementation of which would reduce other Project impacts below established thresholds. This is true with respect to: Impact 3.4-1 (potential construction impacts to special- status plant species within an unsurveyed 800-acre area of the Project Site), Impact 3.4-2 (construction impacts on nesting bald and golden eagles –although the likelihood of eagles nesting within the Project Site is low, construction noise and activity could result in nesting disruption or abandonment if activities occur during the nesting season and active nests are located in the vicinity), Impact 3.4-4 (decommissioning impacts to nesting bald and golden eagles similar to those described for the construction in Impact 3.4-3), Impact 3.4-6 (construction and decommissioning impacts to nesting raptors other than goshawks due to noise, vegetation removal, and increased activities during the construction and decommissioning), Impact 3.4-7 (construction and decommissioning impacts to nesting goshawks due to noise, vegetation removal, and increased activities	Under Alternative 1, the Project Site would be 4,086 acres resulting in 378 acres of less Project-related disturbance and seven (9.7 percent) fewer turbines than the Project. This would result in a similar percentage reduction in bird and bat collision-related impacts. Collisions resulting in eagle, other sensitive raptors, and bats would continue to be significant and unavoidable, but likely reduced by approximately 10 percent compared to the Project. Alternative 1 would require less Rocky Mountain Maple Riparian Scrub (a sensitive vegetation community) habitat removal. An estimated 31.3 fewer acres of this habitat would be removed, resulting in a 27 percent reduction in the impact area. As for the Project, the impacts related to removal of this habitat would be less than significant with mitigation incorporated. In other respects, Alternative 1 would reduce impacts relative to the Project generally commensurate with the reduction in disturbance and number of turbines. Although the impacts would be reduced relative to the Project, the impact conclusions and mitigation requirements would remain the same. **Less than the Project**	Alternative 2 is anticipated to result in 102 fewer acres of temporary disturbance and 49 fewer acres of permanent disturbance than the Project. Alternative 2 also would result in the construction and operation of four (5.5 percent) fewer turbines than the Project. This would result in a similar percentage reduction in bird and bat collision related impacts. Collisions resulting in eagle, other sensitive raptors, and bats would continue to be significant and unavoidable, but likely reduced by approximately 5.5 percent compared to the Project. Alternative 2 would require approximately 1.7 acres less removal of Rocky Mountain Maple Riparian Scrub habitat. As for the Project, the impacts related to removal of this habitat would be less than significant with mitigation incorporated. In other respects, Alternative 2 reduce impacts relative to the Project generally commensurate with the reduction in disturbance. Although the impacts would be reduced relative to the Project, the impact conclusions and mitigation requirements would remain the same. **Less than the Project**

TABLE 4-1 (CONTINUED)
SUMMARY OF IMPACTS OF THE PROJECT AND ALTERNATIVES

EIR Section	Resource Area	Project	Alternative 1, South of SR 299	Alternative 2, Increased Setbacks
3.4 (cont.)	Biological Resources	during the construction and decommissioning), Impact 3.4-12 (habitat loss and water quality impacts on Pit roach, special-status amphibians and western pond turtle), Impact 3.4-15 (Project impacts to riparian habitat or other sensitive vegetation communities, including removal of up to 107.2 acres of sensitive Rocky Mountain Maple Riparian Scrub habitat), and Impact 3.4-16 (Project impacts to wetlands and other waters, including permanent impacts on 2.22 acres of wetlands and 1.2 acres of other waters; temporary impacts on 1.48 acres of wetlands and 0.6 acres of other waters; and impacts resulting from the construction of or improvement to 32 stream crossings, including crossings of perennial, ephemeral, intermittent and unvegetated ditch type streams. In other respects, Project impacts would be less than significant, and no mitigation measures would be required. This is true with respect to Impact 3.4-5 (Project impacts to California spotted owls – although California spotted owl use of the area is expected to be low based on Project Site surveys and the results of Hatchet Ridge Wind post construction monitoring efforts, 995 acres of the Project Site was identified as being suitable [moderate or high quality] habitat for California spotted owls and potential nesting disruption could result from project noise, vegetation clearing, and increased activities during the construction and decommissioning phases), Impact 3.4-9 (collision-related impacts to waterfowl during operation), Impact 3.4-10 (Project impacts on sandhill cranes during migratory movements in fall and spring), Impact 3.4-11 (construction and decommissioning impacts to nesting songbirds, potentially including special-status species). Impact 3.4-14 (temporary adverse impacts to special-status mammals during site preparation and construction, and during decommissioning and site restoration activities), and Impact 3.4-17 (impacts to movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites).		
3.5	Communications Interference	The Project could cause intermittent interference to or freezing of television reception at some residences in the service area of the stations that broadcast over the Project Site (Impact 3.5-1) and or interference with point-to-point microwave relay station transmissions due to turbine location adjustments or currently unknown transmissions. The implementation of recommended Mitigation Measures 3.5-1 and 3.5-3 would reduce the potential significance of these impacts below established thresholds. (Less than Significant with Mitigation Incorporated) The Project also would result in a less-than-significant impact related to potential interfere with existing navigational systems operated by the FAA or the U.S. military (Impact 3.5-2). (Less than Significant Impact)	All of the turbine locations under Alternative 1 would be at least as far away from land mobile/public safety radio transmitter stations, earth satellite stations, AM broadcast facilities, television broadcast facilities, aircraft navigation beacons, and microwave and cellular communication facilities as for the Project. Therefore, the potential impacts on television reception (Impact 3.5-1), aircraft navigation (Impact 3.5-2), and microwave and cellular communication (Impact 3.5-3) would be the same as described for the Project. It is possible that Alternative 1 could slightly reduce the potential for unforeseen microwave communication interference because the turbines north of SR 299 would not be constructed (turbines A01, A02, and A03 are some of the closest to known microwave paths, as identified in Appendix D; however, evaluation of these turbines did not indicate interfere with the Fresnel zones of these paths, and so these turbines are not expected to cause interference. Therefore, the impact conclusions and mitigation requirements would be the same as for the Project. **Equal to the Project**	All of the turbine locations Under Alternative 2 would be at least as far away from land mobile/public safety radio transmitter stations, earth satellite stations, AM broadcast facilities, television broadcast facilities, aircraft navigation beacons, and microwave and cellular communication facilities as described for the Project. Therefore, the potential impacts on television reception (Impact 3.5-1), aircraft navigation (Impact 3.5-2), and microwave and cellular communication (Impact 3.5-3) would be the same as described for the Project, although there may be a small reduction in the potential for unforeseen microwave communication interference because several turbines would not be constructed (turbine D05 is one of the closest to known microwave paths, as identified in Appendix D; however, evaluation of this turbine did not indicate that it would interfere with the Fresnel zones of these paths and so is not expected to cause interference). Therefore, the impact conclusions and mitigation requirements would be the same as for the Project. **Equal to the Project**
3.6	Cultural and Tribal Cultural Resources	Impact 3.6-3: There is a prehistoric archaeological site in the Project Site that, for the purposes of CEQA, is considered a tribal cultural resource. In addition, Native American tribes have identified tribal cultural resources in the Project Site. The Project would cause a substantial adverse change in the significance of a tribal cultural resource if such a resource were disturbed or damaged. The implementation of recommended Mitigation Measures 3.6-1 and 3.6-3 would reduce the severity of the impact, but not below established thresholds (Significant and Unavoidable) Impact 3.6-1: The Project could cause a substantial adverse change pursuant to CEQA Guidelines Section 15064.5 due to disturbance of a historical resource, for example, during grading and excavation associated with construction, trenching, or the soil borings that would be collected to an approximately 50-foot depth to ensure that the proposed turbine foundations would be stable. The implementation of recommended Mitigation Measure 3.6-1 would reduce the potential significance below established thresholds. (Less than Significant with Mitigation Incorporated) Impact 3.6-2: Given the prehistoric archaeological sensitivity of the Project Site, the possibility of encountering human remains cannot be discounted. Project-related disturbance of human remains would be a significant impact and could occur if, for example, grading, excavation, or soil borings associated with construction of facilities and infrastructure. The implementation of recommended Mitigation Measure 3.6-2 would reduce the potential significance below established thresholds. (Less than Significant with Mitigation Incorporated).	Under Alternative 1, no turbines would be erected north of SR 299. Thus, Alternative 1 would avoid all impacts to cultural and tribal cultural resources north of SR 299, if any such resources exist. There would be an overall reduced acreage of temporary and permanent disturbance, limited to a footprint defined in a smaller area with fewer turbines compared to the Project. The prehistoric archaeological site in the Project Site would not be avoided. Although impacts would be reduced relative to the Project, the impact conclusions and mitigation requirements would remain the same. **Less than the Project**	Under Alternative 2, the prehistoric archaeological site identified within the Project Site would not be avoided; however, the overall reduction in the number of turbines would reduce both temporary (construction-related) and permanent disturbance compared to the Project. Alternative 2 would require implementation of the same protective measures and mitigation as the Project. Although impacts would be reduced relative to the Project, impact conclusions and mitigation requirements would remain the same under Alternative 2. **Less than the Project**

TABLE 4-1 (CONTINUED)
SUMMARY OF IMPACTS OF THE PROJECT AND ALTERNATIVES

EIR Section	Resource Area	Project	Alternative 1, South of SR 299	Alternative 2, Increased Setbacks
3.7	Energy	Impact 3.7-1: Project construction, operation and maintenance, decommissioning and site reclamation could result in the wasteful, inefficient, or unnecessary consumption or use of energy associated with equipment and vehicle fuel use, although there are no unusual Project characteristics that would cause the such use to be less energy-efficient compared with other similar projects elsewhere in the state. The Project's use of electricity during operation and maintenance would be greatly offset by the generation of electricity from the Project. Accordingly, the Project's electricity demand also would not constitute a wasteful, inefficient, or unnecessary use of energy. (Less than Significant Impact) The Project would provide a new source of renewable energy supporting SB 100 and the State's energy goals, and would result in a substantial beneficial impact relating to renewable energy generation, the use of which to serve demand would be prioritized over gas-fired plants and non-renewable sources. (Beneficial Effect)	Under Alternative 1, incrementally less fuel would be required to construct, operate, maintain, and decommission a wind energy development on the Project Site because up-to-seven fewer turbines and related infrastructure would be developed. Alternative 1 would have a total nameplate generating capacity of up to 195 MW, which equates to approximately 21 MW less nameplate generating capacity as the Project. This output would more than offset the amount of electricity needed to operate and maintain Alternative 1, but would not result in as substantial a benefit as the Project due to the reduced overall capacity. Although the impacts and overall benefit of Alternative 1 would be reduced relative to the Project, the impact conclusion would remain the same, and no mitigation measures would be required. **Greater than the Project**	Alternative 2 would preclude the construction of four wind turbines, as compared to the Project, resulting in the loss of approximately 12 MW to 22.8 MW of generating capacity based on generation potential per turbine. Under Alternative 2, the number of workers and durations of construction, operation and maintenance, and decommissioning and site restoration would be incrementally less than for the Project, resulting in slightly reduced fuel use. Electricity needed during operation and maintenance would more than offset the amount of electricity needed to operate and maintain Alternative 2, but would not result in as substantial a benefit as the Project due to the reduced overall capacity. Although the impacts and overall benefit of Alternative 2 would be reduced relative to the Project, the impact conclusions would remain the same, and no mitigation measures would be required. **Greater than the Project**
3.8	Forest Resources	Impact 3.3-1: The Project would result in the temporary disturbance of up to 1,384 acres of timberland during construction and the permanent conversion of up to 713 acres of timberland to developed power generation facilities uses (i.e., to the loss of forest land or conversion of forest land to non-forest use). This would result in a reduction of less than 0.05 percent of the commercial forest lands in Shasta County. (Less than Significant Impact)	Alternative 1 would adversely affect incrementally less timberland than the Project because the approximately 378 acres of the Project Site located north of SR 299 would continue to be managed for timber production. This elimination of 378 acres of the Project Site from development would reduce temporary impacts to commercial forest lands from 1,384 acres to 1,259 acres and would reduce permanent impacts from 713 acres to 652.5 acres. Although the impacts of Alternative 1 would be slightly reduced relative to the Project, the impact conclusion would remain the same, and no mitigation measures would be required. **Less than the Project**	Alternative 2 would reduce temporary impacts to commercial forest lands from 1,384 acres to 1,282 acres relative to the Project and would reduce permanent impacts from 713 acres to 664 acres. Although the impacts of Alternative 2 would be slightly reduced relative to the Project, the impact conclusion would remain the same, and no mitigation measures would be required. **Less than the Project**
3.9	Geology and Soils	The Project would cause less-than-significant impacts to geology, soils and paleontological resources, including the risk of loss, injury, or death involving strong seismic ground shaking (Impact 3.9-1), seismic-related ground failure (including liquefaction) (Impact 3.9-2), and landslides (Impact 3.9-3). It also would result in less-than-significant impacts resulting in substantial soil erosion or the loss of topsoil (Impact 3.9-4) or unstable geologic units or soils that potentially could result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse (Impact 3.9-5). Further, the Project would cause less-than-significant impacts relating to the creation of substantial direct or indirect risks to life or property due to its location on expansive or corrosive soil (Impact 3.9-6) and the adequacy of onsite soils to support the proposed septic tank (Impact 3.9-7). (Less than Significant Impact)	Alternative 1 would result in an incremental reduction in soil disturbance (and erosion potential) relative to the Project due to the fact that up-to-seven fewer turbines and related infrastructure would be developed, and fewer onsite road miles would be needed to develop and serve Alternative 1. A septic system would be developed just as for the Project. Although the impacts of Alternative 1 would be slightly reduced relative to the Project, the impact conclusions would remain the same, and no mitigation measures would be required. **Less than the Project**	Alternative 2 would result in an incremental reduction in soil disturbance (and erosion potential) relative to the Project due to the fact that four fewer turbines and related infrastructure would be developed, and fewer onsite road miles would be needed to develop and serve Alternative 2. A septic system would be developed just as for the Project. Although the impacts of Alternative 2 would be slightly reduced relative to the Project, the impact conclusions would remain the same, and no mitigation measures would be required. **Less than the Project**
3.10	Greenhouse Gas Emissions	The Project also would have a less than significant impact relating to its potential to conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. The Project would directly support the 40 percent reduction in GHG emissions by 2030 target under the 2017 Scoping Plan Update and goal of SB 100 for increasing California's procurement of electricity from renewable sources to 100 percent by 2045; Executive Order B-55-18 and the new statewide goal of achieving carbon neutrality (zero-net GHG emissions) by 2045 and maintaining net negative emissions thereafter; the 2018 Regional Transportation Plan & Sustainable Communities Strategy for the Shasta Region; and the Forest Carbon Plan. (Impact 3.10-2). The Project would result in a less-than-significant impact relating to the generation, directly and indirectly, of GHG emissions such as CO_2, methane, nitrous oxide and SF_6. After accounting for the annualized construction and decommissioning, and annual operational emissions of 809 MT CO2e per year, and the loss of carbon sequestration capacity during the Project's operational timeframe, the Project would provide a potential reduction of 225,131 MT CO2e per year. Overall, this would be a beneficial impact. (Impact 3.10-1)	Alternative 1 would generate incrementally fewer GHG emissions than the Project and would offset incrementally fewer MT CO2e per year because it would have a total nameplate generating capacity that would be approximately 21 MW less than the Project due to the reduction in the number of turbines. There would be no change relative to the Project with respect to plan consistency. The impacts of Alternative 1 would be slightly reduced relative to the Project; the beneficial effect of Alternative 1 also would be reduced. Nonetheless, the impact conclusions would remain the same, and no mitigation measures would be required. **Greater than the Project**	Alternative 2 would generate incrementally fewer GHG emissions than the Project and would offset incrementally fewer MT CO2e per year because it would have a total nameplate generating capacity that would be 12 to 22.8 MW less than the Project due to the reduction in the number of turbines. There would be no change relative to the Project with respect to plan consistency. The impacts of Alternative 2 would be slightly reduced relative to the Project; the beneficial effect of Alternative 2 also would be reduced. Nonetheless, the impact conclusions would remain the same, and no mitigation measures would be required. **Greater than the Project**

TABLE 4-1 (CONTINUED)
SUMMARY OF IMPACTS OF THE PROJECT AND ALTERNATIVES

EIR Section	Resource Area	Project	Alternative 1, South of SR 299	Alternative 2, Increased Setbacks
3.11	Hazards and Hazardous Materials	During normal operation, equipment failure or an extreme event could lead to turbine failure, resulting in a potential hazard (Impact 3.11-3). The Project also could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan (Impact 3.11-7). The implementation of recommended Mitigation Measure 3.11-3 and Mitigation Measure 3.11-7, respectively, would reduce the potential significance of each impact below established thresholds. (Less than Significant with Mitigation Incorporated) The Project would have a less-than-significant impact from the potential to create a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials or wastes (Impact 3.11-1), reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment (Impact 3.11-2), potential hazards from ice shed from turbine blades (Impact 3.11-4), applications of certain pesticides (Impact 3.11-5), and from the alternating changes in light intensity that could occur when turbine blades are rotating (Impact 3.11-6).	Alternative 1 would result in substantially the same impact as the Project relating to equipment or turbine failure and to potential impairment of or interference with an evacuation plan. the same mitigation requirements would apply. Alternative 1 would result in incremental reductions in the less-than-significant impacts that would be caused by the Project due to the up-to-seven fewer turbines that would be constructed, operated and ultimately decommissioned. As a result, Alternative 1 would cause an incremental reduction in the amount of hazardous materials or waste, incrementally fewer turbine blades that could shed ice, and incrementally less vegetation that would be subject to pesticide application. The turbines that would be installed under Alternative 1 would cause substantially the same shadow flicker as the Project in light of the locations of potential receptors. Even with these incremental changes in impact levels, the impact conclusions would remain the same. **Less than the Project**	Alternative 2 would differ from the Project by precluding the construction, operation and maintenance of turbines within three times the height of the turbine from a residential property line and would require setbacks of 1.5 times the height of the turbine from public and private roads. Because Project turbines (M03, D05, B01 and K02 not be constructed, Alternative 2 would result in a less than significant impact relative to whether, during normal operation, equipment failure or an extreme event could lead to a turbine failure resulting in a blade throw. Under Alternative 2, Mitigation Measure 3.11-3 (Mandatory Setbacks) would not be required. Given the greater distance between proposed turbines and potential visual receptors, the less than significant impact of the Project relating to shadow flicker would be even more remote under Alternative 2. Remaining impacts would be incrementally reduced, or substantially the same as the Project. **Less than the Project**
3.12	Hydrology and Water Quality	The Project would, unless mitigated, violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality during construction and decommissioning (Impact 3.12-1); substantially degrade groundwater quality from blasting, if it occurs (Impact 3.12-2); substantially increase siltation of waterways or provide substantial additional sources of polluted runoff during construction and decommissioning (Impact 3.12-4); and conflict with implementation of the Central Valley Basin Plan (Impact 3.12-5). The implementation of recommended mitigation measures would reduce the potential significance of each of these potential significant impacts below established thresholds. (Less than Significant with Mitigation Incorporated) The Project would result in a less-than-significant impact relating to the potential to decrease groundwater supplies or interfere with groundwater recharge such that the project may impede sustainable groundwater management of the basin (Impact 3.12-3).	Alternative 1 would avoid all impacts to Little Hatchet Creek and most disturbance-related impacts to the main stem of Hatchet Creek. There would be an overall reduction in temporary and permanent disturbance due to the fewer number of turbines compared to the Project. Although the impacts of Alternative 1 would be reduced relative to the Project, the impact conclusions would remain the same, and the same mitigation measures would be required. **Less than the Project**	Given the location of the Project turbines that would not be constructed under Alternative 2, Alternative 2 would result in substantially similar impacts to hydrology and water quality as the Project. The same impact conclusions would be reached, and the same mitigation measures would be required. **Equal to the Project**
3.13	Noise and Vibration	The Project could result in the generation of a substantial temporary increase in ambient noise levels (Impact 3.13-2) on and near the Project Site in excess of standards if construction activities were required during nighttime hours or during helicopter use. The implementation of recommended Mitigation Measure 3.13-2 would reduce the potential significance of this potential significant impact below established thresholds. The Project also could result in significant impacts due to groundborne vibration from blasting. The implementation of Mitigation Measure 3.13-3 would reduce impacts to below established thresholds. (Less than Significant with Mitigation Incorporated) The Project would have a less-than-significant impact from operational noise due to the generation of a substantial permanent increase in ambient noise levels in the vicinity of the Project (Impact 3.13-1).	Because the Project turbines that would not be constructed under Alternative 1 would be located over 5,000 feet from the nearest receptor (LT-3) and, thus, would contribute substantially less to noise and vibration impacts, the impacts of Alternative 1 would be substantially the same as those of the Project, the impact conclusions would be the same, and the same mitigation requirement would apply. **Equal to the Project**	Under Alternative 2, proposed setbacks would be increased relative to the Project to preclude turbine construction within 2,037 feet of a residential property line and within 1,018.5 feet of SR 299, any other publicly-maintained public highway or street, and of Supan Road or Terry Mill Road. Implementation of these setbacks would remove turbines M03, D05, and B01 based on the residential property line setback, and would remove turbine KO2 based on the roadway setback. The effect of eliminating these turbines, in particular turbine D05, would reduce the operational and construction-related noise levels at receptor location R-4 compared to those identified for the Project. Although this impact would be incrementally reduced relative to the Project, the impact conclusions would be the same and the same mitigation requirements would apply. **Less than the Project**
3.14	Transportation	The Project would, unless mitigated, substantially increase safety hazards to the public and inhibit emergency access due to the proposed use of oversize vehicles, which could limit motorists' views on roadways and obstruct the driving area (Impact 3.14-3, Impact 3.14-4). The implementation of recommended Mitigation Measure 3.14-3 would reduce these potential significant impacts to a less-than-significant level. (Less than Significant with Mitigation Incorporated) The Project would result in less-than-significant impacts relating to its potential to conflict with a program plan, ordinance or policy addressing the circulation system (Impact 3.14-1) and its potential to conflict or be inconsistent with CEQA Guidelines Section 15064.3(b) regarding vehicle miles traveled (VMT) as the appropriate focus of transportation analyses toward reducing related GHG emissions (Impact 3.14-2).	Alternative 1 would require incrementally fewer oversized loads to deliver/remove heavy construction equipment and wind turbine components due to the reduction by up to seven turbines relative to the Project. Further, Alternative 1 would incrementally further reduce the Project's less-than-significant VMT impact because incrementally fewer vehicle trips by pick-up trucks, haul trucks, and worker vehicles due to the possibility of an incremental reduction in construction and decommissioning schedules resulting from a need for less work to occur during those timeframes. Although the impacts of Alternative 1 would be reduced relative to the Project, the impact conclusions would remain the same and the same mitigation measure would be required. **Less than the Project**	Alternative 2 would require incrementally fewer oversized loads to deliver/remove heavy construction equipment and wind turbine components due to the reduction by four turbines relative to the Project. Further, Alternative 2 would incrementally further reduce the Project's less-than-significant VMT impact because it would require fewer vehicle trips due to the possibility of an incremental reduction in construction and decommissioning schedules resulting from a need for less work to occur during those timeframes. Although the impacts of Alternative 2 would be reduced relative to the Project, the impact conclusions would remain the same and the same mitigation measure would be required. **Less than the Project**

TABLE 4-1 (CONTINUED)
SUMMARY OF IMPACTS OF THE PROJECT AND ALTERNATIVES

EIR Section	Resource Area	Project	Alternative 1, South of SR 299	Alternative 2, Increased Setbacks
3.15	Utilities and Service Systems	The Project would have a less-than-significant impact on utilities and service systems relating to the sufficiency of water supplies available to serve the Project (Impact 3.15-1), the adequacy of a wastewater treatment provider's capacity to serve the Project's projected demand (Impact 3.15-2), and the Project's potential to generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals (Impact 3.15-3). (Less than Significant Impact*)*	Alternative 1 would incrementally reduce water, wastewater and solid waste needs commensurate with the reduction in development and ground disturbance associated with up-to-seven fewer turbines and related infrastructure such as would be needed for the collector system, access roads, and lay-down areas relative to the Project. Storm water drainage infrastructure or improvements would not be required north of SR 299. Although the impacts of Alternative 1 would be reduced relative to the Project, the impact conclusions would remain the same. **Less than the Project**	Alternative 2 would incrementally reduce water, wastewater and solid waste needs commensurate with the reduction in development and ground disturbance associated with the development of four fewer turbines and related infrastructure. Although the impacts of Alternative 2 would be reduced relative to the Project, the impact conclusions would remain the same. **Less than the Project**
3.16	Wildfire	The Project would, unless mitigated, substantially impair an adopted emergency response plan or emergency evacuation plan (Impact 3.16-1); exacerbate wildfire risks and expose Project occupants to pollutant concentrations or a significant risk of loss, injury or death from a wildfire or the uncontrolled spread of a wildfire (Impact 3.14-2); and expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes (Impact 3.16-4). The implementation of recommended Mitigation Measure 3.16-1; Mitigation Measures 3.16-2a, 3.16-2b and 3.16-2c; and Mitigation Measure 3.16-4 would reduce these potential significant impacts to a less-than-significant level. (Less than Significant with Mitigation Incorporated) The Project also would have a less-than-significant impact resulting from the proposed installation and maintenance of infrastructure such as roads, fuel breaks, emergency water sources, power lines or other utilities because such infrastructure could exacerbate fire risk (Impact 3.16-3). (Less than Significant Impact*)*	Alternative 1 would incrementally reduce the construction, operations and maintenance, and decommissioning footprint, restricting it to the portion of the Project Site that is located south of SR 299. This would have the effect of incrementally reducing the potential for a wind project-related ignition during all phases of the Project. Further, under Alternative 1, the portion of the Project Site north of SR 299 would remain under timber management and production, which could decrease the risk of wildland fire because that portion of the Project Site would be harvested and thinned, preventing excessive fuel build up in the area of the Project Site north of SR 299. Although the impacts of Alternative 1 would be reduced relative to the Project, the impact conclusions would remain the same and the same mitigation requirements would apply. **Less than the Project**	Alternative 2 would reduce the number of turbines by four relative to the Project, and so would incrementally reduce potential ignition sources from turbines, vehicles and equipment during construction, operation and decommissioning relative to the Project. Additionally, increasing the setbacks of the turbines from residential properties would provide some additional protection to surrounding communities by increasing the area between residences and the turbines in the event that a turbine fire were to occur. Although Alternative 2 would reduce impacts to wildland fire slightly, impact conclusions would be the same and the same mitigation requirements would apply. **Less than the Project**

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CHAPTER 5
Report Preparation

5.1 Lead Agency

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Kelley, Matthew P.	U.S. Army Corps of Engineers, Sacramento District, Redding Office
Norris, Jennifer	U.S. Fish and Wildlife Service
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	California Public Utilities Commission
Grah, Kathy	Caltrans District 2, Local Development Review MS6
	Native American Heritage Commission
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Hubbard, Kristin (Environmental Scientist)	California Department of Fish and Wildlife
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Brown, Jeff	Caltrans Division of Aeronautics
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Local Agencies

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	County of Siskiyou, Planning Department
Maze, Kristen	County of Tehama, Planning Department
Hubbard, Leslie	County of Trinity, Planning Department
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Kerns, Steven	Shasta County Planning Commission
MacLean, Tim	Shasta County Planning Commission
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Re: Fountain Wind Project	Shasta County, Clerk of the Board
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Hall, Roy (Chairperson)	Shasta Nation
Whitehouse, Gene (Chairperson)	United Auburn Indian Community of the Auburn Rancheria
Sisk-Franco, Caleen (Chief)	Winnemem Wintu Tribe
	Wintu Educational and Cultural Council
	Wintu Tribe and Cultural Council
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Notices of the Availability of the Draft EIR also were provided to the following organizations and individuals:

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John Gable	Moose Camp
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Brenda Phillips	Moose Camp
Marvin Beaver	Moose Camp
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Appendix A
Aesthetics

Fountain Wind Project

Visual Resources Technical Report

December 11, 2019

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Appendix A KEY OBSERVATION POINTS WORKSHEETS

Acronyms and Abbreviations

DEM	Digital Elevation Model
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
GIS	geographic information systems
I-5	Interstate 5
KOP	Key Observation Point
MW	megawatt
project	Fountain Wind Project
SR	State Route
VIA	Visual Impact Analysis

Note:

Often, agency suggestions and guidelines are provided in US units of measure (e.g., acres, feet, or miles), and in other instances, agency guidance is provided in metric (aka SI, or System International) units (e.g., meters or kilometers). To convert an otherwise readily recognized agency standard (e.g., 10 miles or 1 kilometer) to the other system may result in confusion. Accordingly, we provide measures in either system, using the original agency suggestion unchanged, and provide conversion to the other standard only when it makes sense to do so.

Glossary

These terms are included in Federal Highway Administration (FHWA) Guidelines for the Assessment of Highway Projects (FHWA 2015). Slight modifications in terminology and descriptions have been made to some terms to reflect the way the FHWA method is applied in this report.

Color	The light reflecting off an object at a particular wavelength that creates hue (green, indigo, purple, red, etc.) and value (light to dark hues).
Distance Zones	Distance zones are based on the position of the viewer in relationship to the landscape. They are measured from one static point, such as the location of a viewpoint. There are three defined distance zones: • Foreground: 0.25–0.5 mile from the viewer • Middleground: Extends from the foreground zone to 3–5 miles from the viewer • Background: Extends from the middleground zone to infinity
Form	The unified mass or shape of an object that often has an edge or outline and can be defined by surrounding space. For example, a high-rise building would have a highly regular, rectangular form whereas a hill would have an organic, mounded form.
Intactness	The integrity of visual order in the natural and human-built landscape, and the extent to which the landscape is free from visual encroachment.
Key Observation Point (KOP)	A viewpoint usually selected for use in a visual impact analysis because it is either critical or representative of the visual character of either the environment or the project. If simulations are prepared for an analysis, they are prepared for views from KOPs.
Landscape Unit	Identified area within a project area that has similar visual features and homogeneous visual character and frequently, a single viewshed. Typically, the spatial unit or organizing principle used for assessing visual impacts.
Line	Perceived when there is a change in form, color, or texture and where the eye generally follows this pathway because of the visual contrast. For example, a city's high-rises can be seen silhouetted against the blue sky as a skyline, a river can have a curvilinear line as it passes through a landscape, or a hedgerow can create a line where it is seen rising up against a flat agricultural field.
Simulations	Two- or three-dimensional depictions of the visual character of a future state. Simulations range from artistic renderings to computer animations.
Texture	The perceived coarseness of a surface that is created by the light and shadow relationship over the surface of an object. For example, a rough surface texture (e.g., a rocky mountainside) would have many facets resulting in several areas in light and shadow and, often, with distinct separations between areas of light and shadow. Conversely, a smooth surface texture (e.g., a beach) would have fewer facets, larger surface areas in light or shadow, and gradual gradations between light and shadow.

Unity	The degree to which the visual resources of the landscape join to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony or inter-compatibility between landscape elements.
Viewers	Those who occupy or will occupy a project site or lands within a project's viewshed can see the proposed project and travelers who would use it. • Neighbors: Viewers who occupy or will occupy land adjacent or visible to the proposed project. For a complex or controversial project, neighbors can be defined by land-use, including residential, retail, commercial, industrial, agricultural, recreational, and civic neighbors. • Travelers: Viewers who see the project, defined by the purpose of traveling, including commuting, hauling, touring, or exercising travelers, or by their mode of travel as motorists, bicyclists, or pedestrians.
Viewshed	The surface area visible from a location (e.g., an overlook) or sequence of locations (e.g., a roadway or trail). The area in which the project would theoretically be visible as influenced by the presence or absence of intervening topography, vegetation, and structures.
Visual Character	The description of the visible attributes of a scene or object typically using artistic terms such as form, line, color, and texture.
Visual Quality	What viewers like and dislike about visual resources that compose the visual character of a particular scene. Different viewers may evaluate specific visual resources differently based on their interests in natural harmony (harmony is considered desirable; disharmony is undesirable), cultural order (orderly is considered desirable; disorderly is undesirable), and project coherence (coherent is considered desirable; incoherent is undesirable). Neighbors and travelers may have different opinions on what they like and dislike about a scene.
Visual Resources	Components of the natural, cultural, or project environments capable of being seen. • Natural Visual Resources: The land, water, vegetation, and animals that compose the natural environment. Although natural resources may have been altered or imported by people, resources that are primarily geological or biological in origin are considered natural. A grassy pasture with rolling terrain, scattered trees, and grazing cows, for example, is considered to be composed of natural visual resources, even though it is a landscape created by people. • Cultural Visual Resources: The buildings, structures, and artifacts that compose the cultural environment. These are resources constructed by people. • Project Visual Resources: The geometrics, structures, and fixtures that compose the project environment. These are the constructed resources that were or will be placed in the environment as part of the proposed project.
Vividness	The memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.

Executive Summary

Fountain Wind LLC, is proposing the development of the Fountain Wind Project ("project") in Shasta County, CA. The request for authorization to construct the project has been submitted to Shasta County in the application for Use Permit 16-007. This technical report evaluates potential effects on visual character and quality from development of the proposed project, which would consist of up to 72 wind turbines and associated infrastructure and facilities. It would be located on 76 assessor parcels and would have a nameplate generating capacity of up to 216 megawatts.

Stantec Consulting Services Inc. (Stantec) visual resources specialists identified areas of potential project visibility and visual sensitivity, collected photographs of views toward the project from publicly accessible locations throughout the surrounding landscape, and with advice from Shasta County identified seven viewpoints for use in the analysis of the project's potential visual effects. Visualization specialists developed simulations that placed a photo-realistic model of the project into views from Key Observation Points. Visual resources specialists then assessed the difference in visual quality between existing and proposed conditions, relying on the Federal Highway Administration Visual Impact Assessment method. This method evaluates visual quality based on concepts of natural harmony, cultural order, overall coherence, and landscape composition and vividness. Potential contrast to visual character from the proposed project was also identified and described as applicable in terms of form, line, color and texture. The evaluation in this analysis is focused on the proposed project turbines. Because the project is set entirely within forested lands that are actively managed for timber production, other proposed features—including ancillary structures and overhead transmission corridors—would be located within private parcels, set back from publicly accessible locations, and generally obscured by forest and topography in views toward the project from outside the project footprint.

The views used in the analysis represent three landscape units: Mountain Communities, Hat Creek and Pit River, and Sacramento Valley. These areas have distinct qualities in terms of topography, expansiveness of views, and land development patterns. Stantec's analysis concluded that visual quality would be reduced in views where existing turbines are not visible at present. Such views are located in the Mountain Communities landscape unit. Visual quality would also be reduced in long-distance views to the east from the Sacramento Valley, in which the project would appear across a portion of mountain slopes without much coherence. The project would contrast with existing visual character, although existing turbines are already detectable in views.

In Mountain Communities views that include existing wind turbines, the project would not substantially reduce visual quality and it would appear consistent with the visual character of existing views. Views of the project from Hat Creek and Pit River would be long-distance and elevated, in which the project would appear to expand the segment of ridgeline already occupied by wind turbines without reducing visual quality or contrasting with visual character.

1.0 INTRODUCTION

Fountain Wind LLC (Fountain Wind) is proposing the development of the Fountain Wind Project ("project") in Shasta County, CA. The project would consist of up to 72 wind turbines and associated infrastructure and facilities. It would be located on 76 assessor parcels and would have a nameplate generating capacity of up to 216 megawatts (MW). The request for authorization to construct the project has been submitted to Shasta County in the application for Use Permit 16-007.

Visual resources are elements of a natural or built environment with aesthetic value based on visual quality and character. They may be formally identified by local, state, or federal governments or recognized by other institutions and organizations. They may also be components of a natural or built environment that contribute to a memorable or distinct landscape. A visual resources technical report evaluates the potential effects on visual resources from a proposed project based on the project's physical characteristics and potential visibility, and the degree to which the project could alter existing visual quality and/or visual character.

This technical report evaluates potential effects on visual quality from development of the project. It assumes development of the project with the largest class of turbine contemplated for the project at all potential turbine locations, as specified in the following section.

2.0 PROPOSED PROJECT AND ENVIRONMENTAL SETTING

2.1 PROPOSED PROJECT

The project would include the following: turbines and other permanent features including meteorological (MET) towers, transformers, lay-down areas, access roads, underground and overhead collector lines, an operation and maintenance building, and substation components. This report evaluates potential visual effects from the proposed turbine locations in views from the surrounding area. Some of the proposed MET towers may be intermittently visible from nearby roadways. All other features will be located within the project site, away from publicly accessible viewpoints or otherwise completely to mostly obscured by intervening vegetation. Up to 72 turbines are proposed, with hub heights of up to 125 meters and rotor diameters of up to 162 meters. The maximum potential height of project turbines with rotor blades at their apex would be 206 meters.

The 206-meter–tall turbines would have individual generating capacities of up to 5.7 MW. If the 5.7 MW turbines are eventually used, only 38 would be required to be installed to achieve the project's generating capacity. All 72 turbine sites would be required if 3.0 MW turbines are used. The largest potential 3.0 MW turbine being considered has a hub height of 120 meters and rotor diameters of 138 meters, with a maximum potential height of 189 meters. The difference between these two turbine sizes would be detectable in views from 1 mile away but it would not be discernable at 3 miles away.

This report and the visual simulations evaluate a project layout of 72 turbine locations with the maximum 5.7MW turbine with a 206-meter height. This evaluation of the largest turbines at all 72 proposed locations provides the most conservative evaluation of potential visual effects.

2.2 SETTING

The project would be built on privately owned and managed lands in rural, unincorporated Shasta County, 28 miles northeast of Redding. The nearest established communities are Montgomery Creek (3 miles to the west) and Burney (7 miles to the east). The project is set within mixed conifer forest lands that are actively logged and managed. The project would be located to the west and south of the existing Hatchet Ridge Wind project, along several ridgelines and peaks. The Shasta-Trinity National Forest is to the north and west of the project and dispersed portions of the Lassen National Forest are to the south and east. Figure 1 includes an overview of the project location, along with existing landscape features and visual resources, and views referred to in this technical report (Figure 1a shows the area within a 30-mile radius of the project footprint; Figure 1b the area within a 10-mile radius).

The project is in the southern end of the Cascade Range and is within the Cascades Ecological Region, which is characterized by underlying volcanic rock strata and a physiography defined by recurring periods of glaciation (USEPA 2013). With high plateaus and valleys that trend east-west, it includes steep ridges as well as both active and dormant volcanoes and is marked by a generally mesic, temperate climate that supports productive coniferous forests. At higher elevations, subalpine meadows may occur that support unique flora and fauna.

The leasehold area is characterized by a number of buttes and peaks separated by small valleys formed by a number of tributaries in the Pit River and Cow Creek Watersheds. Elevations within the leasehold area range from about 3,000 to 6,600 feet.

3.0 METHODS

This assessment of potential effects to visual resources from the project relies on and implements selected concepts from the Federal Highway Administration (FHWA) Visual Impact Assessment (VIA) for Highway Projects method (FHWA 2015). When fully implemented, the FHWA VIA process requires four phases: 1) an Establishment Phase defines the study area and builds an understanding of the conceptual character of a proposed project; 2) the Inventory Phase examines visual quality related to the project footprint, considering the relationship between components of the affected environment and the composition of the affected population; 3) the Analysis Phase evaluates impacts on visual quality from a proposed project; and 4) the Mitigation Phase defines the mitigation and enhancement efforts to be included in project design, typically after project alternatives have been evaluated and a preferred alternative selected. This report addresses the first three phases; typical mitigation approaches for wind energy projects are briefly discussed in Section 5.4.

Section 4, Affected Environment, describes the project's study area, and Section 4.3, Visual Resources and Viewer Sensitivity, identifies affected populations, or viewers. An inventory of visual quality from representative viewpoints and potential project effects on visual quality are described in Section 5, Results and Discussion.

3.1 STUDY PROCEDURE

This section summarizes the primary steps undertaken in the production of this report.

3.1.1 Review of Project and Setting

Stantec Consulting Services Inc. (Stantec) visual resources specialists initiated the work to support this report by achieving a thorough understanding of the project components and the setting within which they are proposed to be constructed and operated. They reviewed local plans and policies, along with pertinent aerial imagery and maps. The visual resource specialists identified important visual resources, including any state or locally designated scenic roadways, designated scenic areas, or vistas, and the location of residential, recreational, or cultural sites where those with views of the proposed project are likely to have heightened sensitivity to perceived changes in the visual environment.

3.1.2 Project Study Area

A proposed project's visual study area is defined by its presumed maximum viewshed—the area within which it is likely to be visible (see following section)—and areas of presumed or known visual concern. Areas of visual concern are located within a project's viewshed; for an on-shore, utility-scale wind energy project, the viewshed is typically the area within a 10- to 20-mile radius of the project site.

For the project, visibility was projected within a 30-mile radius, with the assumption that the size of the proposed turbines, in concert with the region's topography—a mountainous project location with valley regions to both the east and west and elevated areas with direct lines of sight to the east—would result in a larger theoretical viewshed than for wind projects of comparable footprints in other areas. Public scoping comments indicated concerns about long-range views from the more highly populated Sacramento Valley to the west of the project and the elevated mountains and valleys to the east.

Within the study area, Stantec identified three landscape units—based on presumed landscape character, topography, and land uses—to inform a broad selection of preliminary viewpoints. The Mountain Communities, Hat Creek and Pit River, and Sacramento Valley landscape units are described in Section 4.4.

In this study, "project" and "project footprint" refer to the total footprint of the proposed turbines and associated structures, or the acres that will be temporarily or permanently disturbed by these structures. "Project site" refers to the approximately 4,463-acre area where project facilities could be sited. "Leasehold area" refers to the approximately 29,000-acre area comprised of all parcels to be under lease to the applicant. References to "project vicinity" are specified as necessary.

3.1.3 Viewshed Analysis

A viewshed analysis is a geographic information systems (GIS) generated map that identifies, based on the maximum height of proposed components and surrounding topography, the theoretical visibility of a proposed project. The viewshed analysis identifies the locations within the visual study area where it may be possible to view the proposed wind turbines, or any portion of proposed turbines, from eye-level (1.7-meter) vantage points. In its most basic form, a viewshed graphic's line-of-sight analysis between project components and ground elevations

throughout the surrounding terrain does not account for intervening vegetation or structures. It serves as an initial step in defining a project's maximum visibility and informs selection of preliminary viewpoints in representative areas in part by eliminating from further consideration views in areas where topography would prevent any visibility of a project.

Topographic viewshed maps were prepared using United States Geological Survey Digital Elevation Model (DEM) data, coordinates, and dimensions of all proposed turbines; an assumed viewer height of 1.7 meters; and ESRI ArcGIS® software with the Spatial Analyst extension. The viewshed analyses are based upon a 206-meter blade tip height, a 125-meter hub height (the Federal Aviation Administration [FAA] warning light height), and the location of all proposed turbines. The analyses run at blade tip height illustrate maximum potential day time visibility; modeled visibility of any portion of a turbine, including just the tip of one blade at maximum height, registers in the analysis as a visible turbine. The analyses run at the height of the FAA warning light define maximum potential nighttime visibility based on an anticipated FAA lighting plan. The resulting topographic viewshed maps define the maximum area from which any turbine or part of a turbine within the completed facility could potentially be seen within the 30-mile study area. A second set of viewshed maps showing only the area within a 10-mile zone is also included here to show areas of potential visibility at a scale not allowed by the 30-mile zone.

3.1.4 Site Photography and Selection of Key Observation Points

In December 2017, a Stantec visual resources specialist conducted a photography site visit, documenting views toward the project from publicly accessible locations throughout the surrounding area. Atmospheric conditions ranged from sunny to mostly cloudy over the multi-day site visit, typical for the region during the late fall. The site was visited again in December 2018 when conditions ranged from sunny in valley views to hazy in long-distant views and in April 2019 when there was a comparatively higher degree of clarity in long-distance views.

Visual resources specialists photographed with a high-resolution, full-frame, 35mm Digital Single-Lens-Reflex camera with a fixed 50mm lens. A 50mm focal length is widely accepted as an industry standard for approximating the field of vision of the human eye. That is, a photograph of a landscape shot with a full-frame camera with a 50mm lens generally replicates what a person would see in a single frame of view.

Stantec collected photographs of the project site from a total of 37 viewpoints. These locations included preliminary viewpoints from representative or visually sensitive areas within the project viewshed. These preliminary viewpoints were validated in the field and retained or revised based on confirmation of project footprint visibility. The visual resources specialists collected additional views to account for observed views and potentially sensitive receptors, particularly those identified during the project's public scoping phase in early 2019. All photographs serve to document project visibility and existing visual conditions within and near the project site, as viewed from publicly accessible locations; this technical report does not assess effects to private views. Each viewpoint location is documented using a hand-held global positioning system device.

From the total set of viewpoints photographed, and based on discussions with Shasta County, Stantec identified five views that represented the general ranges of viewer sensitivities, landscapes, and land uses in the project viewshed. This set included two long-distance views requested by the County, which reviewed and concurred with their use as Key Observation Points (KOPs) in the formal visual analysis. Upon review of preliminary simulations (see following section), Stantec added two more mid-range views to allow for consideration of additional views from closer proximity to the project site in the evaluation of potential effects. KOPs are included in all maps in Figures 1 and 2. In addition,

Character Views, which are not relied upon in the formal visual analysis as a KOP but rather serve to supplement discussions of existing visual character, are included throughout the description of the affected environment.

3.1.5 Preparation of Simulations

Visual simulations, in which a photo-realistic model of a project is placed into existing photographs, serve as the basis by which contrast between existing conditions and those with the project is evaluated. Using Autodesk 3ds Max™, Stantec visualization specialists built a three-dimensional model of the project based on the layout and specifications provided by ConnectGen. The model includes only the proposed turbines, the only project component visible in views selected for analysis. They then developed a simulated perspective (camera view) to match the geo-referenced location of each KOP, as well as the bearing and focal length of each photograph. Stantec obtained and used DEM data as the land base upon which existing elements in each view (e.g., buildings, vegetation, infrastructure) were modeled based on aerial imagery. Stantec placed the project model and existing elements into the DEM, then adjusted the camera and target location, focal length, and camera roll to align all modeled elements with the corresponding elements in the photograph within which the model was placed. Visual resources specialists reviewed simulations for photo-realistic quality and consistency with the project plans and layout.

This report includes simulations of long-distance views of up to 28 miles away. The human eye can, under certain atmospheric conditions, detect structures with the size, form, and color of the proposed turbines at that distance. However, standard approaches to simulation production, namely the resolution of the monitors or quality of printed images on which readers are likely to view such images, can restrict or even limit visibility of simulated features photographed from such distances. The visibility of proposed turbines in the two long-distance views evaluated here has, therefore, been exaggerated to facilitate their appearance in simulations. This was done by adjusting the resolution of the turbines to twice the default level which, when compressed into photographic format, results in a "denser," and thus more visible, simulation.

3.1.6 Assessment of Effects on Visual Resources

Relying on observations during the site photography and the resulting images of views toward the project, visual resources specialists evaluated the visual quality of existing conditions for each KOP. This process relied on the use of worksheets that focus on key concepts of the FHWA method; it assessed natural harmony, cultural order, overall coherence, and landscape composition and vividness for each view, assigning a visual quality rating ranging from "very low" to "very high" (Appendix A). This assessment was replicated for the simulated images showing the project as it would be seen from each KOP. Stantec established a visual quality rating for each view showing proposed conditions. The difference in visual quality rating for each view between existing and proposed conditions established the degree of contrast in visual quality from the project. Potential sources of contrast related to visual character–-described in terms of form, line, color, and texture—were also identified and are discussed as appropriate.

4.0 AFFECTED ENVIRONMENT

The project's affected environment includes the regulatory environment within which it would be permitted, the area within which it would likely be visible and the visual resources and landscapes it contains, and the typical viewers who would see it. Each of these is described in this section.

4.1 REGULATORY SETTING

This technical report does not evaluate project consistency with any specific local, regional, or state policies related to visual or scenic resources that would be directly applicable to the proposed project or its location. However, the Initial Study prepared for the project identified the following, which informed selection of preliminary viewpoints.

4.1.1 Shasta County

Section 6.8, Figure SH-1 of Shasta County's General Plan, designates the Hatchet Ridge Summit on State Route (SR) 299 as a "gateway or location that marks the entrance to a community of geographic area" (Shasta County 2004). Additionally, SR 299 from Bella Vista east to the Hatchet Ridge Summit gateway and SR 44 from Old Station to Millville are each considered a "corridor in which the natural environment is dominant." SR 299 from the Hatchet Ridge Summit gateway to Burney is also considered a "corridor in which natural and manmade environment contrast" (Shasta County 2004).

4.1.2 California State Scenic Highway Program

The California Scenic Highway Program was created by the Legislature in 1963 and is managed by the Landscape Architecture Division of the California Department of Transportation. Its purpose is to protect and enhance the natural scenic beauty of California highways and adjacent corridors through special conservation treatment. A highway may be designated scenic depending on how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent to which development intrudes upon travelers' enjoyment of the view.

A 3.3-mile segment of SR 151 extending south from Shasta Dam is the only officially designated California State Scenic Highway in Shasta County. This roadway segment is 28 miles away from the western edge of the project footprint. Eligible State Scenic Highways include SR 89 from the Siskiyou County border to its intersection with SR 44, SR 299 west of Interstate-5 (I-5) and east of SR 89, and SR 44 from I-5 to its intersection with SR 89 (Caltrans 2017).

4.2 PROJECT VIEWSHED

Four iterations of a viewshed map were produced for use in this analysis. They are included collectively as Figure 2. Figure 2a presents a ramped viewshed analysis, based on the screening effect of topography alone for the maximum turbine height, which assumes blade tip at its apex for a 30-mile radius from the project. A "ramped" presentation indicates ranges (e.g., "heat mapping" or color coding) for 0, 1–5, 6–10, 11–20, 21–30, 31–50, and 51–72 turbines or portions of turbines potentially visible from the surrounding terrain. For example, Figure 2a indicates that the number of turbines that would theoretically be partially or fully visible based on maximum height is relatively few (areas

colored purple and blue) in valley areas within the 10 miles east of the project footprint. Beyond 10 miles away, east of SR 89 where elevations increase, theoretical visibility increases (as indicated by yellow and orange shading).

Figure 2b shows the same viewshed for each tower at hub height, where FAA lighting would be mounted. This provides a theoretical example of where aircraft warning lights would be visible throughout the surrounding landscape, without being obscured by topography.

Figure 2c shows the blade tip viewshed for just a 10-mile radius from the project footprint, and Figure 2d shows the hub height viewshed for the 10-mile radius.

4.3 VISUAL RESOURCES AND VIEWER SENSITIVITY

The visual resources near the project are primarily components of the project's geologic and natural setting. The progression in elevation and change in landscape from the broad, flat Sacramento Valley—characterized by large-scale agricultural operations and communities concentrated along the Sacramento River—to the mountainous and more sparsely populated southern Cascade Range is evident and results in the presence of limited but broadly distributed locations from which long, expansive views, or vista views, of the leasehold area are available. A portion of the designated overlooks within the mountain area, as well as informal overlooks (e.g., pull-outs along the side of mountain roads) provide for such views. Conversely, views of the ridges within the project from the nearby mountain valleys and more distant Sacramento Valley display the topography and vegetation that is emblematic of the region's visual character.

Designated visual resources within the study area and viewshed include the Fountain Fire Overlook and the eligible state scenic roadways noted above (SR 299, SR 89, and SR 44). Public lands and recreational destinations are visual resources in that they potentially provide views toward the project.

Finally, cultural features—particularly historic structures, cemeteries, and schools or other institutions—have aesthetic value in that there may be interest to conserve views from these sites. Views from such features within the leasehold area were considered and documented as appropriate.

Potential viewers include the following, based on the FHWA definitions of neighbors and travelers (FHWA 2015). The set of publicly accessible viewpoints described in the following section was identified to be representative of assumed viewer concerns.

Residential viewers: Residential neighbors live within viewing distance of the proposed project. Their visual preferences tend toward a desire to maintain the existing landscape as it is. Depending on their location, residential neighbors are often interested in cultural order and natural harmony, with less emphasis on project coherence unless it impacts their ability to appreciate the other two aspects of visual quality.

Recreational viewers: Recreational neighbors (or "recreationists") provide or participate in recreation within the project viewshed. Recreation includes organized sporting events, indoor and outdoor leisure activities, and cultural events. The visual preferences of recreational neighbors tend to be focused on and associated with their recreational activity. They tend to prefer the status quo and are leery of visual encroachments that may cause adverse effects on the setting of their activity. Depending on the type of recreation, recreational neighbors are very interested in cultural

order and natural harmony, with some emphasis on project coherence as it impacts their experience traveling to their recreational activity.

Tourists: Tourists travel on a highway, primarily for enjoyment, usually to a pre-determined destination. Tourist trips tend to be more adventuresome, cover longer distances, and take more time than commuting trips. Tourists frequently travel in groups with both a driver and passengers, and are equally interested in project coherence, cultural order, and natural harmony.

Workers: In agricultural areas, project viewers can include agricultural neighbors who are farmers of crops or herd animals and who often work in fields and pastures. Some are permanent; many are migratory but may return to the same area again and again over the years. Agricultural neighbors regard cultural order and natural harmony as critical components of the landscape. They are less interested in project coherence.

Commuters: Commuters are regular travelers of the same route. The frequency of the travel may vary, but there tend to be peaks—such as morning and evening rush hours and holidays. Commuters, like all travelers, are particularly interested in project coherence. They are also interested in cultural order and natural harmony to the extent that it contributes to wayfinding.

Residents, recreationists, and tourists are assumed to have moderately high to high sensitivity to visual change from the project, based on the context of specific views. Workers and commuters are assumed to have more moderate sensitivity to visual change.

4.4 LANDSCAPE UNITS, KEY OBSERVATION POINTS, & VISUAL CHARACTER

To frame the analysis of visual effects from the project, the viewshed is divided into landscape units. Landscape units are spatially enclosed and/or visually bounded areas with distinct landscape character and interrelated visual elements. Three general landscape units are used in this analysis: Mountain Communities, Hat Creek and Pit River, and Sacramento Valley. Publicly accessible KOPs, located within the viewshed identified in Section 4.2 and representative of the range of viewer types defined in Section 4.3 who are likely to have views toward the project, are included for each landscape unit (Table 1).

Existing visual conditions within each landscape unit are described below, supported by images of KOPs and character views. KOP and character view locations are shown in Figures 1a-b, and KOP locations are also included in the viewshed images (Figures 2a-d). Existing views from KOPs are included in Figures 3 through 9. The text in this section summarizes the visual character discussions included in the FHWA rating sheets completed for the KOPs (Appendix A).

Table 1. Landscape Units and Key Observation Points

Landscape Unit / KOP	Distance from Nearest Project Turbine (miles)	Visual Resources	Typical Viewers
Mountain Communities			
KOP 1 – Fountain Fire Overlook	0.8	Designated overlook just off of SR 299	Residents, tourists

Landscape Unit / KOP	Distance from Nearest Project Turbine (miles)	Visual Resources	Typical Viewers
KOP 2 – Montgomery Creek	3.1	Elementary School	Residents, tourists, commuters, workers
KOP 3 – Round Mountain	3.1	Hill Country Clinic / Community Center	Residents, tourists, commuters, workers
KOP 4 – SR 299 at Tamarack Road	4.5	Rural mountain landscape	Tourists, commuters, workers
KOP 5 – Burney	7.1	Main population center east of project	Residents, tourists, commuters, workers
Hat Creek and Pit River			
KOP 6 – SR 299 Pit River Overlook	18.6	Eligible State Scenic Highway	Recreationists, tourists, commuters
Sacramento Valley			
KOP 7 –Redding	27.8	Main population center west of project	Residents, tourists, commuters, workers

4.4.1 Mountain Communities

The Mountain Communities landscape unit encompasses the portion of the study area between the foothills east of Bella Vista and SR 89, east of the project. The project is entirely located within this landscape unit, which is characterized visually by its multiple local mountain peaks and general cover of mostly coniferous forest lands; mixed montane chaparral and forest scrub are present throughout the forested areas. Views from publicly accessible locations throughout the landscape unit generally contain ridgelines and slopes of varying grades with partial to complete coverage of evergreen trees, namely ponderosa pine, Douglas-fir, and white fir.

The view from KOP 1 at the Fountain Fire Overlook, a designated viewpoint commemorating the 1992 Fountain Fire that burned nearly 64,000 acres in the area, is demonstrative of homogenous vegetation in the area (Figure 3a). While there are scattered plots of federal forest in this part of Shasta County, most forest lands visible from throughout the landscape unit are privately held. There is active logging in the area. Timber facilities and associated roads and infrastructure comprise the majority of development visible to travelers on SR 299 between towns and communities. Dispersed residential uses, including clustered homes and neighborhoods, are evident. However, the majority of the population in this landscape unit is concentrated in established towns and communities mostly located along the SR 299 corridor.

Views to the east from the western slopes afford intermittent visibility of the nearby ridgelines beyond the highway and developed areas, as evidenced in the views from KOP 2 in Montgomery Creek (Figure 4a) and from KOP 3 in Round Mountain (Figure 5a). Roadside vegetation frequently obstructs views outside of the roadway corridor (see Character View 1 below). While there are similar views from the elevated valleys east of the project, such as that from KOP 4 in an open segment of SR 299 (Figure 6a), most views are more enclosed by trees and, in populated areas, structures. The view from KOP 5, in Burney, illustrates the variety of intervening elements in views toward the project from within an urbanized environment (Figure 7a). The view from SR 299 just east of SR 89, near the community of Johnson Park, further demonstrates the narrow views from the more heavily wooded portions of the study area, in which views are blocked in all directions save for down the roadway corridor (see Character View 2 below). Turbines

that are part of the currently operating Hatchet Ridge Wind project are visible in views from a number of these locations.

The collective visual character in these views is defined by the ridgeline forms visible above and beyond vivid evergreen trees, and it is further informed by the human-made elements in view: the strong linear roadways; vertical forms of utility poles and the clear-cut transmission right-of-way; existing wind turbines with their angular rotors; and the varied forms and colors of development within or just beyond the highway corridor.

Typical viewers within the Mountain Communities landscape type include tourists who may be seeking out vista views in this portion of the Cascade Range or traveling to recreational destinations beyond the study area, as well as commuters, workers, and residents within the region.

Character View 1: View along eastbound SR 299, approaching Hatchet Summit from the west. Hatchet Ridge Wind project turbines are visible to the northeast; however, most views from the highway corridor are obstructed by trees.

Character View 2: View along westbound SR 299, near the community of Johnson Park and just east of the SR 299 / SR 89 junction. Trees line the highway corridors throughout this area, which narrows or eliminates views to the west.

4.4.2 Hat Creek and Pit River

The Hat Creek and Pit River landscape unit encompasses the portion of the study area east of SR 89, where the landscape is characterized by the contrast between the Hat Creek Valley and the mountain peaks and buttes to the east and west. Hat Creek flows northward through the flatlands and is a tributary to the Pit River, which flows downhill from the east, alongside Saddle Mountain and Haney Mountain. From within the valley, which is as close as 11 miles from the project footprint, long-distance views to the west are mostly blocked by Burney Mountain and other, lower ridgelines. Character View 3, below, shows a scene typical in views from the valley floor: waterways meander through sparsely developed, intermittently wooded flatlands. Cinder cones and other geologic features are indicative of the region's volcanic origins.

Higher elevations to the east afford broader, less obstructed views to the west. In the view from KOP 6 (Figure 8a), located at an informal overlook along Haney Mountain, a few hundred feet above the valley floor and nearly 19 miles away from the project footprint, the varied topography of the region is visible. Individually detectable trees populate the landscape at all elevations and are primary vertical features. Two linear components appear to divide the view: the Pit River extends from the foreground into the middleground, below the viewpoint; further away, an electrical transmission corridor, observably cleared of vegetation, extends into the background and is visible ascending the view's mountain backdrop. Hatchet Ridge Wind project turbines are discernable along the ridgeline in the right half of the view. The view from Big Valley Point Summit shows the above features more comprehensively (see Character View 4 below), with striated mountain ridgelines and buttes serving as backdrop to the elevated and irregularly vegetated Fall River Valley. This viewpoint is more than 30 miles away from the project footprint.

Along with the travelers, residents, commuters, and workers common to the entire study area, recreationists are among typical viewers in this landscape unit. Hat Creek and Pit River are both fishing destinations. SR 89 is a

segment of the Volcanic Legacy Scenic Byway. Additionally, the Pacific Crest National Scenic Trail's route between McArthur-Burney Falls Memorial State Park and Lassen Volcanic National Park passes through Hat Creek.

Character View 3: View to the southwest from Cassel Road, east of SR 89 and Hat Creek, one of few locations that afford unobstructed views to the west. Burney Mountain is visible in the left side of the view. The project would be 12 miles away from this location. The row of trees beyond the Hat Creek sign are typical of view-obstructing vegetation along SR 89.

Character View 4: View to the southwest from Big Valley Point Summit, east of Fall River Mills. Burney Mountain, 27 miles away, is visible in the left of the view. Saddle Mountain and Haney Mountain, 13 miles away, are in the right of the view, appearing above the Fall River Valley.

4.4.3 Sacramento Valley

The lands west of the project and surrounding mountain communities descend 3,000 feet to the northern extent of the Sacramento Valley. West of Round Mountain and near the community of Bella Vista, about 17 miles from the project footprint, transitional foothills characterize the landscape. As observable in the view from Character View 5, oaks replace conifers as the predominant trees in this area. Away from the upland areas, where denser forest lands and steep grades obstruct many views from roadway corridors and populated areas, the mountains are visible in views beyond low hills. From some locations within Redding, the mountains to the east appear as a mostly uninterrupted distant skyline. Hatchet Ridge Wind project turbines are faintly visible within this backdrop (see Character View 6, below).

The view from KOP 7 represents sustained views from Redding toward the leasehold area, 28 miles to the east. This viewpoint is along a bike path near the eastbound lanes of SR 299, just under 0.5 miles east of I-5. Mostly residential neighborhoods are obscured by dense street trees and riparian vegetation visible to the north and south of the highway. Built features typical of urbanized areas and high-volume roadways—mostly vertical in form and mainly consisting of roadside signage, light poles, and electrical transmission and distribution structures—are prevalent and serve to briefly and partially block views toward the distant mountains in views from the highway. Views to the east from within urban Redding and its suburban surroundings are often blocked by structures and/or vegetation. Where attainable, visibility of these mountains serves as a visual reminder of Redding's north Sacramento Valley setting and its spatial relationship to the Cascade Range.

A broad range of viewers are present within this landscape unit. While Redding and its surroundings afford various recreational opportunities, sustained views represented by KOP 7 are primarily experienced by residents, along with workers and eastbound travelers and commuters.

Character View 5: View from eastbound SR 299, just east of Bella Vista. Rural residential uses and a patchwork pattern of open areas and mature trees are typical of the landscape east of Redding. Hatchet Ridge Wind project turbines are detectable with the eye along the distant ridgeline in the left side of the view.

Character View 6: View to the east from Hilltop Drive just east of I-5 in Redding. Burney Mountain is visible in the right of the view, 41 miles away. Hatchet Ridge Wind turbines are detectable to the naked eye along the ridgeline in the left of the view, around 36 miles away.

5.0 RESULTS AND DISCUSSION

This section describes the components of the project evaluated in this report and their potential effects to visual character and quality in each of the views just described. It summarizes the more detailed analysis in the worksheets included in Appendix A.

A project's potential effects to existing visual character in landscape units are described qualitatively in terms of identifiable contrast with regard to form, line, color, or texture, as applicable. Motion in the landscape is also considered for wind energy projects. The following discussions identify the most prominent sources of potential contrast given the project and existing visual character described in Section 4.4.

This analysis focuses on the effects from the proposed turbines. Because the project is set entirely within forested lands that are actively managed for timber production, other proposed features—including ancillary structures and overhead transmission and associated corridors—would be located within private parcels, set back from publicly accessible locations, and generally obscured by forest and topography in views toward the project from outside the project site. Most access roads would utilize existing roadways. Overhead transmission corridors would be cleared of vegetation and are generally oriented north/south, with the exception of a segment that would be located within an existing transmission right-of-way. While a newly cleared corridor may be detectable in long-distance views, most portions would be obscured by topography, forest, or be otherwise absorbed into the distant landscape and would not substantially alter existing views.

Table 2 summarizes the assessed change in visual quality for views from each KOP. Change in visual quality between existing conditions in each of the KOP views and conditions with the project as detailed in the worksheets

was made based on comparison of the existing view (the "A" view in Figures 3–9) and a view with the project simulated (the "B" view in Figures 3–9). Each figure also includes a panoramic image of existing conditions to provide greater context of current views from KOPs (the "C" image in each figure) and an image showing the field of view in the simulation (the "D" image). The "D" images are intended to help with viewer orientation relative to the site layout; they do not specify which turbines are visible in the accompanying simulations and which are obscured by topography, vegetation, and/or distance. For the two long-distance views from KOP 6 and KOP 7, an "E" figure is included. Each is an enlarged version of the simulation, provided to help readers better see proposed turbines and intended to account for distance of the views, along with photographic detection of atmospheric haze and resolution issues related to document formatting and/or quality of printed materials.

Table 2. Existing and Simulated Visual Quality by Landscape Type

Landscape Type / KOP	Visual Quality in Existing View	Visual Quality with Project Simulated
Mountain Communities		
KOP 1 – Fountain Fire Overlook	Moderately High	Moderately Low
KOP 2 – Montgomery Creek	Moderate	Moderately Low
KOP 3 – Round Mountain	Moderate	Moderately Low
KOP 4 – SR 299 at Tamarack Road	Moderate	Moderate
KOP 5 – Burney	Moderate	Moderate
Hat Creek and Pit River		
KOP 6 – SR 299 Pit River Overlook	High	High
Sacramento Valley		
KOP 7 –Redding	Moderately High	Moderate

Potential effects to nighttime views are discussed for each view. Current FAA regulations require lights on the nacelles of turbines on the perimeter of a wind energy facility and select turbines within the facility. A lighting plan has not yet been approved for the project. However, due to their height of greater than 500 feet, all turbines will need to be lit with two lights per FAA circular 70/7460-1 Marking and Lighting Wind Turbines, Section 13.6.

5.1 MOUNTAIN COMMUNITIES

5.1.1 Visual Character

In Mountain Communities views, project turbines would be visible atop ridgelines or emerging above tree lines. Where no existing turbines are visible (KOP 1, KOP 2, and KOP 3), such new features would be a source of substantial visual contrast: strong, vertical/angular forms, relatively light in color and smooth in texture would be visible where no similar features exist. The turbines would encroach upon existing skylines, which generally appear undeveloped though built features such as transmission towers do appear to extend above the ridgelines in some views (e.g., the view from KOP 2; see Figure 4). Effects to visual character would vary by proximity. In the view from KOP 1 (Figure 3b) only two project turbines would be visible, but their proximity to viewers introduce features appearing at a scale not currently represented in views. In views from KOP 2 and KOP 3 (Figures 4b and 5b) a

number of turbines would be visible across the entirety of these views. This would substantially affect the character of these views, in which even industrial appearing, predominantly linear, transmission infrastructure is mainly relegated to the foreground and middleground. When spinning, the rotor blades would further contrast with the rest of the mostly static elements in views toward areas outside of roadway corridors.

In views from KOP 4 and KOP 5, in which Hatchet Ridge Wind project turbines are visible (Figures 6b and 7b), proposed turbines would be either barely visible above a ridgeline or at some distance, an element of the view's existing visual character would appear reinforced. Project turbines would be similar in form, color, and texture to existing turbines, and they would be viewed at a similar scale. The horizontal presence of wind energy development would appear expanded in such views but additional turbines would not introduce forms or sources of motion that are not already part of the existing view's visual character.

5.1.2 Visual Quality

Under current conditions, visual quality in Mountain Communities landscape unit views range from moderate to moderately high. With the project, visual quality would range from moderately low to moderate.

5.1.2.1 KOP 1 – Fountain Fire Overlook

Existing visual quality in the view from KOP 1 is moderately high (Figure 3a). The visual quality of the same view with the project would be reduced to moderately low (Figure 3b). Two turbines would be within 1 mile of, and be prominently visible from, the Fountain Fire Overlook. Primary viewers here are tourists traveling through the area and stopping at a designated scenic overlook for a static view in the direction of the project. This KOP is also intended to represent views of nearby residents traveling along Moose Camp Road. Both tourists and residents are presumed to have moderately high to high sensitivity to visual change.

Project turbines visible from this location would appear out of scale with what is visible in the rest of the view. The turbines would extend above the viewer's perspective. This inferior viewer position to the project, in concert with its proximity, would accentuate the manner in which turbines would appear as darkened forms in afternoons when backlit by sunlight coming from the west.

The turbines in this view would detract from the natural harmony of the existing view based not so much on any removal or obfuscation of natural elements but on their dominance of all other view elements. There are no similar structures to which they would relate, and without additional turbines in view, these two do not appear as a part of any broader pattern of development, within which some sense of order might be observed. Viewers visiting the Fountain Fire Overlook, upon reading the facility's interpretive signs and looking in a direction intended to memorialize the fire, would see two large wind turbines.

Night lighting would be highly visible from this location, though vegetation would likely intervene at least partially in similar visibility throughout the surrounding area. The view from the designated overlook is presumably one intended to be observed during daylight hours. Turbine lighting would be unavoidable in any nighttime views from this location. The rural residences in the vicinity of this KOP are sources of localized night lighting, the majority of which is likely absorbed by adjacent woodlands, which do not allow for widely visible skyglow or light trespass at night. The effects of night lighting would be enhanced by the proximity of the turbines to the KOP.

5.1.2.2 KOP 2 – Montgomery Creek

Existing visual quality in the view from KOP 2 is moderate (Figure 4a), and with the project visual quality would be reduced to moderately low (Figure 4b). Project turbines would be most visible in the left side of the view, though blade tips would be detectable beyond and below the tree line in the right half of the view. They would be noticeable during operation, when rotors are spinning. All turbines visible here would be located between 3 and 5 miles away. Viewers include Montgomery Creek residents, who would have relatively static or sustained views from areas within the Montgomery Creek community, and tourists, who would view the project while traveling SR 299 en route or returning from destinations to the east. Both residents and tourists are presumed to have moderately high to high sensitivity to visual change. There are also commuters and workers passing through or based in Montgomery Creek, who are presumed to have more moderate sensitivity to visual change.

Project turbines visible from this location would appear along the view's backdrop, atop a ridgeline that contains no visible development under current conditions. Their scale would match that of the high-voltage transmission lines located atop a nearby hill and which define the skyline in the right half of the view. The turbines' placement to the east and above viewers at this location would make their backlit, darkened appearance during morning hours highly visible. In afternoon light, when front lit, they would appear lighter, as shown in Figure 4b.

As with other relatively narrow views toward the project, turbines would not appear as part of any larger pattern of development, new or existing. To that extent, the cultural order and landscape composition of the existing view would be reduced with the project. In addition to adding unique forms and a new type of land use to the view, the irregularly oriented turbines would extend the presence of built structures across the view, drawing viewer attention. The duration of views from people driving along the highway would be relatively short. Vegetation, terrain, and orientation would prevent substantial visibility of turbines from points north or south along this stretch of SR 299. The view from KOP 2 presents a comparatively narrow view toward the project. In more sustained views from outside the highway corridor, project turbines would be unique to views, as would their motion.

Six of the turbine nacelles would be visible above the ridgeline, as close as 3 miles away. Night lighting would, therefore, be highly visible from this location and light would appear where none is present currently. Vegetation may partially or completely block visibility of light from nearby parts of Montgomery Creek, but the simulated view from KOP 2 is indicative of the potential presence of night lighting in unobstructed views in the area.

5.1.2.3 KOP 3 – Round Mountain

The effects of the project in views from KOP 3 would be similar to those from KOP 2. Existing visual quality in the view from KOP 3 is moderate (Figure 5a). With the project, visual quality would be reduced to moderately low (KOP 5b). Under current conditions, a rounded and articulated ridgeline appears as an undeveloped backdrop to a narrow valley floor that contains residences, mature trees, and a series of high-voltage transmission lines uniformly oriented across the view. With the project, a number of turbines would appear atop the near ridgeline, at various distances from the viewpoint and extending to various heights based on the elevation of their location. The nearest turbines would be 3 miles away. Viewers at or near KOP 3 include local residents, who would have relatively static or sustained views from areas within the Round Mountain community, and tourists, who would view the project as they pass through the area. Both residents and tourists are presumed to have moderately high to high sensitivity to visual change. Commuters and workers, who are presumed to have more moderate sensitivity to visual change, would also

have intermittent or sustained views of the project depending on their location within or duration of time spent passing through Round Mountain.

Except for one segment of transmission line, nothing appears to extend above the ridgeline in existing views from KOP 3. This would change with construction of the project, and the skyline in the left and right portions of the view would be defined by turbines. Blades of turbines located beyond and below the mountain saddle in the center of the view would also be intermittently visible when spinning. In this view to the east, over a dozen mostly or partially visible turbines would appear backlit and dark in morning light. As seen in Figure 5b, they would appear light and visible when front lit by afternoon light.

While the project itself would appear orderly in general—seen no closer than the ridgeline but with varying heights and depths—overall coherence and composition of the view would change. What is currently a natural-appearing backdrop to a densely developed transmission corridor would, with the project, appear dedicated to energy generation. The turbines would add elements of visual interest to views from KOP 3 and in nearby Round Mountain, but their high visibility, unique forms and color, and motion when spinning would reinforce the intactness of the existing view, observable as the extent to which specific elements appear spatially discrete and the ridgeline mostly uninterrupted. Because the highway traverses the western edge of this portion of the mountain valley, and because mature vegetation is often set back from the road, views of the project here would be of short duration but not so short as to be momentary or intermittent. The attention of viewers in this portion of Round Mountain would be drawn to the project.

The nacelles of most of the turbines visible here would be visible above the ridgeline, and night lighting would be new and unobstructed in views from KOP 3. Some lighting associated with the nearby substation or other uses may be sources of night light within the mountain valley, but the project would contribute new sources of night light from an elevated, highly visible location.

5.1.2.1 KOP 4 – SR 299 at Tamarack Road

Existing visual quality in the view from KOP 4 is moderate (Figure 6a) and it would remain moderate with the project (Figure 6b). Only two turbines would be partially visible in views from KOP 4. Their blades would be intermittently visible extending above the mountain ridgeline in the center of the view. These turbines would be between 4 and 6 miles away from the viewpoint along SR 299, where likely viewers are moderate high to highly sensitive tourists and the less sensitive commuters and workers, the majority of whom would presumably view the project while passing through the area within which KOP 4 is located.

Because of their low profile, these two turbines would not be prominently visible to viewers at KOP 4, though they would be noticeable. During operation, the rotation of their blades apparently absent towers, which would not be visible from this location, could warrant additional attention. The view angle would be inferior, as they would appear at elevation. And while view duration from a straight stretch of SR 299 in an open valley would be relatively long, only portions of these two turbines would be visible here. The view's orientation to the west-southwest would result in the turbines appearing well-lit in morning light and backlit and slightly darkened in the afternoon during certain late fall, winter, and early spring.

The horizontal space of the view occupied by wind turbines would expand with the project. However, existing Hatchet Ridge Wind project turbines would remain the most visible human-made feature in the view, and the new turbines

would not detract from the natural elements visible throughout the mountain valley and hillsides. Visual quality would not be substantially altered in daytime views. At night, lighting mounted on one turbine would be partially visible beyond the tree line in the center of the view. A single source of light appearing atop a nearby ridgeline where no such light exists would draw attention; however, night lighting associated with the Hatchet Ridge turbines would be prominently visible in the right side of the view.

5.1.2.2 KOP 5 – Burney

Similar to the view from KOP 4, existing visual quality in the view from KOP 5 is moderate (Figure 7a) and would remain moderate with the project (Figure 7b). Hatchet Ridge Wind project turbines are visible in the right side of the view, just over 5 miles away. Project turbines would appear to the left of the existing turbines, between 7 and 10 miles away. Few of these turbines would be highly visible; most would appear partly obscured by foreground vegetation or intervening topography along the ridgeline, allowing for visibility of just their blades. Viewers at or near KOP 3 include local residents, who would have static or sustained views of the project from within Burney, and tourists, some of whom may be traveling through Burney, and some of whom may have stopped in town and thus have more static or sustained views. Residents and tourists are presumed to have moderately high to high sensitivity to visual change. Commuters and workers, who are presumed to have more moderate sensitivity to visual change, could also have static views of the project, depending on their location, but would also likely view the project while in motion.

The angle of view toward these turbines from within Burney results in their appearing as an extension of an existing string of turbines along Hatchet Ridge. They would be visible to varying degrees and would not, given their position relative to Hatchet Ridge Wind project turbines, appear as unique features in views. Rather, their consistency in appearance would result in a retained coherence and composition in the view. The project turbines, though larger than existing turbines, would appear at a similar scale due to their greater distance from the viewpoint. Because they would appear atop or beyond the current row of turbines on the ridgeline backdrop, the intactness of the existing view would be retained. No new structures would appear to encroach on other features in the view. The view's orientation to the west-southwest would result in the turbines appearing well-lit in morning light and backlit and slightly darkened in the afternoon during late fall, winter, and early spring.

Viewers in Burney would have intermittent views of the project, particularly those who would view the project while passing through the downtown area, where foreground buildings and trees would obstruct certain views toward areas outside of town. At night, the set of turbine lighting already visible from within Burney would appear extended across Hatchet Ridge. However, while the Hatchet Ridge Wind project turbine lighting appears as a row, given that project's layout, lighting associated with the proposed project would, based on the nacelle positions visible in Figure 7b, appear horizontally and vertically layered where visible.

5.2 HAT CREEK AND PIT RIVER

5.2.1 Visual Character

The project would be visible in very few views from the low lands along Hat Creek, but in upland views such as the Pit River overlook at KOP 6, dozens of proposed turbines would, under favorable atmospheric conditions, be discernable but not prominently visible along the ridgeline in the distant background (Figure 8b). They would be visible to the same degree that the existing Hatchet Ridge Wind project turbines are in current views, which are visible under favorable conditions as distant, bright white, vertical structures rising above the view's horizon and faintly defining the

skyline in the portion of the landscape north of the transmission right-of-way that bisects the view. Cloudy or hazy conditions result in poor long-distance visibility from the elevated portions of the landscape unit that afford direct views toward the project, obscuring existing turbines. The addition of proposed project turbines would therefore not substantially alter visual character observable in long-distance views from the east, which would remain characterized by the broad and diverse landscape visible between the viewpoint and the project footprint. New turbines would, when visible, appear to extend the horizontal space of the view occupied by wind turbines to the south with structures that would not appear to be meaningfully different in size or appearance from this distance. Spinning rotors would be detectable along an increased segment of the ridgeline, when visible. Neither the additional turbines nor the motion of their spinning rotors would alter the existing visual character in views from this landscape unit.

5.2.2 Visual Quality

Under current conditions, visual quality in Hat Creek and Pit River landscape unit views are high. With the project, visual quality would remain high.

5.2.2.1 KOP 6 – SR 299 at Pit River Overlook

Existing visual quality in the view from KOP 6 is high (Figure 8a) and it would remain high with the project (Figure 8b). About half of the project turbines would be detectable along the distant ridgeline, as close as 18 miles away. There is a direct line-of-sight between the informal overlook and the project footprint, and Hatchet Ridge Wind project turbines are visible extending atop the ridgeline in the right half of this view when atmospheric haze or seasonal clouds don't limit visibility. Proposed project turbines would appear to the left of the existing turbines and extend above the segment of the ridgeline in the center left quarter of the view. Viewers here include recreationists and tourists, who are presumed to have moderately high to high sensitivity to visual change. There are also commuters traveling this road, and they are presumed to have more moderate sensitivity to visual change. While the KOP is at a cleared pull-off area which functions as an informal overlook, the majority of viewers at this location would view the leasehold area while in motion, traveling along a relatively curved, mountainous road.

Although the project footprint is between 1,000 and 2,000 feet higher than the KOP, viewers experience a level angle of view from this distance. As with views from other KOPs in which proposed turbines would appear alongside existing ones, from here, when visible, the project would extend the portion of distant skyline occupied by wind turbines. This would generally retain and reinforce the cultural order observable in the existing view, though the footprint of the proposed project would result in new turbines appearing clustered in certain portions of the view. Such difference would be difficult to discern from this distance, and the natural setting occupying the 18 miles between the KOP and the project would remain the portion of the view most likely to draw viewer attention during most times of day. When directly backlit during later afternoon light, existing and proposed turbines would appear as a series of darkened vertical structures across the majority of the view's distant horizon.

This long-distance view, intended to represent viewers driving westbound on SR 299, has a short duration, unless viewers have stopped at the informal overlook. The mountain highway allows for moderately high speeds in this area, and the curving route requires driver attention to focus on the road. Visibility of the project footprint rather quickly disappears as eastbound drivers achieve the nearby summit and begin their descent into the Fall River Valley and westbound drivers descend out of the line-of-sight toward the leasehold area. Thus, at night, views of night lighting at the project would be visible relatively briefly to viewers at or near KOP 6. However, for the time that it would be visible, night lights associated with both projects would be cumulatively visible across the majority of the view.

5.3 SACRAMENTO VALLEY

5.3.1 Visual Character

As opposed to views from Hat Creek and Pit River, in which the horizontal space occupied by turbines would appear to expand along a distant ridgeline, in views from the Sacramento Valley, project turbines would extend such space both along and below the ridgetop. This would alter the visual character observable under favorable weather conditions in views such as that from KOP 7 (Figure 9b). With the project, and from this distance, turbines appearing similar to those currently relegated to a more distant ridgeline would be detectable throughout the west-facing slopes of the mountains east of Redding. While such features already exist and are visible in long-distance views, the project would introduce vertical forms, bright white color, and, when rotors are spinning, motion to a portion of the landscape where no such elements are currently visible. The visual character of the landscape unit's mountain backdrop would be altered.

5.3.2 Visual Quality

Under current conditions, visual quality in Sacramento Valley landscape unit is moderately high. With the project, visual quality would be reduced to moderate.

5.3.2.1 KOP 7 – Redding

The existing visual quality in the view from KOP 7 is moderately high (Figure 9a). It would be reduced to moderate with the project (Figure 9b). Nearly all of the proposed turbines would be detectable in views from Redding, 28 miles away, under favorable atmospheric conditions. Hatchet Ridge Wind project turbines, 35 miles away, are discernable in views from Redding under such conditions, and they can be seen extending in a more or less orderly fashion across the ridgetop in the left quarter of the view from KOP 7. The project would be visible between the existing turbines and the center of the view. This KOP is representative of views of residents and tourists, presumed to have moderately high to high sensitivity to visual change, and of commuters and workers, who generally have more moderate sensitivities. While the viewpoint is adjacent to a highway, from which views would be from moving vehicles, the straight segment of roadway allows for sustained views. It also serves as a proxy for static views from eastern Redding, where unobstructed by vegetation.

The distance between the viewpoint and project makes the view seem level, but with focal points along a prominent ridgeline, viewers may still get the sense of an inferior viewing angle. The presence of proposed turbines within the western slopes of the mountains, scattered with no pattern or orderly layout apparent, would give the appearance of development spilling down from the ridgeline. The additional turbines would encroach upon the skyline; they would also encroach upon the mountain slopes visible from Redding. As with the view from KOP 6, such change would be barely detectable in the distant background, though all turbines would likely be more visible during early morning light, when they would be directly backlit and thus appear as a row and clusters of darkened, vertical forms. Under such conditions, the expansion of the portion of the mountains dedicated to wind energy development would be noticeable.

Views toward the project from Redding are generally longer ones than from other locations. Residents have long duration views, and drivers at the KOP location, eastbound SR 299, would be embarking on a relatively long segment of straight road, from which the project footprint is visible. The layout of the project along the western slopes would become more apparent to viewers as they approached and/or passed through eastern portions. In particular,

nighttime lighting associated with turbines would appear substantially different with most of the proposed turbines placed on the downslope side, toward the viewer. The current, orderly presence of turbines would appear subsumed by, what would appear from this location to be, a much larger footprint of wind energy development.

5.4 POTENTIAL MITIGATION

Utility-scale wind projects appear in landscapes at a scale that does not allow for application of most mitigation strategies intended for general development projects. Their footprint is large, and their form and height make them prominent because they typically are not sited near similarly scaled structures, unless an existing wind project is nearby. As such, suggested mitigations like screening, camouflage/disguise, or developing at a low profile are not practical. Relocation and downsizing are also not practical measures for mitigating impacts from wind energy projects since such projects typically require precise locations and layouts to maximize wind resources and contracts with utilities or other off takers that have agreed to purchase the power the project will generate. Typical mitigation measures are not effective for wind energy projects and likely were not intended for developments of such scale.

Nevertheless, several measures can be considered to reduce the visual impacts of the proposed project turbines:

- Use of nonreflective paint finishes for turbine towers and blades, to the extent practicable, and subject to industry standards and requirements to comply with the FAA's lighting and marking standards.
- Limiting or minimizing the visual effects of lighting to the maximum extent practicable in compliance with FAA requirements. Project lights typically used to comply with FAA requirements will, to some extent, be shielded from ground-level views due to a constrained (3 to 5 degree) vertical beam.
- Shielding and hooding lighting fixtures, except those required by the FAA for aviation safety purposes; orienting them toward the ground so that direct rays of light do not shine onto neighboring properties or otherwise become a source of light pollution.
- Use of sensors and switches to keep proposed project facility lights off when not required.

6.0 CONCLUSIONS

Development of the Fountain Wind Project would reduce visual quality in views from the Fountain Fire Overlook, Montgomery Creek, Round Mountain—views toward the project in which Hatchet Ridge Wind Project turbines are not visible—and in long-distance views from the west. In views from Burney and SR 299 east of the project, in which existing turbines along Hatchet Ridge are visible in relatively close proximity, and in views from elevated areas further east, visual quality would not be substantially reduced.

In Mountain Community views, reduction in visual quality would be associated with instances where project turbines would appear atop currently uninterrupted ridge skylines or where they would become the view's dominant feature, either reducing the natural harmony visible in current conditions or appearing in a manner that causes the views cultural coherence or landscape composition to diminish. The project would contrast with the existing visual character in these areas, based on the introduction of comparatively large, vertical/angular forms appearing as white, smooth, sources of motion where no such feature is visible.

In Mountain Communities views within which existing turbines are visible at present, such effects would be comparatively reduced. New turbines would not alter the visual quality in any substantive way, and they would be consistent with existing visual character.

In Hat Creek and Pit River views, the addition of turbines along a ridgetop that already contains similar structures, visible in long-distance views, would not affect visual quality, and it would not contrast with existing visual character. Project turbines would appear beyond and to the side of the existing turbines in a generally orderly fashion.

Visual quality would be reduced, however, in views from Redding where project turbines would be visible in long-distance views both atop a distant ridgeline and its western slopes. This encroachment would affect the natural harmony of the view, and the dispersed project layout would be lacking in cultural order. Though visible only in the distance, the number of turbines added to the view would contrast with existing visual character.

7.0 REFERENCES

Apostol, D., J. Palmer, M. Pasqualetti, R. Smardon, and R. Sullivan (editors). 2016. The Renewable Energy Landscape: Preserving Scenic Values in our Sustainable Future. Routledge.

California Department of Transportation (Caltrans). 2017. List of eligible and officially designated State Scenic Highways, March 2017. Available online: https://dot.ca.gov/programs/design/lap-landscape-architecture-and-community-livability/lap-liv-i-scenic-highways. Accessed 16 October 2019

Federal Highway Administration (FHWA). 2015. Guidelines for the Visual Impact Assessment of Highway Projects. (FHWA-HEP-15-029.)

Shasta County. 2004. Shasta County General Plan as Amended Through September 2004. September. Available online: https://www.co.shasta.ca.us/index/drm_index/planning_index/plng_general_plan.aspx. Accessed 22 May 2019.

U.S. Environmental Protection Agency (USEPA). 2013. Level III ecoregions of the continental United States. Corvallis, Oregon, U.S. EPA – National Health and Environmental Effects Research Laboratory. Available online: https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states. Accessed 16 October 2019.

FIGURES

Figure 1a. Project Location, Visual Resources, & Key Observation Points, 30-Mile Radius

Figure 2b. Project Location, Visual Resources, & Key Observation Points, 10-Mile Radius

Figure 3a. 30-Mile Radius Viewshed, Turbine Blade Tip

Figure 4b. 30-Mile Radius Viewshed, Hub Height

Figure 5c. 10-Mile Radius Viewshed, Turbine Blade Tip

Figure 6d. 10-Mile Radius Viewshed, Turbine Blade Tip

Figure 7. Key Observation Point 1

Figure 8. Key Observation Point 2

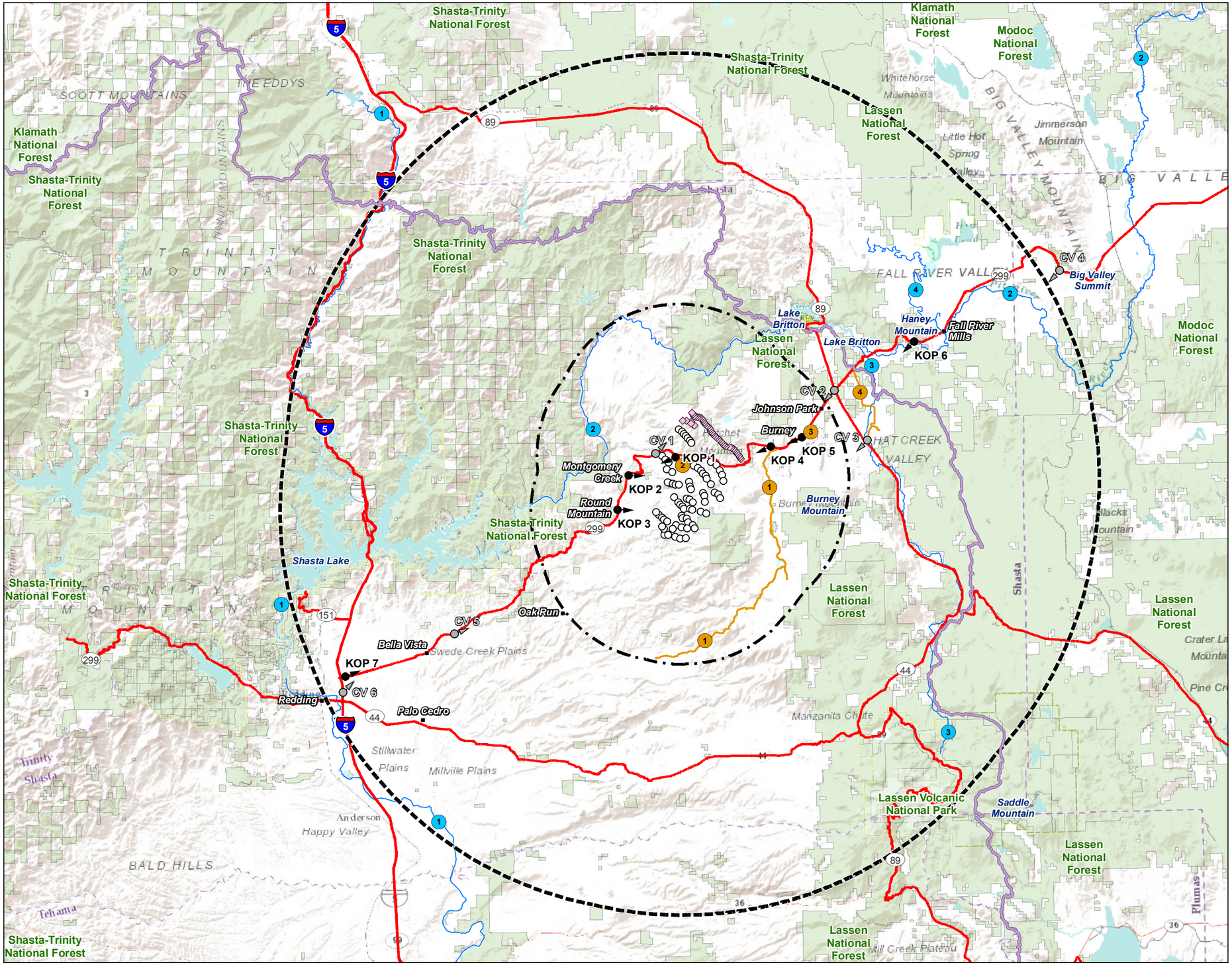
Figure 9. Key Observation Point 3

Figure 10. Key Observation Point 4

Figure 11. Key Observation Point 5

Figure 12. Key Observation Point 6

Figure 13. Key Observation Point 7



Stantec

Legend

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

Road and Water Features

1	Tamarack Road
2	Moose Camp Road
3	Main Street, Burney
4	Cassel Road
1	Sacramento River
2	Pit River
3	Hat Creek
4	Fall River

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 2019-10-23
Reviewed by JH on 2019-10-24

Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
1a

DRAFT

Title
Project Location, Visual Resources, and Key Observation Points

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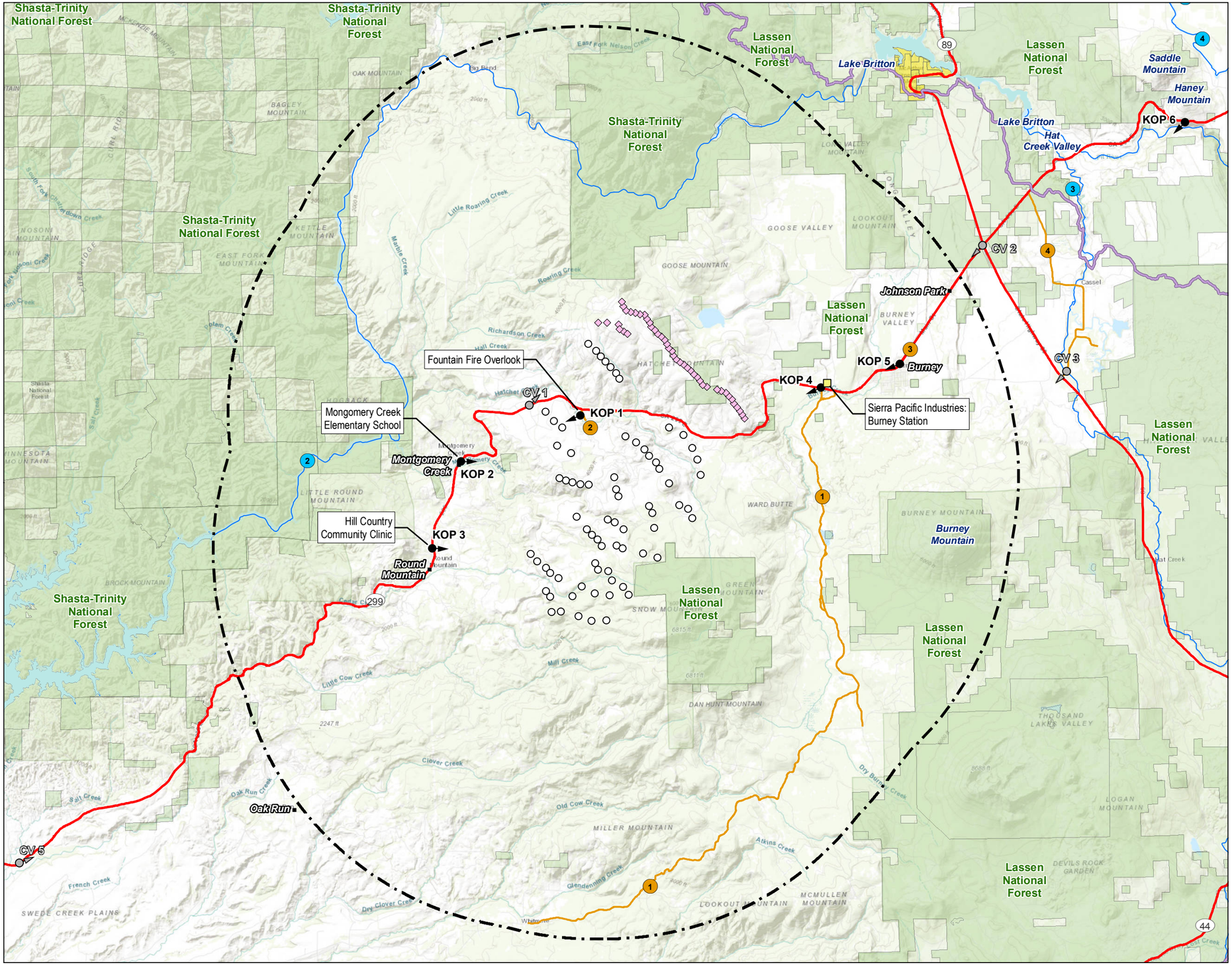

Stantec

Legend

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

Road and Water Features

1	Tamarack Road
2	Moose Camp Road
3	Main Street, Burney
4	Cassel Road
1	Sacramento River (See Fig. 1a)
2	Pit River
3	Hat Creek
4	Fall River

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 2019-10-23
Reviewed by JH on 2019-10-24

Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
1b

DRAFT

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\185804576_01B_LocationVS.mxd Revised: 2019-11-06 By: gcarpentier

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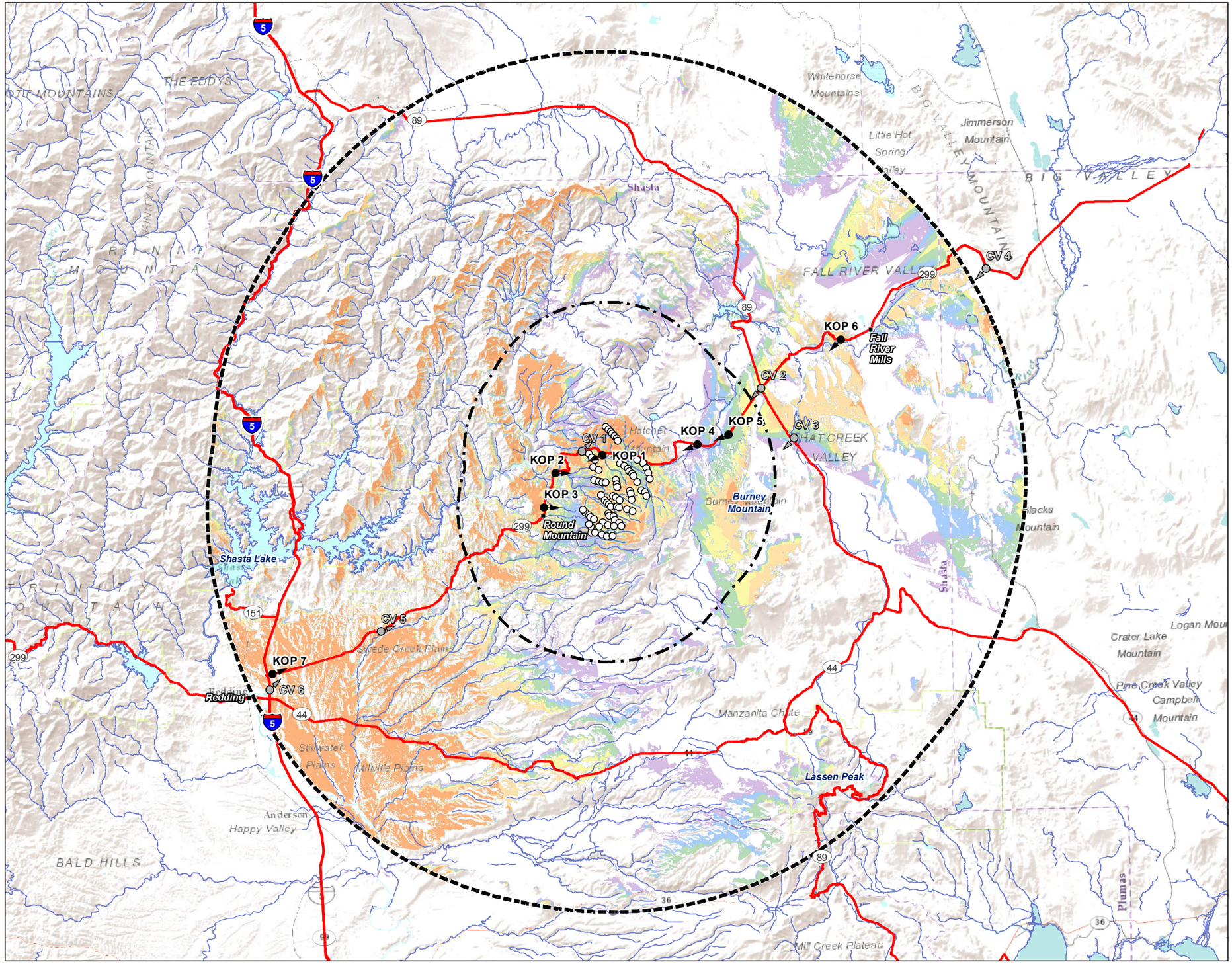

Stantec

Legend

- Turbine
- Key Observation Point (KOP)
- Character View (CV) Location
- 10 Mile Turbine Buffer
- 30 Mile Turbine Buffer

30-Mile Radius Viewshed – Turbine Blade Tip

Number of Potential Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 72

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 2019-10-23
Reviewed by JH on 2019-10-24

Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
2a

DRAFT

Title
30-Mile Radius Viewshed
Turbine Blade Tip

V:\1956\active_Task Owner and other Non-BC\1956 Jobs\185703743\03_data\gis_cad\gis\mxd\Viewshed\185804576_02A_30mileBladeTipVS.mxd Revised: 2019-11-04 By: gcarpenter

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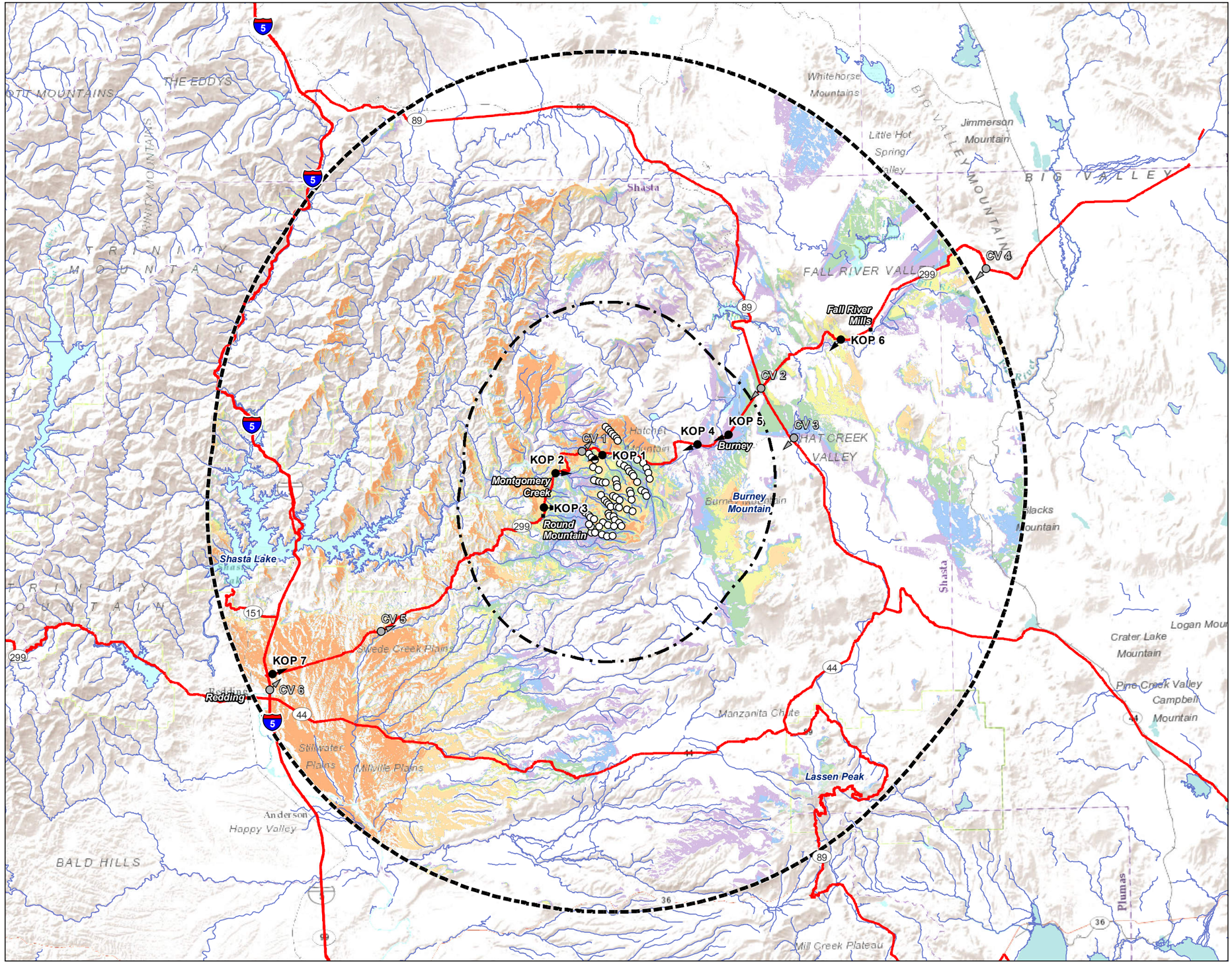

Stantec

Legend

- Turbine
- Key Observation Point (KOP)
- Character View (CV) Location
- 10 Mile Turbine Buffer
- 30 Mile Turbine Buffer

30-Mile Radius Viewshed – Hub Height

Number of Potential Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 72

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 2019-10-23
Reviewed by JH on 2019-10-24

Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
2b

DRAFT

Title
30-Mile Radius Viewshed
Hub Height

V:\1956\active_Task Owner and other Non-BC\1956.Jobs\185703743\03_data\gis_cad\gis\mxd\Viewshed\185804576_02B_30mileHubVS.mxd Revised: 2019-11-04 By: gcarpentier

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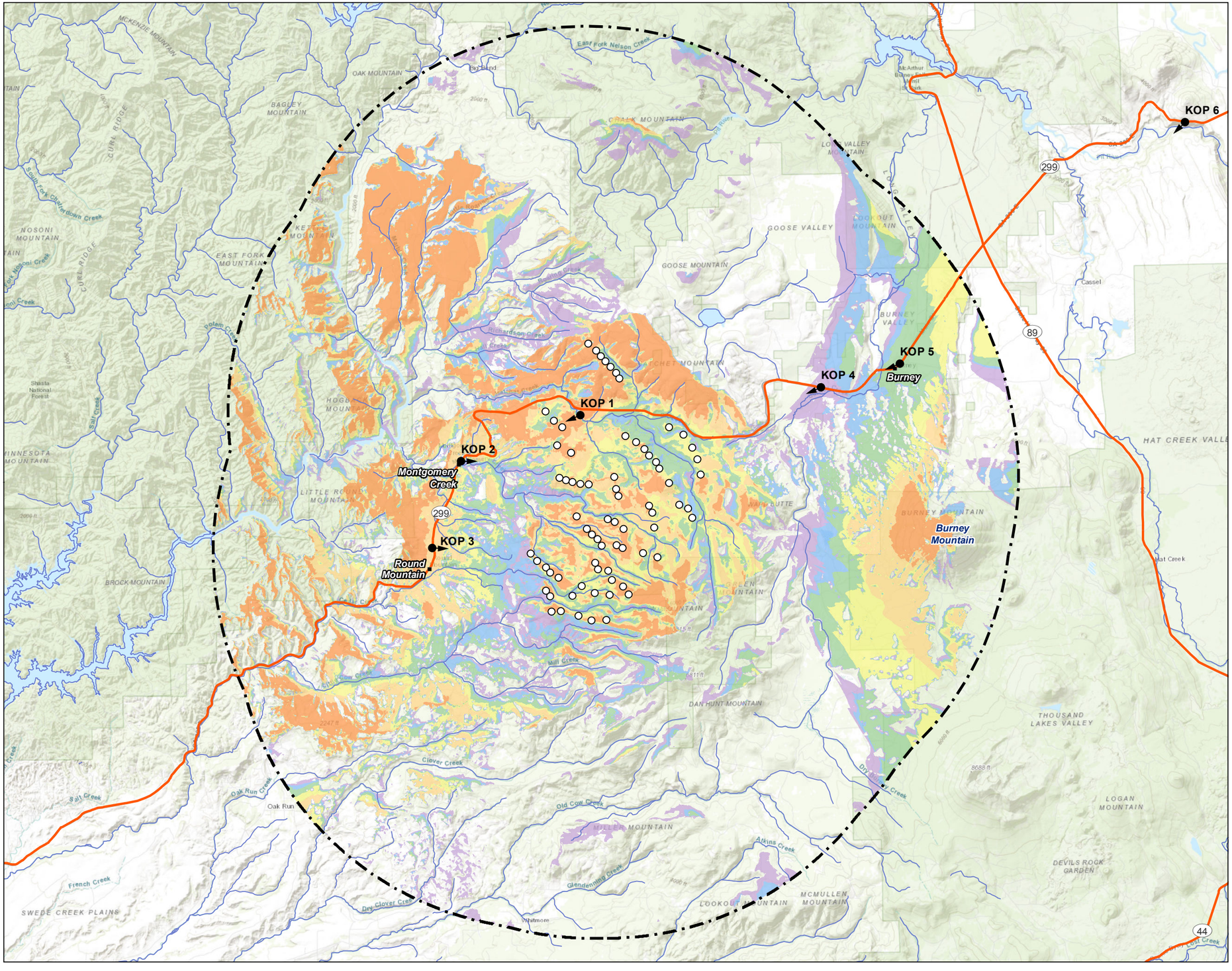

Stantec

Legend

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

10-Mile Radius Viewshed – Turbine Blade Tip

Number of Potential Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 72

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 2019-10-23
Reviewed by JH on 2019-10-24

Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
2c

Title
10-Mile Radius Viewshed
Turbine Blade Tip

V:\1956\active_Task Owner and other Non-BC\1956 Jobs\185703743\03_data\gis_cad\gis\mxd\Viewshed\185804576_02C_10mileBladeTipVS.mxd Revised: 2019-12-11 By: gcarpenter

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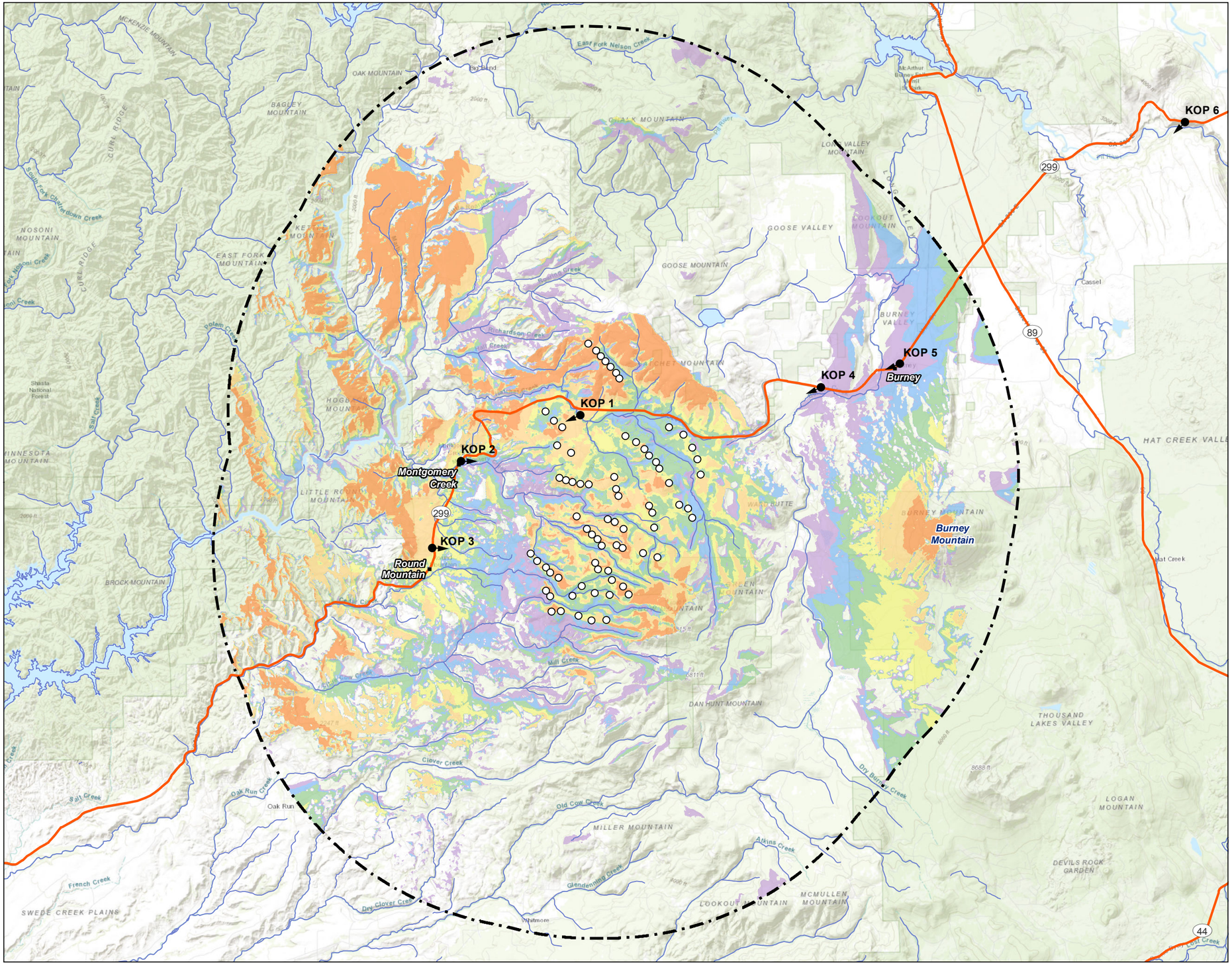

Stantec

Legend

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

10-Mile Radius Viewshed – Hub Height

Number of Potential Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 72

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 2019-10-23
Reviewed by JH on 2019-10-24

Client/Project
Fountain Wind Project
ConnectGen Operating LLC

185804576

Figure No.
2d

Title
10-Mile Radius Viewshed
Hub Height

V:\1956\active_Task Owner and other Non-BC\1956 Jobs\185703743\03_data\gis_cad\gis\mxd\Viewshed\185804576_02D_10mileHubVS.mxd Revised: 2019-12-11 By: gcarpentier

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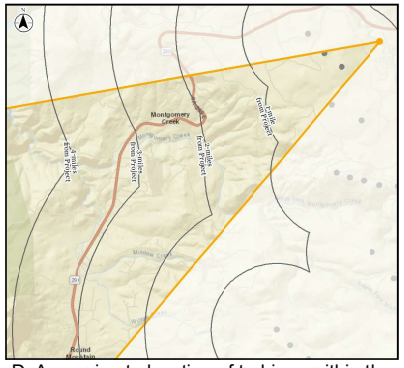
A: View to the west-southwest from the Fountain Fire Overlook, located along Moose Camp Road, just south of SR 299. A temporary meteorological tower is visible in the right half of the view.

B: View from KOP 1 with project simulated. Proposed turbines would be visible just under one mile away, in the middleground of the view.

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.

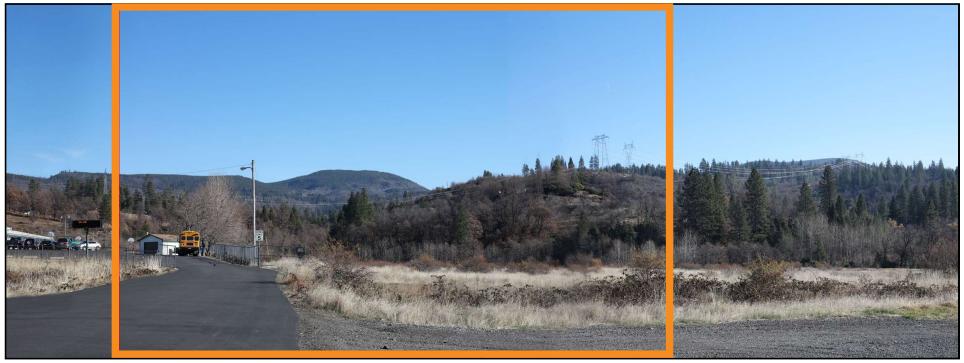
Specifications
Location: 40°51'47.50"N, 121°51'1.23"W
View Direction: West-Southwest
Date & Time: 18 April 2019, 10:38 a.m.
Camera Focal Length: 50 mm
Camera Make / Model: 5DsR
Photo Source: Stantec
Number of Proposed Turbines: 2

Stantec

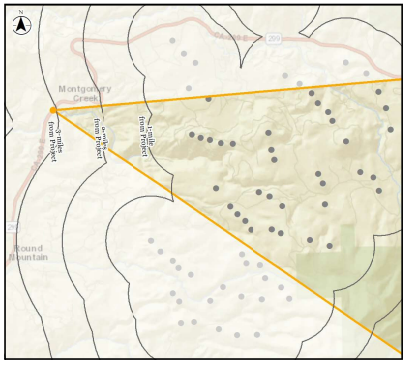
Figure 3
KOP 1: Fountain Fire Overlook
Fountain Wind Project

A: View to the east from the entrance to Montgomery Creek Elementary School off of SR 299.

B: View from KOP 2 with project simulated. Turbines would be most visible in the left half of the view, between three and five miles away.



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.

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 Proposed Turbines: 10

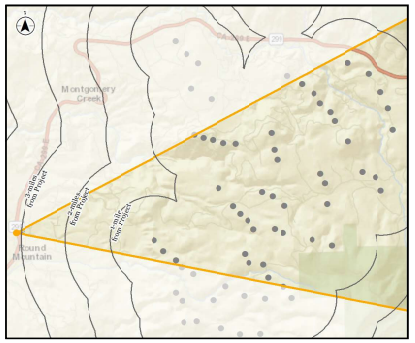
Stantec

Figure 4
KOP 2: Montgomery Creek
Fountain Wind Project

A: View to the east from the Round Mountain Post Office, just south of the Hill Country Community Clinic.

B: View from KOP 3 with project simulated. Project turbines would be visible between three and six miles away.

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.

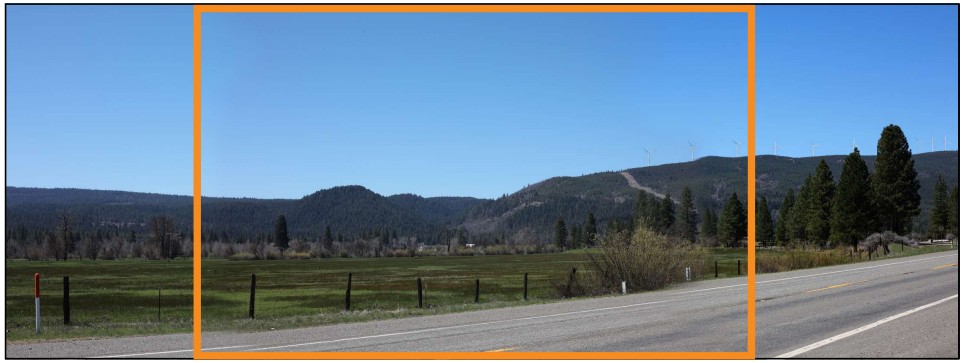
Specifications
Location: 40°48'11.94"N, 121°56'24.44"W
View Direction: East
Date & Time: 13 December 2018; 3:18 p.m.
Camera Focal Length: 50 mm
Camera Make / Model: 5DsR
Photo Source: Stantec
Number of Proposed Turbines: 13

Stantec

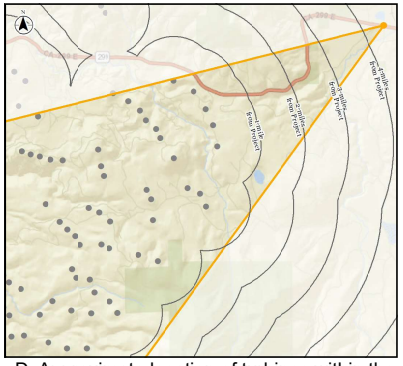
Figure 5
KOP 3: Round Mountain
Fountain Wind Project

A: View to the west-southwest from SR 299 at Tamarack Road, near Sierra Pacific Industries. Existing Hatchet Ridge turbines are visible less than three miles away.

B: View from KOP 4 with project simulated. Two project turbines would be visible between four and six miles away in the center of the view.



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.

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 Proposed Turbines: 2

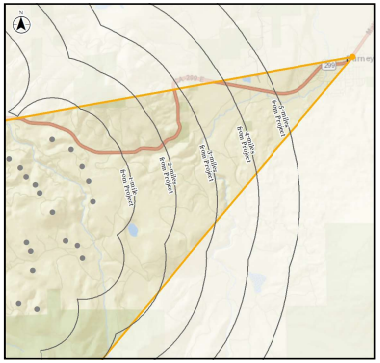
Stantec

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

A: View to the west-southwest from downtown Burney. The existing Hatchet Ridge project is visible in the right portion of the view.

B: View from KOP 5 with project simulated. Project turbines would be visible near the center of the view, to the left of existing Hatchet Ridge turbines, between seven and ten miles away.

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.

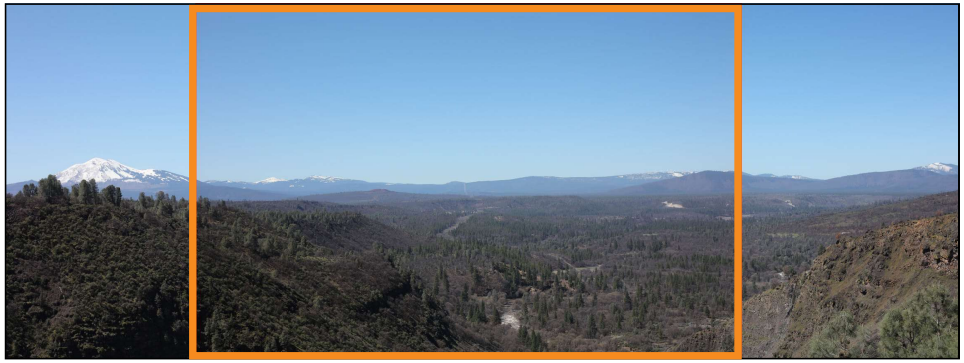
Specifications
Location: 40°53'4.21"N, 121°39'27.93"W
View Direction: West-Southwest
Date & Time: 18 April 2019, 11:08 a.m.
Camera Focal Length: 50 mm
Camera Make / Model: 5DsR
Photo Source: Stantec
Number of Proposed Turbines: 8

Stantec

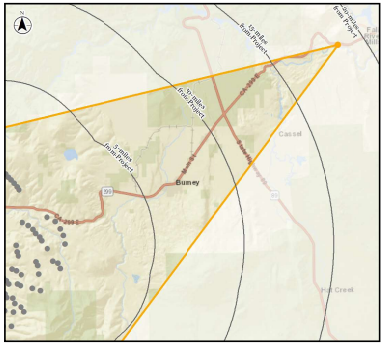
Figure 7
KOP 5: Burney
Fountain Wind Project

A: View to the southwest from SR 299, at an overlook en route to Fall River Mills. Hatchet Ridge turbines are discernable along the ridgeline in the right half of the view.

B: View from KOP 6 with project simulated. The project would be visible just under 19 miles away.



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.

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 Proposed Turbines: 36

Stantec

Figure 8
KOP 6: SR 299-Pit River Overlook
Fountain Wind Project

E: Enlarged image showing view from KOP 6 with project simulated.

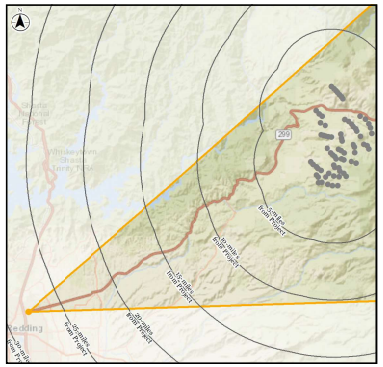
Stantec

Figure 8
KOP 6: SR 299-Pit River Overlook
Fountain Wind Project

A: View to the east from eastbound SR 299, east of Redding near Shasta College and local bike path. Existing Hatchet Ridge turbines are barely detectable along the ridgeline in the left portion of the view.

B: View from KOP 7 with project simulated. Project turbines would be visible just under 28 miles away.

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.

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 Proposed Turbines: 72

Stantec

Figure 9
KOP 7: Redding
Fountain Wind Project

E: Enlarged image showing view from KOP 7 with project simulated.

Stantec

Figure 9
KOP 7: Redding
Fountain Wind Project

APPENDICES

Appendix A KEY OBSERVATION POINTS WORKSHEETS

Fountain Wind Project - Assessment of Visual Effects

Existing Conditions

KOP 1	Location: Fountain Fire Overlook	Photo Date: 18-Apr-19
Landscape Unit or Type:	Mountain Communities	Viewer Type(s): Residents, tourists
View Orientation / Viewer Position to Project (Inferior, Level, or Superior):	WSW / Inferior	
Viewpoint Description (Figure Caption):	View to the west-southwest from the Fountain Fire Overlook, located along Moose Camp Road, just south of SR 299. A temporary meteorological tower is visible in the right half of the view.	

VISUAL CHARACTER

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	Mostly flat ridgeline detectable beneath trees. Ground partly visible.	Fore Mid Back	x x -	Buildings	NA	Fore Mid Back	
Water	NA	Fore Mid Back		Infrastructure	NA	Fore Mid Back	
Vegetation	Uniformly evergreen and conical	Fore Mid Back	x x -	Structures	A temporary meteorological tower associated with the Project is visible in the right half of the view.	Fore Mid Back	x - -
Animals	NA	Fore Mid Back		Artifacts / Art	NA	Fore Mid Back	
Atmospheric	Sunny.	Fore Mid Back		Motion	NA	Fore Mid Back	

VISUAL QUALITY

	Score**	Notes
Natural Harmony	6	The uniformity of the view results in a high degree of natural harmony. Homogenous elements. From this location, viewers expect a scene indicative of a forest in some stage of recovery from the Fountain Fire.
Cultural Order	4	Project's meteorological tower is only human-made component of view. It is visible but not dominent. A single element, it is set back from the viewpoint, along the ridgeline and appearing beyond the trees. As such, it appears neither orderly nor disorderly.
Overall Coherence	5	This is a forested, ridgeline landscape. The only built feature appears beyond the trees.
Landscape Composition and Vividness	5	The trees, and some portions of ground cover, are the primary sources of color and visual interest in the view. Meteorological tower adds a slight element of color.
Overall Visual Quality Score	5.0	Moderately High. This is a mostly uniform view of forest lands with little of visual interest beyond trees.

With Project

KOP 1	Location: Fountain Fire Overlook	Date of Eval: 14-May-19
Landscape Unit or Type:	Mountain Communities	Viewer Type(s): Residents, tourists
View Orientation / Viewer Position to Project (Inferior, Level, or Superior):	WSW / Inferior	
Viewpoint Description (Figure Caption):	View from KOP 1 with project simulated. Proposed turbines would be visible just under one mile away, in the middleground of the view.	

VISUAL CHARACTER CONTRAST

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	No change from project.	Fore Mid Back		Buildings	NA	Fore Mid Back	
Water	NA	Fore Mid Back		Infrastructure	NA	Fore Mid Back	
Vegetation	The two turbines would appear to extend upwards from the tree line, but would not obstruct any views of vegetation. Cleared areas not visible.	Fore Mid Back	- x -	Structures	Turbines would be highly visible vertical / angular forms. Strong contrast also in color (white), line (strong), and texture (smooth).	Fore Mid Back	- x -
Animals	NA	Fore Mid Back		Artifacts / Art	NA	Fore Mid Back	
Atmospheric	Atmospheric conditions did not affect project visibility in simulation.	Fore Mid Back		Motion	When spinning, turbines would be source of motion. Rotors would spin at a consistent speed and be stationary.	Fore Mid Back	- x -

VISUAL QUALITY

	Score**	Notes
Natural Harmony	5	While the project would not appear from this location to obstruct or remove trees, its strong presence along the ridgeline appears to partially enclose the natural-appearing portion of the view, only slightly detracting from the existing view's natural harmony.
Cultural Order	2	Without additional turbines in view, the two here do not appear as part of any broader pattern of built structures.
Overall Coherence	3	The project would add a highly visible pair of structures, which would appear beyond and above a mostly uniform landscape. They would add an element (power generation) that is not present in the existing view and they would become a dominant element of the view, though they would do so without obscuring any existing forested areas.
Landscape Composition and Vividness	3	Wind turbines viewed at this proximity are highly visible. While appearing at much greater scale than any other feature, they would also be the view's most memorable feature.
Overall Visual Quality Score	3.3	Moderately Low. Project turbines would become the view's dominant visual features.

* Foreground = zone including area up to 0.25 - 0.5 mile from viewer; Middleground = zone extending between 0.25 - 0.5 mile from viewer to 3 - 5 miles away; Background = zone extending from 3-5 miles away from viewer to infinity.

** 1 = Very Low; 2 = Low; 3 = Moderately Low; 4 = Moderate; 5 = Moderately High; 6 = High; 7 = Very High

Fountain Wind Project - Assessment of Visual Effects

Existing Conditions

KOP 2	Location: Montgomery Creek Elementary School	Photo Date: 13-Dec-18

Landscape Unit or Type: Mountain Communities
Viewer Type(s): Residents, tourists, commuters, workers
View Orientation / Viewer Position to Project (Inferior, Level, or Superior): East / Inferior
Viewpoint Description (Figure Caption): View to the east from the entrance to Montgomery Creek Elementary School off of State Route 299.

VISUAL CHARACTER

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	Overlapping layers of undulating ridgelines visible.	**Fore**	x	**Buildings**	Elementary school shed visible beyond school bus in left of view.	**Fore**	x
		Mid	x			**Mid**	-
		Back	x			**Back**	-
Water	NA	**Fore**		**Infrastructure**	Utility line extends across view - strong linear/vertical component. Lighting, signage, fence and paving all associated w/ school.	**Fore**	x
		Mid				**Mid**	x
		Back				**Back**	-
Vegetation	Blend of evergreen and deciduous trees of varying species and forms visible throughout the view; individually identifiable in foreground.	**Fore**	x	**Structures**	Fences and other farm appurtenences visible in foreground. Structures partially visible along hillside.	**Fore**	x
		Mid	x			**Mid**	-
		Back	x			**Back**	x
Animals	NA	**Fore**		**Artifacts / Art**	NA	**Fore**	
		Mid				**Mid**	
		Back				**Back**	
Atmospheric	Sunny.	**Fore**		**Motion**	Viewpoints adjacent to highway, but few sources of motion wihtin view aside from traffice to / from school	**Fore**	x
		Mid				**Mid**	-
		Back				**Back**	-

VISUAL QUALITY

	Score**	Notes
Natural Harmony	**4**	Ridgelines and hilltops appear to increase in elevation with distance from the viewpoint, giving the appearance of a uniform grade change. No discernable pattern / order to vegetation. Typical view of natural setting from highway corridor.
Cultural Order	**4**	View epitomizes pattern of development in area: larger developments (i.e., commercial, institutional) relegated within valley floor, with other uses (residential, transmission / infrastructural) extending into nearby foothils, with more distant hills appearing as mostly undeveloped.
Overall Coherence	**3**	High-voltage power lines cut across view, appearing to extend built features into and above foothills nearest the viewpoint. Transmission towers atop nearby hillside provide slight symmetry with vertical form of school light pole.
Landscape Composition and Vividness	**3**	Mountain backdrop frames the view and appears to enclose developed / popualted areas. Few memorable components, transmission structures atop hill are view's most vivid features.
Overall Visual Quality Score	**3.5**	Moderate. This view is typical of conditions along the highway corridor, with views toward the mostly undeveloped hills and mountains interrupted by transmission or distribution facilities.

With Project

KOP 2	Location: Montgomery Creek Elementary School	Date of Eval: 14-May-19

Landscape Unit or Type: Mountain Communities
Viewer Type(s): Residents, tourists, commuters, workers
View Orientation / Viewer Position to Project (Inferior, Level, or Superior): East / Inferior
Viewpoint Description (Figure Caption): View from KOP 2 with project simulated. Turbines would be most visible in the left half of the view, between three and five miles away.

VISUAL CHARACTER CONTRAST

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	Project would appear beyond / atop land forms and would not effect changes to existing conditions, though would encroach on ridgeline.	**Fore**	-	**Buildings**	No change from project	**Fore**	
		Mid	x			**Mid**	
		Back	-			**Back**	
Water	NA	**Fore**		**Infrastructure**	No change from project	**Fore**	
		Mid				**Mid**	
		Back				**Back**	
Vegetation	No change from project	**Fore**		**Structures**	New turbines visible atop ridgeline in left view would prominently reshape skyline with new vertical / angular forms.	**Fore**	-
		Mid				**Mid**	x
		Back				**Back**	-
Animals	No change from project	**Fore**		**Artifacts / Art**	NA	**Fore**	
		Mid				**Mid**	
		Back				**Back**	
Atmospheric	Atmospheric conditions did not affect project visibility in simulation.	**Fore**		**Motion**	The project turbines would be substantial sources of motion along the ridgeline in the middleground.	**Fore**	-
		Mid				**Mid**	x
		Back				**Back**	-

VISUAL QUALITY

	Score**	Notes
Natural Harmony	**4**	No change with project.
Cultural Order	**3**	Project turbines would appear set back from the viewpoint and the mountain valley floor, between 3 and 5 miles away. Aside from consistency in distance, there would be no decipherable pattern to the placement of the turbines.
Overall Coherence	**3**	Project turbines would be visible to varying extents in the left half of the view, where all would be prominently visible, with the nacelle above the ridgeline. In the right half of the view, portions of turbine blades appearing above the near hilltop but behind hilltop vegetation are visible.
Landscape Composition and Vividness	**3**	The addition of turbines would balance out the transmission towers in terms of spreading built, highly visible, forms across the upper portion of the entire view. Project would also introduce a new use to the view, altering the composition of the landscape by adding electricity generation to the highest portion of the view, beyond the transmission facilities and elementary school.
Overall Visual Quality Score	**3.3**	Moderately Low. Turbines would appear along currently undeveloped portion of ridgeline, adding memorable features but also a new use affecting overall composition of view.

* Foreground = zone including area up to 0.25 - 0.5 mile from viewer; Middleground = zone extending between 0.25 - 0.5 mile from viewer to 3 - 5 miles away; Background = zone extending from 3-5 miles away from viewer to infinity.
** 1 = Very Low; 2 = Low; 3 = Moderately Low; 4 = Moderate; 5 = Moderately High; 6 = High; 7 = Very High

Fountain Wind Project - Assessment of Visual Effects

Existing Conditions

KOP 3	Location: Round Mountain	Photo Date: 13-Dec-18
Landscape Unit or Type:	Mountain Communities	Viewer Type(s): Residents, workers, commuters, tourists
View Orientation / Viewer Position to Project (Inferior, Level, or Superior):	East / Inferior	
Viewpoint Description (Figure Caption):	View to the east from the Round Mountain Post Office, just south of the Hill Country Community Clinic.	

VISUAL CHARACTER

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	An irregular ridgeline serves as backdrop to a varied slope (gradual and wide in some areas, steep and crevassed elsewhere) and valley floor.	Fore	-	Buildings	A residence typical of those in the area is visible on the east side of the highway. A second building is visible beyond trees.	Fore	X
		Mid	-			Mid	-
		Back	X			Back	-
Water	NA	Fore		Infrastructure	Multiple towers adjacent to Round Mountain Substation are visible. Towers discernable on ridgeline. Conductors visible along top of view.	Fore	X
		Mid				Mid	X
		Back				Back	X
Vegetation	A variety of individually identifiable trees is visible across the valley floor in the foreground. Vegetative cover of hills and ridge is more uniform.	Fore	X	Structures	None other than buildings and transmission infrastructure	Fore	
		Mid	X			Mid	
		Back	-			Back	
Animals	NA	Fore		Artifacts / Art	NA	Fore	
		Mid				Mid	
		Back				Back	
Atmospheric	Sunny.	Fore		Motion	Vehicles traveling along SR 299 in either direction are visible in views to the east from the post office.	Fore	X
		Mid				Mid	-
		Back				Back	-

VISUAL QUALITY

	Score**	Notes
Natural Harmony	4	This view is emblematic of the ridge-and-valley form that characterizes the Mountain Communities landscape unit. Mature vegetation is visible throughout the valley floor, and in a patchier pattern throughout the somewhat rugged mountain backdrop. The natural skyline is disrupted slighlty by two discernable transmission towers.
Cultural Order	3	Transmission infrastructure consists of varied forms but appears generally unidirectional (Round Mountain Substation is just left of view) and limited to valley floor with exception of discernable towers along ridgeline. Prominent presence of residence and other non-utilty structures on opposite side of SR 299 reduces cultural order in the view.
Overall Coherence	3	Moderately low due to contrast resulting from residence and shed visible amid a landscape otherwise dedicated to electricity transmission.
Landscape Composition and Vividness	4	Transmission towers are the view's most vivid features, along with the mature trees closest to the viewpoint. The mostly undeveloped mountain slope and ridgeline provide a clearly defined backdrop to the valley floor.
Overall Visual Quality Score	3.5	Moderate. The ridgeline provides a somewhat scenic backdrop to a valley floor that appears visually cluttered despite the overall intactness that results from the transmission infrastructure appearing contained to that area.

With Project

KOP 3	Location: Round Mountain	Date of Eval: 14-May-19
Landscape Unit or Type:	Mountain Communities	Viewer Type(s): Residents, workers, commuters, tourists
View Orientation / Viewer Position to Project (Inferior, Level, or Superior):	East / Inferior	
Viewpoint Description (Figure Caption):	View from KOP 3 with project simulated. Project turbines would be visible between three and six miles away.	

VISUAL CHARACTER CONTRAST

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	Nearest turbine just over 3 miles away. Turbines would visibly encroach on ridgeline but would not appear to alter land.	Fore	-	Buildings	No change from project.	Fore	
		Mid	-			Mid	
		Back	x			Back	
Water	NA	Fore		Infrastructure	No change from project.	Fore	
		Mid				Mid	
		Back				Back	
Vegetation	No change from project except along skyline.	Fore		Structures	Project turbines would be visible across the entire ridgeline in the view from KOP 2.	Fore	-
		Mid				Mid	x
		Back				Back	x
Animals	NA	Fore		Artifacts / Art	NA	Fore	
		Mid				Mid	
		Back				Back	
Atmospheric	Atmospheric conditions did not affect project visibility in simulation.	Fore		Motion	Would introduce sources of motion to view background, across entire view.	Fore	X
		Mid				Mid	-
		Back				Back	x

VISUAL QUALITY

	Score**	Notes
Natural Harmony	4	In the background of the view, the project would appear as a prominent interruption in the mostly natural skyline. However, the natural harmony visible to viewers would be retained, if subordinate to built features.
Cultural Order	3	Turbines would be prominent new features in the view, increasing the presence of electricity-related facilities in the landscape. Their vertical forms would relate to the closer transmission towers, and the mostly linear presence along the ridgeline would appear across the view much like the conductor lines visible throughout the foreground.
Overall Coherence	2	With the project, the view changes from one in which electricity transmission is visible as a component to one in which a generation facility is also prominentliy featured. All other features in the would be subordinate to the varied forms associated with such uses. While thematically consistent, the overall coherence would be reduced.
Landscape Composition and Vividness	3	The turbines would be highly memorable features, given their relative scale and concentration along the ridgeline. Their relegation to the background of the view would retain some intactness in the existing view's composition.
Overall Visual Quality Score	3.0	Moderately low. The project would reinforce a cultural order related to power generation and transmission, but the introduction of prominent new forms would reduce the view's cohesiveness.

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** 1 = Very Low; 2 = Low; 3 = Moderately Low; 4 = Moderate; 5 = Moderately High; 6 = High; 7 = Very High

Fountain Wind Project - Assessment of Visual Effects

Existing Conditions

KOP 4	Location: SR 299 at Tamarack Road	Photo Date: 18-Apr-19
Landscape Unit or Type:	Mountain Communities	Viewer Type(s): Tourists, commuters, workers
View Orientation / Viewer Position to Project (Inferior, Level, or Superior):	WSW / Inferior	
Viewpoint Description (Figure Caption):	View to the west-southwest from SR 299 at Tamarack Road, near Sierra Pacific Industries. Existing Hatchet Ridge turbines are visible less than three miles away.	

VISUAL CHARACTER

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	Pleasing contrast between flat, elevated valley floor and articulated, layered hills / mountains.	Fore	X	Buildings	Home and barn visible amid trees in far portion of valley.	Fore	X
		Mid	X			Mid	-
		Back	X			Back	-
Water	NA	Fore		Infrastructure	Hwy corridor and transmission right-of-way (ROW) corridor are linear elements that appear out-of-sync with each other. Dist line to house.	Fore	X
		Mid				Mid	-
		Back				Back	-
Vegetation	Strong vertical forms in foreground. Individually identifiable in middleground. Blended as cover in background.	Fore	X	Structures	Existing Hatchet Ridge turbines prominent in right edge of view. Roadside fenceposts minor but highly visible vertical features.	Fore	-
		Mid	X			Mid	X
		Back	X			Back	-
Animals	NA	Fore		Artifacts / Art	NA	Fore	
		Mid				Mid	
		Back				Back	
Atmospheric	Sunny.	Fore		Motion	Spinning of existing turbine blades highly visible from this distance. Highway traffic.	Fore	X
		Mid				Mid	X
		Back				Back	-

VISUAL QUALITY

	Score**	Notes
Natural Harmony	5	Densely vegetated hillsides and mountain slopes yield to an open and more sparsely vegetated elevated valley floor.
Cultural Order	3	Highway and ROW corridors are strong linear features, appearing from this vantage point to be aligned perpendicular to one another but not clear. A home and associated structures is set back from the roadway, beyond the treeline, but distribution line/poles extending to its location are visible. Southern edge of Hatchet Ridge turbine string appears as a short row of strong vertical forms.
Overall Coherence	4	Though the natural setting is scenic, there are a number of disparate cultural elements that reduce the overall coherence and intactness of the view.
Landscape Composition and Vividness	4	This segment of SR 299 affords a comparatively sustained and open view. Existing turbines are memorable elements, but the rest of the human-made components serve to distract from an otherwise moderately scenic setting.
Overall Visual Quality Score	4.0	Moderate. A scenic and varied mountainside and ridgeline view includes prominently visible turbines and transmission right-of-way.

With Project

KOP 4	Location: SR 299 at Tamarack Road	Date of Eval: 14-May-19
Landscape Unit or Type:	Mountain Communities	Viewer Type(s): Tourists, commuters, workers
View Orientation / Viewer Position to Project (Inferior, Level, or Superior):	WSW / Inferior	
Viewpoint Description (Figure Caption):	View from KOP 2 with project simulated. Two project turbines would be visible between four and six miles away in the center of the view.	

VISUAL CHARACTER CONTRAST

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	No change from project.	Fore		Buildings	No change from project.	Fore	
		Mid				Mid	
		Back				Back	
Water	No change from project.	Fore		Infrastructure	No change from project.	Fore	
		Mid				Mid	
		Back				Back	
Vegetation	No change from project.	Fore		Structures	Two project turbines would be partially visible in the center of the view.	Fore	-
		Mid				Mid	x
		Back				Back	x
Animals	NA	Fore		Artifacts / Art	NA	Fore	
		Mid				Mid	
		Back				Back	
Atmospheric	Sunny.	Fore		Motion	Project turbines would extend the horizontal space within which motion associated with turbines would appear.	Fore	-
		Mid				Mid	x
		Back				Back	x

VISUAL QUALITY

	Score**	Notes
Natural Harmony	5	No change to evident natural harmony from project.
Cultural Order	3	Horizontal space occupied by existing turbines would appear to extend into center of view. Partial visibility of turbines in center of view adds elements that are identifiable but appear as incomplete within the landscape. No substantial change from existing conditions.
Overall Coherence	4	With only two project turbines partially visible, the project would not have a substantial presence in the view. It would appear to extend the presence of existing turbines to a relatively minor degree.
Landscape Composition and Vividness	4	Turbines would remain memorable features, with project turbines adding incrementally to their presence.
Overall Visual Quality Score	4.0	Moderate. The partial presence of two project turbines would not substantially affect existing visual quality.

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Fountain Wind Project - Assessment of Visual Effects

Existing Conditions

KOP 5	Location: Burney	Photo Date: 18-Apr-19

Landscape Unit or Type: Mountain Communities
Viewer Type(s): Residents, tourists, commuters, workers
View Orientation / Viewer Position to Project (Inferior, Level, or Superior): WSW / Inferior
Viewpoint Description (Figure Caption): View to the west-southwest from downtown Burney. The existing Hatchet Ridge project is visible in the right portion of the view.

VISUAL CHARACTER

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	Clearly defined, rounded and gradual ridgeline is visible in portions of view background. Viewpoint vicinity flat and developed.	Fore	x	Buildings	Commercial portion along Burney's Main Street.Relatively large-scale, angular and rectilinear buildings, as well as cottage-scale buildings.	Fore	X
		Mid	-			Mid	-
		Back	x			Back	-
Water	NA	Fore		Infrastructure	Road corridor, including stop lights, occupies large portion of view.	Fore	x
		Mid				Mid	-
		Back				Back	-
Vegetation	Individual trees along ridgeline barely discernable. Mature trees of varying form, color, and scale visible throughout urban area.	Fore	x	Structures	Hatchet Ridge turbines visible. A nearby flagpole and street lights / parking lot lights are among the tallest components fo the view.	Fore	x
		Mid	-			Mid	-
		Back	x			Back	x
Animals	NA	Fore		Artifacts / Art	NA	Fore	
		Mid				Mid	
		Back				Back	
Atmospheric	Sunny	Fore		Motion	Hatchet Ridge turbine blade rotation visible from here. Main Street is also SR 299; relatively high volume of through and local traffic.	Fore	x
		Mid				Mid	-
		Back				Back	x

VISUAL QUALITY

	Score**	Notes
Natural Harmony	3	Ridge and valley composition of Mountain Communities landscape is evident, but developed ridgeline and urban vegetation do not contribute to any substantial degree of natural harmony.
Cultural Order	4	Development appears concentrated within - but not completely relegated to - valley portion of view. Within the urbanized foreground, order is typical of a commercial portion of a small city or town. Existing turbines limited to ridgeline backdrop.
Overall Coherence	4	In views allowing for visibility of the project site, SR 299 / Main Street occupies a substantial portion of the field of vision. Urban forms and vegetation appear to line the roadway and a ridgeline with active electrical generation and transmission activities appears in portions of the background.
Landscape Composition and Vividness	3	None of the observable components are particularly memorable as viewed from this particular location; Hatchet Ridge turbines are vivid, particularly when operating, but are visible here from a distance that reduces their apparent scale. Clean and orderly mountain town streetscape, typical of what viewers would likely expect.
Overall Visual Quality Score	3.5	Moderate. This view affords a view of Burney's mountain backdrop,

With Project

KOP 5	Location: Burney	Date of Eval: 14-May-19

Landscape Unit or Type: Mountain Communities
Viewer Type(s): Residents, tourists, commuters, workers
View Orientation / Viewer Position to Project (Inferior, Level, or Superior): WSW / Inferior
Viewpoint Description (Figure Caption): View from KOP 3 with project simulated. Project turbines would be visible near the center of the view, to the left of existing Hatchet Ridge turbines, between seven and ten miles away.

VISUAL CHARACTER CONTRAST

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	No change from project.	Fore		Buildings	NA	Fore	
		Mid				Mid	
		Back				Back	
Water	NA	Fore		Infrastructure	No change from project.	Fore	
		Mid				Mid	
		Back				Back	
Vegetation	No change from project.	Fore		Structures	Jagged / rigid blade tips would be visible just above the skyline in the center-right of the view, partially obscured by trees.	Fore	-
		Mid				Mid	-
		Back				Back	x
Animals	NA	Fore		Artifacts / Art	NA	Fore	
		Mid				Mid	
		Back				Back	
Atmospheric	Atmospheric conditions did not affect project visibility in simulation.	Fore		Motion	Project turbines would extend the horizontal space currently occupied by Hatchet Ridge turbines in which rotating blades would be visible.	Fore	-
		Mid				Mid	-
		Back				Back	x

VISUAL QUALITY

	Score**	Notes
Natural Harmony	3	The partial visibility of project turbines in the center-right portion of the view, appearing above and beyond the supermarket parking lot, would not detract from the existing natural harmony in the view.
Cultural Order	4	Project turbines, though larger than existing turbines, would appear at a similar scale due to their greater distance from the viewpoint. Because they would appear atop or beyond the current row of turbines on the ridgeline backdrop, the integrity of the existing view would be retained. No new structures would appear to encroach on other features in the view.
Overall Coherence	4	Project turbines would expand the portion of the view within which power generation structures would be visible. However, the structures would appear consistent in appearance and at a greater distance than existing, similar structures. The addition of turbines would not substantially affect the overall coherence of the view.
Landscape Composition and Vividness	3	With the project, a currently undeveloped segment of the ridgeline would appear with turbines. Additional turbines would attract viewer attention, but would not be likely to do more than the existing, visible turbines do.
Overall Visual Quality Score	3.5	Moderate. Project turbines visible in a relatively narrow portion of the view, from this distance, would not substantially alter the visual quality of the view, which already includes turbines.

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Fountain Wind Project - Assessment of Visual Effects

Existing Conditions

KOP 6	Location: SR 299 - PIt River Overlook	Photo Date: 18-Apr-19
Landscape Unit or Type:	Hat Creek and Pit River	Viewer Type(s): recreationists, tourists, commuters
View Orientation / Viewer Position to Project (Inferior, Level, or Superior):	SW / Level	
Viewpoint Description (Figure Caption):	View to the southwest from SR 299, at an overlook en route to Fall River Mills. Hatchet Ridge turbines are discernable along the ridgeline in the right half of the view.	

VISUAL CHARACTER

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	Broad, varied landscape with mountains, slopes, and river valleys clearly visible.	Fore	x	Buildings	NA	Fore	
		Mid	x			Mid	
		Back	x			Back	
Water	The Pit River is visible in the middle ground. Snow visible atop peaks in background.	Fore	-	Infrastructure	A cleared right-of-way for electrical transmission is visible extending through the center of the view from middleground to background.	Fore	-
		Mid	X			Mid	x
		Back	x			Back	x
Vegetation	Mostly evergreen trees, visible individually in fore and middleground and as collective cover in background. Spiky texture.	Fore	x	Structures	Hatchet Ridge turbines are discernable along the ridgeline in the right half of the view.	Fore	-
		Mid	x			Mid	-
		Back	x			Back	x
Animals	NA	Fore		Artifacts / Art	NA	Fore	
		Mid				Mid	
		Back				Back	
Atmospheric	Sunny. Atmospheric haze evident from long-distance view. Existing turbines must be looked for in order to be seen clearly.	Fore		Motion	Pit River flow and Hatchet Ridge turbines, when operating, are sources of motion in existing views.	Fore	-
		Mid				Mid	x
		Back				Back	x

VISUAL QUALITY

	Score**	Notes
Natural Harmony	6	Tree line visible across the view, appears to give way to a meadow / clearing in the right side of the view. Generally consistent height and type of trees with some exception, which adds vegetative variety.
Cultural Order	4	Transmission right-of-way cuts through most of view, but does so in a way that appears to generally bisect the view. Associated infrastrucutre is generally aligned with the corridor. Other notable built structures - Hatchet Ridge turbines - appear as a row atop distant ridgeline. Cut made for segment of SR 299 at lower elevation is clearly visible in right portion of view.
Overall Coherence	6	Clear depiction of nominally developed mountain and river valley setting with human-made elements visible but not dominant. Mountain ridgeline / peaks form clear backdrop to view.
Landscape Composition and Vividness	6	Presence of snow accentuates ridge / valley character of view, as does the perpendicular river valley in middleground. the two primary human-made elements are not only subordinate to the broader natural setting but are each responded to by natural elements: the transmission ROW by the Pit River and Hatchet Ridge turbines by the jagged and occasionally snow-capped peaks to the south.
Overall Visual Quality Score	5.5	High. This is a scenic view.

With Project

KOP 6	Location: SR 299 - PIt River Overlook	Date of Eval: 14-May-19
Landscape Unit or Type:	Hat Creek and Pit River	Viewer Type(s): recreationists, tourists, commuters
View Orientation / Viewer Position to Project (Inferior, Level, or Superior):	SW / Level	
Viewpoint Description (Figure Caption):	View from KOP 4 with project simulated. The project would be visible just under 19 miles away.	

VISUAL CHARACTER CONTRAST

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	No change from project.	Fore		Buildings	No change from project.	Fore	
		Mid				Mid	
		Back				Back	
Water	No change from project.	Fore		Infrastructure	No change from project.	Fore	
		Mid				Mid	
		Back				Back	
Vegetation	No change from project.	Fore		Structures	Project turbines would appear to the left of existing Hatchet Ridge turbines, larger in scale though further away from the KOP	Fore	-
		Mid				Mid	-
		Back				Back	x
Animals	NA	Fore		Artifacts / Art	No change from project.	Fore	
		Mid				Mid	
		Back				Back	
Atmospheric	Project turbine visibility would also be hindered somewhat by atmospheric haze associated with long-distance views.	Fore		Motion	When both projects are operating, motion from spinning rotors would appear across nearly 3/4 of the view.	Fore	-
		Mid				Mid	-
		Back				Back	x

VISUAL QUALITY

	Score**	Notes
Natural Harmony	6	Project turbines would appear atop ridgeline in center and center-left of view, above and beyond the view's natural elements. As such, the existing natural harmony would remain unchanged.
Cultural Order	4	Because the Project turbines would appear along the ridgeline as an extention of existing turbines - in form, color, and texture, if larger in scale - the cultural order of the existing view would be reinforced and not substantially altered.
Overall Coherence	6	The Project would have little effect on the overall coherence of the exisitng view. The mountain valley setting, bisected by the linear transmision right-of-way and backdropped by wind turbines along the skyline would remain so, with the turbines occupying larger horizontal space.
Landscape Composition and Vividness	6	New, larger turbines would enhance memorability of existing view components. Composition of existing view would otherwise be retained.
Overall Visual Quality Score	5.5	High. View would remain scenic.

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Fountain Wind Project - Assessment of Visual Effects

Existing Conditions

KOP7	Location: Redding	Photo Date: 18-Apr-19
Landscape Unit or Type:	Sacramento Valley	Viewer Type(s): Residents, tourists, commuters, workers
View Orientation / Viewer Position to Project (Inferior, Level, or Superior):	ENE / Level	
Viewpoint Description (Figure Caption):	View to the east from eastbound SR 299, east of Redding near Shasta College and local bike path. Existing Hatchet Ridge turbines are barely detectable along the ridgeline in the left portion of the view.	

VISUAL CHARACTER

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	Foothill environment in foreground, indicating beginning of transition from Sacramento Valley floor to more mountainous region, as visible.	Fore	x	Buildings	Homes partially visible in foreground.	Fore	X
		Mid	x			Mid	-
		Back	X			Back	-
Water	Snow-capped peaks	Fore	-	Infrastructure	SR 299 corridor, including signage and lighting, is prominent. Slight portion of bike trail at viewpoint is evident. Dist. wires cross view.	Fore	X
		Mid	-			Mid	-
		Back	X			Back	-
Vegetation	Trees of various species and generally rounded / irregular form appear along road and within surrounding area. Grasses.	Fore	X	Structures	Hatchet Ridge turines barely detectable along mountain skyline in left portion of view.	Fore	-
		Mid	-			Mid	-
		Back	-			Back	X
Animals	NA	Fore		Artifacts / Art	NA	Fore	
		Mid				Mid	
		Back				Back	
Atmospheric	Sunny. Atmospheric haze evident from long-distance view. Existing turbines must be looked for in order to be seen clearly.	Fore		Motion	Hwy traffic, moving at relatively high speeds and in higher volumes than local roads. Motion of Hatchet Ridge turbines detectable.	Fore	X
		Mid				Mid	-
		Back				Back	-

VISUAL QUALITY

	Score**	Notes
Natural Harmony	5	Moderately high degree of natural harmony based primarily on the evidence of a mountain region serving as backdrop to a verdant valley and foothill setting.
Cultural Order	5	The highway corridor is the view's dominant feature. Most human-made components are aligned with it, and the low-density housing adjacent is viewed relative to it. Cultural features appear orderly. Only existing wind turbines appear - barely - in a manner that does not reinforce the form of the roadway.
Overall Coherence	5	Viewers here - primarily travelers or commuters leaving Redding - would expect a reduction in scale and volume of development and an opening up of views to the east. The roadway broadens, cultural elements are fewer, and the distant mountains come into view. Power-generating wind turbines relegated to the view's background, difficult to identify unless specifically looking for them.
Landscape Composition and Vividness	5	Foothill transition clearly in view, with distant ridgeline serving as highly visible backdrop.
Overall Visual Quality Score	5.0	Moderately High. Mountains are scenic and, along with preponderance of vegetation in foreground, vivid components of the view.

With Project

KOP7	Location: Redding	Date of Eval: 14-May-19
Landscape Unit or Type:	Sacramento Valley	Viewer Type(s): Residents, tourists, commuters, workers
View Orientation / Viewer Position to Project (Inferior, Level, or Superior):	ENE / Level	
Viewpoint Description (Figure Caption):	View from KOP 7 with project simulated. Project turbines would be visible just under 28 miles away.	

VISUAL CHARACTER CONTRAST

Natural Environment		Distance Zones *		Cultural Environment		Distance Zones *	
Land	Project turbines would appear amid distant, west-facing mountain slopes, appearing in front of lands not easily differentiated.	Fore	-	Buildings	No change from project.	Fore	
		Mid	-			Mid	
		Back	X			Back	
Water	No change from project.	Fore		Infrastructure	No change from project.	Fore	
		Mid				Mid	
		Back				Back	
Vegetation	No change from project.	Fore		Structures	Though distant, Project turbines would be visible in an irregular pattern across the west-facing mountain slopes in left view.	Fore	-
		Mid				Mid	-
		Back				Back	X
Animals	NA	Fore		Artifacts / Art	NA	Fore	
		Mid				Mid	
		Back				Back	
Atmospheric	Project turbine visibility would also be hindered somewhat by atmospheric haze associated with long-distance views.	Fore		Motion	When spinning, rotors would be new visible source of motion in a limited portion of the view.	Fore	-
		Mid				Mid	-
		Back				Back	X

VISUAL QUALITY

	Score**	Notes
Natural Harmony	5	Project would not alter degree of natural harmony in existing view.
Cultural Order	3	Project turbines would be visible from this distance, but would appear scattered rather than orderly, encroaching substantially into the foothills. Distance and atmospheric conditions would affect visibility.
Overall Coherence	4	With the Project, the portion of the view dedicated to power generation would remain in the background, but would appear to encroach on the lower elevations of the mountains in a scattered, irregular pattern. Turbines would appear closer and larger in scale than the existing turbines and would increase the portion of the view containing such features.
Landscape Composition and Vividness	4	Would remain much the same, though larger and closer turbines, when detectable, would be memorable elements.
Overall Visual Quality Score	4.0	Moderate. On a clear day, Project turbines would expand the visible envelope of development in the distant mountains, noticeably into the western slopes. Rest of view would remain as is currently.

* Foreground = zone including area up to 0.25 - 0.5 mile from viewer; Middleground = zone extending between 0.25 - 0.5 mile from viewer to 3 - 5 miles away; Background = zone extending from 3-5 miles away from viewer to infinity.

** 1 = Very Low; 2 = Low; 3 = Moderately Low; 4 = Moderate; 5 = Moderately High; 6 = High; 7 = Very High

Appendix B
Air Quality and Greenhouse Gas Emissions

Construction Emissions - Unmitigated

Phase	Source	ROG	NOx	PM10			PM2.5		
				Exhaust	Dust	Total	Exhaust	Dust	Total
Peak Construction Emissions - First Year (pounds/day)									
Timber Removal and Grubbing	Equipment	7	62	2	0	2	2	0	2
	Vehicles	4	52	1	1,739	1,740	0	174	174
Grading and Access Road Work	Equipment	21	208	9	45	54	8	21	29
	Vehicles	4	43	2	1,062	1,064	1	107	108
Concrete Batch Plants or Deliveries (assume deliveries)*	Equipment	5	43	2	6	8	2	4	6
	Vehicles	2	19	1	1,266	1,267	0	127	128
Foundations	Equipment	5	57	3	19	21	3	10	13
	Vehicles	0	0	0	302	302	0	30	30
Total (1, 2)		**35**	**365**	**14**	**2,846**	**2,860**	**12**	**302**	**313**
Total (2, 3, 4, 5)		32	328	14	2,694	2,708	12	295	307
Peak Construction Emissions - Second Year (pounds/day)									
Turbine and Transformer Installation	Equipment	6	67	3	0	3	3	0	3
	Vehicles	2	39	1	527	528	1	55	55
Substation and O&M Building Installation	Equipment	1	10	0	0	0	0	0	0
	Vehicles	1	3	1	595	596	0	60	61
Underground Collector System	Equipment	3	32	2	6	8	2	3	5
	Vehicles	0	0	0	179	179	0	18	18
Overhead Collection System	Equipment	3	34	2	0	2	1	0	1
	Vehicles	0	0	0	179	179	0	18	18
	Helicopter	13	19	1	10	10	1	1	1
Total		29	205	9	1,497	1,506	8	154	162

*Equipment emissions from the on-site concrete batch plant have been subtracted out of the total emissions for the worst-case scenario of trucking concrete to the site.

Construction Emissions - Mitigated (Tier 4 for all off-road equipment)

Phase	Source	ROG	NOx	PM10			PM2.5		
				Exhaust	Dust	Total	Exhaust	Dust	Total
Peak Construction Emissions - First Year (pounds/day)									
Timber Removal and Grubbing	Equipment	2	8	0	0	0	0	0	0
	Vehicles	4	52	1	280	281	0	28	29
Grading and Access Road Work	Equipment	4	17	1	20	21	1	9	10
	Vehicles	4	43	2	175	177	1	8	9
Concrete Batch Plants or Deliveries*	Equipment	1	8	0	6	6	0	4	4
	Vehicles	2	19	1	128	129	0	14	14
Foundations	Equipment	1	7	0	8	8	0	5	5
	Vehicles	0	0	0	30	30	0	3	3
Total (1, 2)		**13**	**120**	**4**	**475**	**479**	**2**	**45**	**48**
Total (2, 3, 4, 5)		10	87	3	361	365	2	38	40
Percent Reduction			67%	74%	83%	83%	81%	85%	
Peak Construction Emissions - Second Year (pounds/day)									
Turbine and Transformer Installation	Equipment	1	6	0	0	0	0	0	0
	Vehicles	2	39	1	61	62	1	8	9
Substation and O&M Building Installation	Equipment	0	3	0	0	0	0	0	0
	Vehicles	1	3	1	63	63	0	7	7
Underground Collector System	Equipment	1	7	0	3	3	0	1	2
	Vehicles	0	0	0	18	18	0	2	2
Overhead Collection System	Equipment	1	8	0	0	0	0	0	0
	Vehicles	0	0	0	18	18	0	2	2
	Helicopter	13	19	1	10	10	1	1	1
Total		18	85	3	172	175	2	21	23
			59%	68%	89%	88%	75%	87%	

*Equipment emissions from the on-site concrete batch plant have been subtracted out of the total emissions for the worst-case scenario of trucking concrete to the site.

Operation and Maintenance Emissions

Source	ROG	NOx	PM10			PM2.5		
			Exhaust	Dust	Total	Exhaust	Dust	Total
Worker Vehicle Emissions	0.14	0.23	0.12	54.48	54.60	0.05	5.58	5.63
Maintenance Work with Cranes and Mowers	0.53	5.51	0.27	0.00	0.27	0.25	0	0.25
Emergency Generator Testing and Maintenance	0.88	2.46	0.13	0	0.13	0.13	0	0.13
Total (pounds per day)	1.55	8.19	0.52	54.48	55.00	0.43	5.58	6.01

Operation and Maintenance Emissions - Mitigated

Source	ROG	NOx	PM10			PM2.5		
			Exhaust	Dust	Total	Exhaust	Dust	Total
Worker Vehicle Emissions	0.00	0.00	0.00	15.25	15.25	0.00	2.79	2.79
Maintenance Work with Cranes and Mowers	0.53	5.51	0.27	0.00	0.27	0.25	0	0.25
Emergency Generator Testing and Maintenance	0.88	2.46	0.13	0	0.13	0.13	0	0.13
Total (pounds per day)	1.41	7.97	0.40	15.25	15.65	0.38	2.79	3.17

Fugitive Dust Associated with Concrete Batch Plants

Source	PM10 (lb/yd3)	concrete (yd3)	lbs PM10	lbs PM2.5
Aggregate delivery to ground storage	0.0031	36,946	114.53	77.194972
Sand delviery to ground storage	0.0007	36,946	25.86	17.431123
Aggreage transfer to conveyor	0.0031	36,946	114.53	77.194972
San transfer to conveyor	0.0007	36,946	25.86	17.431123
Aggregate transfer to elevated storage	0.0031	36,946	114.53	77.194972
Sand transfer to elevated storage	0.0007	36,946	25.86	17.431123
Cement delivery to silo	0.0001	36,946	3.69	2.4901604
Cement supplement to silo	0.0002	36,946	7.39	4.9803208
		Total	432.27	291.35
		Days	70	70
		lb/day	6.18	4.16

Notes:

Concrete volume obtained from traffic study.

Emission factors obtained from AP-42 Table 11.12.6.

PM2.5 Fraction of PM10 is 0.674 (South Coast AQMD, 2006).

HELICOPTER (Bell 206L) EMISSION CALCULATIONS

Helicopter Model	Bell 206L
Engine Type	DDA250-C30P
Fuel Burn Rate (flight)	149 gal/hr
Fuel Burn Rate (LTO)	24 gal/LTO
Aviation Gasoline Fuel Density	6.01 lbs/gal
CO_2 Emission Factor	18.28 lbs/gal fuel
CH_4 Emission Factor	0.01557 lbs/gal fuel
N_2O Emission Factor	0.00024 lbs/gal fuel
CH_4 Global Warming Potential	25
N_2O Global Warming Potential	298

	Combustion Emission Factors				Fugitive Emission Factors		GHG Emission Factors		
Activity	HC	CO	NOx	PM	PM10	PM2.5	CO_2	N_2O	CH_4
Flight (lbs/hr)	1.46	1.81	2.45	0.07	-	-	6,021.49	0.08	5.13
LTO (lbs)	0.63	0.81	0.29	0.01	3.31	0.33	951.19	0.01	0.81

		Combustion Emissions (lbs/day)				Fugitive Emissions (lbs/day)		GHG Emissions (lbs/day)			
Activity	Quantity	HC	CO	NOx	PM	PM10	PM2.5	CO_2	N_2O	CH_4	CO2e
Conductor Installation - Applicable to both the Overhead Collection System and Transmission Line Connection phases											
Flight	7.33 hrs/day	10.66	13.24	17.93	0.52	-	-	44,107.43	0.57	37.57	45,216.20
LTO	3.00 LTOs/day	1.89	2.42	0.86	0.03	9.92	0.99	2,853.56	0.04	2.43	2,925.29
Total		12.55	15.66	18.79	0.54	9.92	0.99	46,960.99	0.61	40.00	48,141.49

	Working	Combustion Emissions (tons)				Fugitive Emissions (tons)		GHG Emissions (metric tons)			
Activity	Days	HC	CO	NOx	PM	PM10	PM2.5	CO_2	N_2O	CH_4	CO2e
Conductor Installation											
Overhead Collection Sytem stringing	5.00	0.03	0.04	0.05	0.00	0.02	0.00	106.51	0.00	0.09	109.18
Transmission Line Connection stringing	1.00	0.01	0.01	0.01	0.00	0.00	0.00	21.30	0.00	0.02	21.84
Total		0.01	0.01	0.01	0.00	0.00	0.00	127.81	0.00	0.11	131.02

Notes:

Emission factors and fuel burn rates obtained from the FOCA Guidance on Determination of Helicopter Emissions, Edition 2, December 2015.

LTO = Landing and take-off cycle.

Each day of helicoper operations was assumed to contain 3 LTOs, each 13.5 minutes long. The helicopter was assumed to be in flight during the remainder of the day's operations.

Emission factors are for the Bell 206L (650 hp).

Fugitive dust emission factor source: Dr. J. A. Gillies et. al. December 31, 2007. Particulate Matter Emissions for Dust from Unique Military Activities . Measurements indicated approximately 0.5 kg of PM10 during takeoff and 1 kg during landing. Measurements were conducted in dry, unpaved, desert in Arizona. The model used in testing was a UH-1H Huey, generally similar to the helicopter above. The 0.5 kg takeoff and 1 kg landing emission factor is conservatively assumed for all helicopters. The landing and takeoff surface is assumed to be watered, reducing fugitive dust emissions 55%.

PM2.5/PM10 Factor: Western Governors' Association. September 7, 2006. WRAP Fugitive Dust Handbook. The emission factor for PM2.5 for unpaved roads is 0.1 x PM10 emissions.

Greenhouse gas emission factors and global warming potentials obtained from California Climate Action Registry General Reporting Protocol, Version 3.0, May 2019.

Density of fuel from ExxonMobil Aviation World Jet Fuel Specifications, 2005 Edition.

775-840 kg/m^3 = 6.47 - 7.01 lb/gallon

Average Density = 6.74 lb/gallon

Greenhouse Gas Construction Emissions

Phase	Source	CO2e
First Year (metric tons/year)		
Timber Removal and Grubbing	Equipment	505
	Vehicles	550
Grading and Access Road Work	Equipment	2,318
	Vehicles	740
Concrete Batch Plants*	Equipment	299
	Vehicles	772
Foundations	Equipment	206
	Vehicles	15
Total (metric tons/year)		5,106
Second Year (metric tons/year)		
Turbine and Transformer Installation	Equipment	594
	Vehicles	2,609
Substation and O&M Building Installation	Equipment	172
	Vehicles	370
Underground Collector System	Equipment	328
	Vehicles	17
Overhead Collection System	Equipment	292
	Vehicles	12
	Helicopter	109
Transmission Line Connection	Equipment	70
	Vehicles	2
	Helicopter	22
Substation Aggregate and Security Fence	Equipment	2
	Vehicles	86
Total (metric tons/year)		4,687
Water Use	Const.	17
Grand Total (metric tons)		**9,809**
Amortized Total (40 years)		**245**

*Equipment emissions from the on-site concrete batch plant have been subtracted out of the total emissions for the worst-case scenario of trucking concrete to the site.

Greenhouse Gas Operation Emissions

Source	CO2e
Commuting Workers	137
Emergency Generator Testing	10
O&M Building*	17
SF6 Circuit Breakers	52
Water Use	5
Maintenance with Cranes and Mowers	96
Total (metric tons/year)	318

*O&M building would be 5,460 sf; assumes 2.5759 MT CO2e for electricity consumption for every 1,000 sf and 0.6236 MT CO2e for waste (see CalEMod Year two output).

Water-related GHG Emissions (construction based on ratio from CalEEMod operations)

Source	Mil Gal	GHG	GHG/ mil. gal.	GHG
Operations	1.825	5.3682	2.941479452	
Construction	5			15.72225

Greenhouse Gas Construction Emissions

Source	**CO2e**
Amortized Construction, Decommissioning, and Site Reclamation Emissions	490
Total Operational Emissions	318
Total (metric tons/year)	809
Amortized Loss of Carbon Sequestration over 40 Years	1,977
Displaced use of traditional energy source per year	-227,917
Total Net Emissions	-225,131

Vehicle Trip Emissions for First Year Construction (tons/year)

	tons/year				metric tons/year			
Phase	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O	CO2e
Timber Removal and Grubbing	0.15	2.09	0.06	0.04	526.05	0.01	0.08	550.23
Grading and Access Road Work	0.18	1.67	0.10	0.05	719.16	0.01	0.07	739.97
Concrete Batch Plants	0.20	2.87	0.09	0.06	737.47	0.01	0.11	771.68
Foundations	0.01	0.01	0.00	0.00	14.91	0.00	0.00	15.08

Notes: Global Warming Potential for CH4 = 25; GWP for N2O = 298.

Vehicle Trip Emissions for First Year Construction (pounds/day)

Phase	ROG	NOx	PM10	PM2.5
Timber Removal and Grubbing	3.65	52.31	0.90	0.29
Grading and Access Road Work	3.64	43.20	1.97	1.17
Concrete Batch Plants	1.53	19.42	0.58	0.38
Foundations	0.32	0.19	0.07	0.03

EMFAC2017 (v1.0.2) Emission Rates
Region Type: County
Region: SHASTA
Calendar Year: 2021
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HTSK and RUNLS, g/vehicle/day for IDLEX, RESTL and DIURN

Region	Calendar Yea	Vehicle Categ	Model Year	Speed	Fuel	Population	VMT	Trips	ROG_RUNEX	ROG_IDLEX	ROG_STREX	ROG_HOTSO	ROG_RUNLO	ROG_RESTL	ROG_DIURN	NOx_RUNEX	NOx_IDLEX	NOx_STREX	CO2_RUNEX	CO2_IDLEX	CO2_STREX	CH4_RUNEX	CH4_IDLEX	CH4_STREX	PM10_RUNEX	PM10_IDLEX	PM10_STREX	PM10_PMTW	PM10_PMBW	PM2_5_RUNE	PM2_5_IDLEX	PM2_5_STRE	PM2_5_PMTV	PM2_5_PMBV	N2O_RUNEX	N2O_IDLEX	N2O_STREX
SHASTA	2021	LDT1	Aggregated	Aggregated	GAS	10339.78041	383046.9123	47282.36511	0.026371956	0	0.417621252	0.224995441	0.791530076	0.452898801	0.679320318	0.107966722	0	0.29295258	326.132945	0	67.65712755	0.006004925	0	0.082242647	0.002164078	0	0.002690654	0.008000002	0.036750011	0.00198994	0	0.002474308	0.002000001	0.015750005	0.008297241	0	0.031242777
SHASTA	2021	T7 single cons	Aggregated	Aggregated	DSL	303.8169793	21362.3418	1373.544751	0.426036513	1.57802503	0	0	0	0	0	6.53639655	22.67282546	3.516604753	1859.782655	3917.791879	0	0.019788293	0.073295176	0	0.115258911	0.032354446	0	0.03600001	0.061740018	0.110272862	0.030954807	0	0.009000003	0.026460008	0.292331934	0.615822325	0

2021 Construction Vehicle Emissions

Running Emissions

Running Emission Factors (grams/mile)	Vehicle Type	ROG	Nox	PM10	PM10TW	PM10BW	PM10Tot	PM2.5	PM2.5TW	PM2.5BW	PM2.5Tot	CO2	CH4	N2O
worker	LDT1	0.03	0.11	0.00	0.01	0.04	0.05	0.00	0.00	0.02	0.02	326.13	0.01	0.01
Haul	T7 sc	0.43	6.54	0.12	0.04	0.06	0.21	0.11	0.01	0.03	0.15	1,859.78	0.02	0.29

				tons/year				metric tons/year		
Workers	Trips/day	Trip Length	Days	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Timber Removal and Grubbing	64	10	80	0.00	0.01	0.00	0.00	16.70	0.00	0.00
Grading and Access Road Work	130	50	160	0.03	0.12	0.05	0.02	339.18	0.01	0.01
Concrete Batch Plants	64	10	70	0.00	0.01	0.00	0.00	14.61	0.00	0.00
Foundations	64	10	70	0.00	0.01	0.00	0.00	14.61	0.00	0.00

			pounds/day			
Workers	Trips/day	Trip Length	ROG	NOx	PM10	PM2.5
Timber Removal and Grubbing	64	10	0.04	0.15	0.07	0.03
Grading and Access Road Work	130	50	0.38	1.55	0.67	0.28
Concrete Batch Plants	64	10	0.04	0.15	0.07	0.03
Foundations	64	10	0.04	0.15	0.07	0.03

			tons/year				metric tons/year		
Haul Trucks	Trips	Trip Length	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Timber Removal and Grubbing	13,000	20	0.12	1.87	0.06	0.04	483.54	0.01	0.08
Grading and Access Road Work	8,830	22	0.09	1.40	0.05	0.03	361.28	0.00	0.06
Concrete Batch Plants	7,610	50	0.18	2.74	0.09	0.06	707.65	0.01	0.11
Foundations	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

46.83342

					pounds/day			
Haul Trucks	Trips	Days	Trips/day	Trip Length	ROG	NOx	PM10	PM2.5
Timber Removal and Grubbing	13,000	80	163	20	3.05	46.83	0.83	0.26
Grading and Access Road Work	8,830	160	55	50	2.59	39.76	1.30	0.89
Concrete Batch Plants	7,610	70	109	10	1.02	15.67	0.51	0.35
Foundations	0	70	0	10	0.00	0.00	0.00	0.00

Start-Up Emission

Start-Up Emission Factors (gram/trip)	Vehicle Type	ROG ST	ROG HOT	ROG Loss	ROG Tot.	NOx	PM10	PM2.5	CO2	CH4	N2O
worker	LDT1	0.42	0.22	0.79	1.43	0.29	0.00	0.00	67.66	0.08	0.03
Haul	T7 sc	0.00	0.00	0.00	0.00	3.52	0.00	0.00	0.00	0.00	0.00

			tons/year				metric tons/year		
Workers	Trips/day	Days	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Timber Removal and Grubbing	64	80	0.01	0.00	0.00	0.00	0.35	0.00	0.00
Grading and Access Road Work	130	160	0.03	0.01	0.00	0.00	1.41	0.00	0.00
Concrete Batch Plants	64	70	0.01	0.00	0.00	0.00	0.30	0.00	0.00
Foundations	64	70	0.01	0.00	0.00	0.00	0.30	0.00	0.00

Workers	Trips/day	pounds/day			
		ROG	NOx	PM10	PM2.5
Timber Removal and Grubbing	64	0.20	0.00	0.00	0.00
Grading and Access Road Work	130	0.41	0.08	0.00	0.00
Concrete Batch Plants	64	0.20	0.04	0.00	0.00
Foundations	64	0.20	0.04	0.00	0.00

Haul Trucks	Trips/day	Days	tons/year				metric tons/year		
			ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Timber Removal and Grubbing	163	80	0.00	0.05	0.00	0.00	0.00	0.00	0.00
Grading and Access Road Work	55	160	0.00	0.03	0.00	0.00	0.00	0.00	0.00
Concrete Batch Plants	109	70	0.00	0.03	0.00	0.00	0.00	0.00	0.00
Foundations	0	70	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Haul Trucks	Trips	Days	Trips/day	pounds/day			
				ROG	NOx	PM10	PM2.5
Timber Removal and Grubbing	13,000	80	163	0.00	1.26	0.00	0.00
Grading and Access Road Work	8,830	160	55	0.00	0.43	0.00	0.00
Concrete Batch Plants	7,610	70	109	0.00	0.84	0.00	0.00
Foundations	0	70	0	0.00	0.00	0.00	0.00

Idling Emissions

Idling Emission Factors (g/vehicle/day)	Vehicle Type	ROG Idle	ROG Rest	ROG Di	ROG Tot.	Nox	PM10	PM2.5	CO2	CH4	N2O
worker	LDT1	0.00	0.45	0.68	1.13	0.00	0.00	0.00	0.00	0.00	0.00
Haul	T7 sc	1.58	0.00	0.00	1.58	22.67	0.03	0.03	3,917.79	0.07	0.62

Workers	Trips/day	Veh./day	Days	tons/year				metric tons/year		
				ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Timber Removal and Grubbing	64	32	80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading and Access Road Work	130	65	160	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Batch Plants	64	32	70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Foundations	64	32	70	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Workers	Trips/day	Veh./day	pounds/day			
			ROG	NOx	PM10	PM2.5
Timber Removal and Grubbing	64	32	0.08	0.00	0.00	0.00
Grading and Access Road Work	130	65	0.16	0.00	0.00	0.00
Concrete Batch Plants	64	32	0.08	0.00	0.00	0.00
Foundations	64	32	0.08	0.00	0.00	0.00

Haul Trucks	Trips	Vehicles	tons/year				metric tons/year		
			ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Timber Removal and Grubbing	13,000	6500	0.01	0.16	0.00	0.00	25.47	0.00	0.00
Grading and Access Road Work	8,830	4415	0.01	0.11	0.00	0.00	17.30	0.00	0.00
Concrete Batch Plants	7,610	3805	0.01	0.10	0.00	0.00	14.91	0.00	0.00
Foundations	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Haul Trucks	Trips	Vehicles	Days	Veh./day	pounds/day			
					ROG	NOx	PM10	PM2.5
Timber Removal and Grubbing	13,000	6500	80	81.25	0.28	4.06	0.01	0.01
Grading and Access Road Work	8,830	4415	160	27.59	0.10	1.38	0.00	0.00
Concrete Batch Plants	7,610	3805	70	54.36	0.19	2.72	0.00	0.00
Foundations	0	0	70	0.00	0.00	0.00	0.00	0.00

Vehicle Trip Emissions for Second Year of Construction (tons/year)

	tons/year				metric tons/year			
Phase	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O	CO2e
Turbine and Transformer Installation*	0.28	9.61	0.22	0.12	2,492.69	0.01	0.39	2609.30
Substation and O&M Building Installation	0.07	0.47	0.06	0.02	365.73	0.01	0.01	369.97
Underground Collector System	0.01	0.01	0.00	0.00	17.28	0.00	0.00	17.46
Overhead Collection System	0.01	0.01	0.00	0.00	12.34	0.00	0.00	12.47
Transmission Line Connection	0.00	0.00	0.00	0.00	2.47	0.00	0.00	2.49
Substation Aggregate and Security Fence	0.01	0.39	0.01	0.00	82.09	0.00	0.01	85.87

Notes: Global Warming Potential for CH4 = 25; GWP for N2O = 298.

***Breakdown of turbine delivery emissions by Jurisdictions along route from Port of Stockton**

			tons/year				metric tons/year					
County	miles	% trip	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O	CO2e	Air District	Nox Threshold
Shasta County	73	27%	0.08	2.60	0.06	0.03	673.95	0.00	0.11	705.48	AQMD	NA
Tehama	41	15%	0.04	1.46	0.03	0.02	378.52	0.00	0.06	396.23	TCAPCD	NA
Glenn	29	11%	0.03	1.03	0.02	0.01	267.73	0.00	0.04	280.26	GCAPCD	NA
Colusa	33	12%	0.03	1.17	0.03	0.01	304.66	0.00	0.05	318.91	CCAPCD	NA
Yolo Solano	77	29%	0.08	2.74	0.06	0.03	710.88	0.00	0.11	744.13	YSAQMD	10
Sacramento Metro	14	5%	0.01	0.50	0.01	0.01	129.25	0.00	0.02	135.30	SMAQMD	NA
San Joaquin Valley	3	1%	0.00	0.11	0.00	0.00	27.70	0.00	0.00	28.99	SJVAPCD	10
Total	270	100%	0.28	9.61	0.22	0.12	2,492.69	0.01	0.39	2,609.30		

Significance thresholds obtain from TCAPCD, 2015; YSAQMD, 2007; SMAQMD, 2015; and SJVAPCD, 2015 (See EIR Section 3.3.5, References). GCAPMD and CCAPCD have not posted adopted

Vehicle Trip Emissions for Second Year of Construction (pounds/day)

Phase	ROG	NOx	PM10	PM2.5
Turbine and Transformer Installation*	5.68	145.76	4.35	2.38
Substation and O&M Building Installation	0.90	2.68	0.71	0.30
Underground Collector System	0.17	0.10	0.04	0.02
Overhead Collection System	0.17	0.10	0.04	0.02

***Breakdown of turbine delivery emissions by Jurisdictions along route from Port of Stockton**

			pounds/day			
Air District	miles	% trip	ROG	NOx	PM10	PM2.5
Shasta County	73	27%	1.54	39.41	1.18	0.64
Tehama	41	15%	0.86	22.13	0.66	0.36
Glenn	29	11%	0.61	15.66	0.47	0.26
Colusa	33	12%	0.69	17.82	0.53	0.29
Yolo Solano	77	29%	1.62	41.57	1.24	0.68
Yolo Solano (tons/yr)			0.08	2.08	0.06	0.03
Sacramento Metro	14	5%	0.29	7.56	0.23	0.12
San Joaquin Valley	3	1%	0.06	1.62	0.05	0.03
San Joaquin Valley (tons/yr)			0.00	0.08	0.00	0.00
Total	270	100%	5.68	145.76	4.35	2.38

Significance thresholds obtain from TCAPCD, 2015; YSAQMD, 2007; SMAQMD, 2015; and SJVAPCD, 2015 (See EIR Section 3.3.5, References). GCAPMD and CCAPCD have not posted adopted

*Levels A

EMFAC2017 (v1.0.2) Emission Rates
Region Type: County
Region: SHASTA
Calendar Year: 2022
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HTSK and RUNLS, g/vehicle/day for IDLEX, RESTL and DIURN

Region	Calendar Y	Vehicle Cat	Model Yea	Speed	Fuel	Population	VMT	Trips	ROG_RUNI	ROG_IDLE	ROG_STRE	ROG_HOTS	ROG_RUNI	ROG_REST	ROG_DIUR	NOx_RUNE	NOx_IDLEX	NOx_STRE	CO2_RUNE	CO2_IDLEX	CO2_STRE	CH4_RUNE	CH4_IDLEX	CH4_STRE	PM10_RUI	PM10_IDLI	PM10_STR	PM10_PM	PM10_PMI	PM2_5_RL	PM2_5_IDI	PM2_5_ST	PM2_5_PN	PM2_5_PN	N2O_RUNI	N2O_IDLE	N2O_STRE
SHASTA	2022	LDT1	Aggregate	Aggregate	GAS	10533.89	387184.9	48221.65	0.022618	0	0.377791	0.209233	0.739262	0.422366	0.62483	0.093709	0	0.272487	318.2334	0	65.97357	0.005219	0	0.075566	0.002015	0	0.002509	0.008	0.03675	0.001853	0	0.002307	0.002	0.01575	0.007484	0	0.030088
SHASTA	2022	T7 single c	Aggregate	Aggregate	DSL	317.811	22201.17	1436.811	0.178471	1.584216	0	0	0	0	0	4.742355	21.41237	3.986891	1793.763	4085.246	0	0.00829	0.073583	0	0.044225	0.013174	0	0.036	0.06174	0.042312	0.012604	0	0.009	0.02646	0.281955	0.642144	0

2021 Construction Vehicle Emissions

Running Emissions

Running Emission Factors (grams/mile)	Vehicle Type	ROG	Nox	PM10	PM10TW	PM10BW	PM10Tot	PM2.5	PM2.5TW	PM2.5BW	PM2.5Tot	CO2	CH4	N2O
worker	LDT1	0.02	0.09	0.00	0.01	0.04	0.05	0.00	0.00	0.02	0.02	318.23	0.01	0.01
Haul	T7 sc	0.18	4.74	0.04	0.04	0.06	0.14	0.04	0.01	0.03	0.08	1,793.76	0.01	0.28

				tons/year				metric tons/year		
Workers	Trips/day	Trip Lengt	Days	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Turbine and Transformer Installation	38	10	100	0.00	0.00	0.00	0.00	12.09	0.00	0.00
Substation and O&M Building Installation	130	50	160	0.03	0.11	0.05	0.02	330.96	0.01	0.01
Underground Collector System	38	10	140	0.00	0.01	0.00	0.00	16.93	0.00	0.00
Overhead Collection System	38	10	100	0.00	0.00	0.00	0.00	12.09	0.00	0.00
Transmission Line Connection	38	10	20	0.00	0.00	0.00	0.00	2.42	0.00	0.00
Substation Aggregate and Security Fence	38	10	15	0.00	0.00	0.00	0.00	1.81	0.00	0.00

			pounds/day			
Workers	Trips/day	Trip Lengt	ROG	NOx	PM10	PM2.5
Turbine and Transformer Installation	38	10	0.02	0.08	0.04	0.02
Substation and O&M Building Installation	130	50	0.32	1.34	0.67	0.28
Underground Collector System	38	10	0.02	0.08	0.04	0.02
Overhead Collection System	38	10	0.02	0.08	0.04	0.02

			tons/year				metric tons/year		
Haul Trucks	Trips	Trip Lengt	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Turbine and Transformer Installation	5336	258	0.27	7.20	0.22	0.12	2,469.45	0.01	0.39
Substation and O&M Building Installation	364	50	0.00	0.10	0.00	0.00	32.65	0.00	0.01
Underground Collector System	0	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overhead Collection System	0	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transmission Line Connection	0	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Substation Aggregate and Security Fence	2116	20	0.01	0.22	0.01	0.00	75.91	0.00	0.01

					pounds/day			
Haul Trucks	Trips	Days	Trips/day	Trip Lengt	ROG	NOx	PM10	PM2.5
Turbine and Transformer Installation	5336	100	53	258	5.42	143.93	4.31	2.36
Substation and O&M Building Installation	364	160	2	50	0.04	1.19	0.04	0.02
Underground Collector System	0	140	0	20	0.00	0.00	0.00	0.00
Overhead Collection System	0	100	0	20	0.00	0.00	0.00	0.00

Start-Up Emission

Start-Up Emission Factors (gram/trip)	Vehicle Type	ROG ST	ROG HOT	ROG Loss	ROG Tot.	NOx	PM10	PM2.5	CO2	CH4	N2O
worker	LDT1	0.38	0.21	0.74	1.33	0.27	0.00	0.00	65.97	0.08	0.03
Haul	T7 sc	0.00	0.00	0.00	0.00	3.99	0.00	0.00	0.00	0.00	0.00

			tons/year				metric tons/year		
Workers	Trips/day	Days	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Turbine and Transformer Installation	38	100	0.01	0.00	0.00	0.00	0.25	0.00	0.00
Substation and O&M Building Installation	130	160	0.03	0.01	0.00	0.00	1.37	0.00	0.00
Underground Collector System	38	140	0.01	0.00	0.00	0.00	0.35	0.00	0.00
Overhead Collection System	38	100	0.01	0.00	0.00	0.00	0.25	0.00	0.00
Transmission Line Connection	38	20	0.00	0.00	0.00	0.00	0.05	0.00	0.00
Substation Aggregate and Security Fence	38	15	0.00	0.00	0.00	0.00	0.04	0.00	0.00

		pounds/day			
Workers	Trips/day	ROG	NOx	PM10	PM2.5
Turbine and Transformer Installation	38	0.11	0.02	0.00	0.00
Substation and O&M Building Installation	130	0.38	0.08	0.00	0.00
Underground Collector System	38	0.11	0.02	0.00	0.00
Overhead Collection System	38	0.11	0.02	0.00	0.00

Haul Trucks	Trips/day	Days	tons/year				metric tons/year		
			ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Turbine and Transformer Installation	5336	100	0.00	2.35	0.00	0.00	0.00	0.00	0.00
Substation and O&M Building Installation	364	160	0.00	0.26	0.00	0.00	0.00	0.00	0.00
Underground Collector System	0	140	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overhead Collection System	0	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transmission Line Connection	0	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Substation Aggregate and Security Fence	2116	15	0.00	0.14	0.00	0.00	0.00	0.00	0.00

Haul Trucks	Trips	Days	Trips/day	pounds/day			
				ROG	NOx	PM10	PM2.5
Turbine and Transformer Installation	5336	100	53	0.00	0.47	0.00	0.00
Substation and O&M Building Installation	364	160	2	0.00	0.02	0.00	0.00
Underground Collector System	0	140	0	0.00	0.00	0.00	0.00
Overhead Collection System	0	100	0	0.00	0.00	0.00	0.00

Idling Emissions

Idling Emission Factors (g/vehicle/day)	Vehicle Type	ROG Idle	ROG Rest	ROG Di	ROG Tot.	Nox	PM10	PM2.5	CO2	CH4	N2O
worker	LDT1	0.00	0.42	0.62	1.05	0.00	0.00	0.00	0.00	0.00	0.00
Haul	T7 sc	1.58	0.00	0.00	1.58	21.41	0.01	0.01	4,085.25	0.07	0.64

Workers	Trips/day	Veh./day	Days	tons/year				metric tons/year		
				ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Turbine and Transformer Installation	38	19	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Substation and O&M Building Installation	130	65	160	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Underground Collector System	38	19	140	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overhead Collection System	38	19	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transmission Line Connection	38	19	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Substation Aggregate and Security Fence	38	19	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Workers	Trips/day	Veh./day	pounds/day			
			ROG	NOx	PM10	PM2.5
Turbine and Transformer Installation	38	19	0.04	0.00	0.00	0.00
Substation and O&M Building Installation	130	65	0.15	0.00	0.00	0.00
Underground Collector System	38	19	0.04	0.00	0.00	0.00
Overhead Collection System	38	19	0.04	0.00	0.00	0.00

Haul Trucks	Trips	Vehicles	tons/year				metric tons/year		
			ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Turbine and Transformer Installation	5336	2668	0.00	0.06	0.00	0.00	10.90	0.00	0.00
Substation and O&M Building Installation	364	182	0.00	0.00	0.00	0.00	0.74	0.00	0.00
Underground Collector System	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overhead Collection System	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transmission Line Connection	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Substation Aggregate and Security Fence	2116	1058	0.00	0.02	0.00	0.00	4.32	0.00	0.00

Haul Trucks	Trips	Vehicles	Days	Veh./day	pounds/day			
					ROG	NOx	PM10	PM2.5
Turbine and Transformer Installation	5336	2668	100	26.68	0.09	1.26	0.00	0.00
Substation and O&M Building Installation	364	182	160	1.14	0.00	0.05	0.00	0.00
Underground Collector System	0	0	140	0.00	0.00	0.00	0.00	0.00
Overhead Collection System	0	0	100	0.00	0.00	0.00	0.00	0.00

Vehicle Trip Emissions for Operations (tons/year)

	tons/year				metric tons/year			
Phase	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O	CO2e
Worker Trips	0.03	0.04	0.02	0.01	136.46	0.00	0.00	137.48

Notes: Global Warming Potential for CH4 = 25; GWP for N2O = 298.

Vehicle Trip Emissions for Operations (pounds/day)

Phase	ROG	NOx	PM10	PM2.5
Worker Trips	0.14	0.23	0.12	0.05

EMFAC2017 (v1.0.2) Emission Rates
Region Type: County
Region: SHASTA
Calendar Year: 2023
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HTSK and RUNLS, g/vehicle/day for IDLEX, RESTL and DIURN

Region	Calendar Y	Vehicle Ca	Model Yea	Speed	Fuel	Population	VMT	Trips	ROG_RUN	ROG_IDLE	ROG_STRE	ROG_HOT	ROG_RUN	ROG_REST	ROG_DIUF	NOx_RUN	NOx_IDLE	NOx_STRE	CO2_RUN	CO2_IDLE	CO2_STRE	CH4_RUN	CH4_IDLE	CH4_STRE	PM10_RUI	PM10_IDL	PM10_STF	PM10_PM	PM10_PM	PM2_5_RU	PM2_5_ID	PM2_5_ST	PM2_5_PI	PM2_5_PI	N2O_RUN	N2O_IDLE	N2O_STREX
SHASTA	2023	LDT1	Aggregate	Aggregate	GAS	10732.28	391228.5	49162.33	0.019463	0	0.342403	0.194831	0.693175	0.395406	0.577125	0.081691	0	0.253867	310.2552	0	64.32045	0.004552	0	0.069523	0.001887	0	0.002356	0.008	0.03675	0.001735	0	0.002166	0.002	0.01575	0.006788	0	0.028961

2023 Vehicle Emissions

Running Emissions

Running Emission Factors (grams/mile)	Vehicle Type	ROG	Nox	PM10	PM10TW	PM10BW	PM10Tot	PM2.5	PM2.5TW	PM2.5BW	PM2.5Tot	CO2	CH4	N2O
worker	LDT1	0.02	0.08	0.00	0.01	0.04	0.05	0.00	0.00	0.02	0.02	310.26	0.00	0.01

				tons/year				metric tons/year		
Soure	Trips/day	Trip Length	Days	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
Worker Trips	24	50	365	0.01	0.04	0.02	0.01	135.89	0.00	0.00

			pounds/day			
Source	Trips/day	Trip Length	ROG	NOx	PM10	PM2.5
Workers	24	50	0.05	0.22	0.12	0.05

Start-Up Emission

Start-Up Emission Factors (gram/trip)	Vehicle Type	ROG ST	ROG HOT	ROG Loss	ROG Tot.	NOx	PM10	PM2.5	CO2	CH4	N2O
worker	LDT1	0.34	0.19	0.69	1.23	0.25	0.00	0.00	64.32	0.07	0.03

			tons/year				metric tons/year		
Source	Trips/day	Days	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
workers	24	365	0.01	0.00	0.00	0.00	0.56	0.00	0.00

		pounds/day			
Source	Trips/day	ROG	NOx	PM10	PM2.5
workers	24	0.07	0.01	0.00	0.00

Idling Emissions

Idling Emission Factors (g/vehicle/day)	Vehicle Type	ROG Idle	ROG Rest	ROG Di	ROG Tot.	Nox	PM10	PM2.5	CO2	CH4	N2O
worker	LDT1	0.00	0.40	0.58	0.97	0.00	0.00	0.00	0.00	0.00	0.00

				tons/year				metric tons/year		
Source	Trips/day	Veh./day	Days	ROG	NOx	PM10	PM2.5	CO2	CH4	N2O
workers	24	12	365	0.00	0.00	0.00	0.00	0.00	0.00	0.00

			pounds/day			
Source	Trips/day	Veh./day	ROG	NOx	PM10	PM2.5
workers	24	12	0.03	0.00	0.00	0.00

Fountain Wind Project Construction Assumptions

Phase	workdays/ week	Total number of Work Days	Year of activity	Equipment	Units	Hour/day
Timber Removal and Grubbing	6	80	Year 1	Feller Buncher (logging)	2	8
				Logging Trucks	8	8
				Skidder	2	8
				Pickups	8	8
				Hydro Axe	2	8
Grading and Access Road Work	6	160	Year 1	Road Grader	3	8
				Scraper	4	8
				Bulldozer (medium)	6	8
				Drum Compactor	4	8
				Rock Trucks	8	8
				Pickups	16	8
				Water Truck	6	8
Concrete Batch Plants	6	70	Year 1	Concrete Pump Truck	2	8
				Mixer	10	8
				Generator	3	8
				Skid Steer Loader	3	8
				Pickups	6	8
				Water Truck	3	8
Turbine, Transformer, Substation, and O&M Foundations	6	70	Year 1	Excavator	3	8
				Bulldozer (medium)	3	8
				Drum Compactor	4	8
				Skid Steer Loader	3	8
				Pickups	10	8
				Mobile Hydraulic Crane	3	4
Turbine and Transformer Installation	6	100	Year 2	Mobile Hydraulic Crane	6	4
				Bulldozer (medium)	2	8
				Rubber Tired Forklifts	10	8
				Large Crawler Crane	4	8
				Pickups	20	8
				Turbine Delivery Vehicles	8	8
				Generator	4	8
Substation and O&M Building Installation	6	160	Year 2	Mobile Hydraulic Crane	2	4
				Skid Steer Loader	2	8
				Pickups	8	8
				Rubber Tired Forklift	3	8
Underground Collector System	6	140	Year 2	Trenching Equipment	4	8
				Rubber Tired Forklift	4	8
				Pickups	12	8
				Bulldozer (medium)	1	8
				Skid Steer Loader	4	8
Overhead Collection System	6	100	Year 2	Backhoe Loader (includes	4	8
				Cable Reel Truck (include	3	8
				Mobile Hydraulic Crane	2	4
				Pickups	10	8
				Bulldozer (medium)	1	8
				Boom Lift	6	4
Substation Aggregate and Security Fence	6	15	Year 2	Skid Steer Loader	1	8

Fountain Wind Project Construction Assumptions

Phase	workdays/ week	Total number of Work Days	Year of activity	Equipment	Units	Hour/day
Transmission Line Connection	6	20	Year 2	Mobile Hydraulic Crane	6	4
				Cable Reel Truck (include	4	8
				Boom Lift	6	4
				Pickups	8	8
				Bulldozer (medium)	1	8
				Excavator	2	8

*It is assumed construction would occur over a period of two years, but no work would occur during the winter months (i.e., January 1st through March 31st).

Volume for material handling estimates for turbine and transformer Foundations

feet	feet	feet	cf	cy	foundations
80	80	15	96000	3,556	72

Water use for operations

gallons/day	days	gallons/year
5000	365	1,825,000

Worker Trips

	Workers	Trucks	Trips	miles/trip	VMT
From Traffic Report	Total Pickup Trucks	20,650	41,300	50	**2,065,000**
	Total Pickup Trucks	13,767	27,534	10	**275,340**

Workers	Trips	miles/trip	miles/trip	VMT	Days/phase	% days	Trips per day*	VMT Proof	Notes
Total 2021	20,650	50	50	1,032,500	160	100%	129.1	1,032,500	Phase 2
	13,767	10	10	137,670	80	36%	62.6	50,062	Phase 1
					70	32%	62.6	43,804	Phase 3
					70	32%	62.6	43,804	Phase 4
Total					220				
Total 2022	20,650	50	50	1,032,500	160	100%	129.1	1,032,500	Phase 2
	13,767	10	10	137,670	100	27%	36.7	36,712	Phase 1
					140	37%	36.7	51,397	Phase 3
					100	27%	36.7	36,712	Phase 4
					20	5%	36.7	7,342	Phase 5
					15	4%	36.7	5,507	Phase 6
Total					375	1		**2,340,340**	

Truck Trips

	Source	Trucks	Trips	miles/trip	traffic report VMT	Revised VMT	Days/phase	Trips per day*	miles/trip	VMT Proof	
Requested information	Logging	6,500	13,000	20		260,000	80	163	20	260,000	Phase 1 - Year 1
From Traffic Report	Construction Equipme	58	116		2,740	5,480	160	1	47	5,480	Phase 2 - Year 1
	Aggregate	3,019	6,038		60,370	120,740	160	38	20	120,740	Phase 2 - Year 1
	Aggregate rocks and co	1,058	2,116		21,165	42,330	15	141	20	42,330	Phase 6 - Year 2
	Turbine Deliveries	2,668	5,336		687,947	1,375,894	100	53	258	1,375,894	Phase 1 - Year 2
	Concrete Deliveries	3,805	7,610		190,250	380,500	70	109	50	380,500	Phase 3 - Year 1
	Miscellaneous	182	364		9,093	18,186	160	2	50	18,186	Phase 2 - Year 2
	Water	1,338	2,676		26,760	53,520	160	17	20	53,520	Phase 2 - Year 1
											2,256,650

	WMT	Trips	miles/trip
Phase 2 - year 1 combined	179,740	8830	20.35560589

Total VMT 4,596,990

Worker Trucks Dirt Road Travel

	miles/trip	Dirt road travel	% dirt road	% paved road
Year 1				
Phase 1	10	3.25	33%	68%
Phase 2	50	3.25	7%	94%
Phase 3	10	3.25	33%	68%
Phase 4	10	3.25	33%	68%
Year 2				
Phase 1	10	3.25	33%	68%
Phase 2	50	3.25	7%	94%
Phase 3	10	3.25	33%	68%
Phase 4	10	3.25	33%	68%
Phase 5	10	3.25	33%	68%
Phase 6	10	3.25	33%	68%

Workers would park at the O&M site or at one of the laydown/staging areas. The O&M site is approximately 0.5 mile from the highway and the various staging areas are estimated to average 6 miles from the highway. (6 miles + .5 mile)/2

Haul Trucks Dirt Road Travel

	miles/trip	Dirt road travel	% dirt road	% paved road
Year 1				
Phase 1	20	6	30%	70%
Phase 2	22	6	27%	73%
Phase 3	50	6	12%	88%
Phase 4	0	0	0%	100%
Year 2				
Phase 1	258	6	2%	98%
Phase 2	50	6	12%	88%
Phase 3	0	0	0%	100%
Phase 4	0	0	0%	100%
Phase 5	0	0	0%	100%
Phase 6	20	6	30%	70%

Average dirt road travel for haul trucks is based on the distance from Highway 299 to the Substation, which is approximately at the center of the site.

Jurisdictions along route from Port of Stockton

County	miles	% trip
Shasta County	65	25%
Tehama	41	16%
Glenn	29	11%
Colusa	33	13%
Yolo Solano	91	35%
Total	259	100%

Fountain Wind Project - First Year of Construction

Shasta County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	1.00	1000sqft	0.02	1,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.7	**Precipitation Freq (Days)**	82
Climate Zone	3			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Fountain Wind Project - First Year of Construction - Shasta County, Summer

Project Characteristics -

Land Use - Land Use data entered for purposes for setting up the model; the assumptions were not used for default construction or operational values.

Construction Phase - Construction equipment assumptions obtained from the applicant.

Off-road Equipment - Equipment assumptions are based on Applicant provided information.

Off-road Equipment - Construction equipment and unit amounts provided by the applicant.

Off-road Equipment - Equipment assumptions obtained from applicant.

Off-road Equipment - 0

Off-road Equipment - Other Material Handling Equipment with 270 hps represent Feller Buncher and Hydro-ax. hp based on John Deere website.

Trips and VMT - Based on "Westwood 2020_0203_Fountain Wind Spreadsheet_Revised by ESA" and requested information, adjusted for construction equipment phases.

On-road Fugitive Dust - See Air Quality Emission Estimate Assumptions.

Grading - Total area contruction disturbance area obtained from Project Description Table 2-1. Material exported represents volume for 72 turbine foundations.

Construction Off-road Equipment Mitigation - Percent reduction for soil stabilizer for unpaved roads obtained from South Coast AQMD Table XI-D

Table Name	Column Name	Default Value	New Value
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	10.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	27.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	9.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

Fountain Wind Project - First Year of Construction - Shasta County, Summer

tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	100.00	70.00
tblConstructionPhase	NumDays	2.00	160.00
tblConstructionPhase	NumDays	1.00	80.00
tblConstructionPhase	NumDays	1.00	70.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	AcresOfGrading	880.00	1,384.00
tblGrading	MaterialExported	0.00	256,000.00
tblOffRoadEquipment	HorsePower	168.00	270.00
tblOffRoadEquipment	HorsePower	168.00	270.00
tblOffRoadEquipment	HorsePower	65.00	280.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	6.00
tblOffRoadEquipment	UsageHours	1.00	8.00
tblOnRoadDust	HaulingPercentPave	100.00	70.00
tblOnRoadDust	HaulingPercentPave	100.00	73.00
tblOnRoadDust	HaulingPercentPave	100.00	88.00

tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	94.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripLength	20.00	22.00
tblTripsAndVMT	HaulingTripLength	20.00	50.00
tblTripsAndVMT	HaulingTripNumber	0.00	13,000.00
tblTripsAndVMT	HaulingTripNumber	0.00	8,830.00
tblTripsAndVMT	HaulingTripNumber	32,000.00	0.00
tblTripsAndVMT	HaulingTripNumber	0.00	7,610.00
tblTripsAndVMT	WorkerTripLength	16.80	10.00
tblTripsAndVMT	WorkerTripLength	16.80	50.00
tblTripsAndVMT	WorkerTripLength	16.80	10.00
tblTripsAndVMT	WorkerTripLength	16.80	10.00
tblTripsAndVMT	WorkerTripNumber	35.00	64.00
tblTripsAndVMT	WorkerTripNumber	78.00	130.00
tblTripsAndVMT	WorkerTripNumber	40.00	64.00
tblTripsAndVMT	WorkerTripNumber	0.00	64.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	35.5264	375.3776	221.4489	0.7969	2,846.0643	13.4642	2,857.2176	301.7285	12.4497	311.9972	0.0000	79,053.4157	79,053.4157	15.8278	0.0000	79,445.3882
Maximum	**35.5264**	**375.3776**	**221.4489**	**0.7969**	**2,846.0643**	**13.4642**	**2,857.2176**	**301.7285**	**12.4497**	**311.9972**	**0.0000**	**79,053.4157**	**79,053.4157**	**15.8278**	**0.0000**	**79,445.3882**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	10.6431	99.6209	269.4909	0.7969	475.2972	1.1218	476.3068	58.5809	1.1060	59.6870	0.0000	79,053.4157	79,053.4157	15.8278	0.0000	79,445.3882
Maximum	**10.6431**	**99.6209**	**269.4909**	**0.7969**	**475.2972**	**1.1218**	**476.3068**	**58.5809**	**1.1060**	**59.6870**	**0.0000**	**79,053.4157**	**79,053.4157**	**15.8278**	**0.0000**	**79,445.3882**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**70.04**	**73.46**	**-21.69**	**0.00**	**83.30**	**91.67**	**83.33**	**80.58**	**91.12**	**80.87**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0278	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668
Mobile	4.2400e-003	0.0279	0.0452	1.9000e-004	0.0124	1.4000e-004	0.0126	3.3300e-003	1.4000e-004	3.4700e-003		19.0991	19.0991	8.1000e-004		19.1194
Total	**0.0326**	**0.0335**	**0.0500**	**2.2000e-004**	**0.0124**	**5.7000e-004**	**0.0130**	**3.3300e-003**	**5.7000e-004**	**3.9000e-003**		**25.8262**	**25.8262**	**9.4000e-004**	**1.2000e-004**	**25.8864**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0278	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668
Mobile	4.2400e-003	0.0279	0.0452	1.9000e-004	0.0124	1.4000e-004	0.0126	3.3300e-003	1.4000e-004	3.4700e-003		19.0991	19.0991	8.1000e-004		19.1194
Total	**0.0326**	**0.0335**	**0.0500**	**2.2000e-004**	**0.0124**	**5.7000e-004**	**0.0130**	**3.3300e-003**	**5.7000e-004**	**3.9000e-003**		**25.8262**	**25.8262**	**9.4000e-004**	**1.2000e-004**	**25.8864**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Timber Removal and Grubbing	Site Preparation	4/1/2021	7/2/2021	6	80	
2	Grading and Access Road Work	Grading	5/17/2021	11/18/2021	6	160	
3	Foundations	Site Preparation	8/2/2021	10/21/2021	6	70	Turbine, Transformer, Substation, and O&M Foundations
4	Concrete Batch Plants	Building Construction	8/2/2021	10/21/2021	6	70	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Fountain Wind Project - First Year of Construction - Shasta County, Summer

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Timber Removal and Grubbing	Off-Highway Trucks	8	8.00	402	0.38
Timber Removal and Grubbing	Other Material Handling Equipment	2	8.00	270	0.40
Timber Removal and Grubbing	Other Material Handling Equipment	2	8.00	270	0.40
Timber Removal and Grubbing	Skid Steer Loaders	2	8.00	280	0.37
Grading and Access Road Work	Graders	3	8.00	187	0.41
Grading and Access Road Work	Off-Highway Trucks	8	8.00	402	0.38
Grading and Access Road Work	Off-Highway Trucks	6	8.00	402	0.38
Grading and Access Road Work	Rollers	4	8.00	80	0.38
Grading and Access Road Work	Rubber Tired Dozers	6	8.00	247	0.40
Grading and Access Road Work	Scrapers	4	8.00	367	0.48
Foundations	Cranes	3	4.00	231	0.29
Foundations	Excavators	3	8.00	158	0.38
Foundations	Rollers	4	8.00	80	0.38
Foundations	Rubber Tired Dozers	3	8.00	247	0.40
Foundations	Skid Steer Loaders	3	8.00	65	0.37
Concrete Batch Plants	Cement and Mortar Mixers	10	8.00	9	0.56
Concrete Batch Plants	Generator Sets	3	8.00	84	0.74
Concrete Batch Plants	Off-Highway Trucks	2	8.00	402	0.38
Concrete Batch Plants	Off-Highway Trucks	3	8.00	402	0.38
Concrete Batch Plants	Skid Steer Loaders	3	8.00	65	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Timber Removal and Grubbing	14	64.00	0.00	13,000.00	10.00	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Grading and Access Road Work	31	130.00	0.00	8,830.00	50.00	6.60	22.00	LD_Mix	HDT_Mix	HHDT
Foundations	16	64.00	0.00	0.00	10.00	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Concrete Batch Plants	21	64.00	0.00	7,610.00	10.00	6.60	50.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Timber Removal and Grubbing - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	6.7833	61.9294	39.8208	0.1427		2.3149	2.3149		2.1297	2.1297		13,811.4613	13,811.4613	4.4669		13,923.1339
Total	**6.7833**	**61.9294**	**39.8208**	**0.1427**	**0.0000**	**2.3149**	**2.3149**	**0.0000**	**2.1297**	**2.1297**		**13,811.4613**	**13,811.4613**	**4.4669**		**13,923.1339**

3.2 Timber Removal and Grubbing - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.1933	40.8514	5.8186	0.1310	1,437.0882	0.1513	1,437.2395	143.8058	0.1447	143.9505		13,722.5246	13,722.5246	0.7038		13,740.1183
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2832	0.1653	2.0547	5.1300e-003	301.7512	3.3900e-003	301.7546	30.1718	3.1200e-003	30.1749		510.3984	510.3984	0.0166		510.8137
Total	**1.4765**	**41.0167**	**7.8732**	**0.1361**	**1,738.8394**	**0.1547**	**1,738.9940**	**173.9776**	**0.1478**	**174.1254**		**14,232.9230**	**14,232.9230**	**0.7204**		**14,250.9320**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	1.7504	7.5850	64.1806	0.1427		0.2334	0.2334		0.2334	0.2334	0.0000	13,811.4613	13,811.4613	4.4669		13,923.1339
Total	**1.7504**	**7.5850**	**64.1806**	**0.1427**	**0.0000**	**0.2334**	**0.2334**	**0.0000**	**0.2334**	**0.2334**	**0.0000**	**13,811.4613**	**13,811.4613**	**4.4669**		**13,923.1339**

3.2 Timber Removal and Grubbing - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.1933	40.8514	5.8186	0.1310	231.7836	0.1513	231.9348	23.5317	0.1447	23.6764		13,722.5246	13,722.5246	0.7038		13,740.1183
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2832	0.1653	2.0547	5.1300e-003	48.5754	3.3900e-003	48.5788	4.9081	3.1200e-003	4.9112		510.3984	510.3984	0.0166		510.8137
Total	**1.4765**	**41.0167**	**7.8732**	**0.1361**	**280.3590**	**0.1547**	**280.5136**	**28.4397**	**0.1478**	**28.5876**		**14,232.9230**	**14,232.9230**	**0.7204**		**14,250.9320**

3.3 Grading and Access Road Work - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					45.3058	0.0000	45.3058	20.8519	0.0000	20.8519			0.0000			0.0000
Off-Road	20.5955	207.7967	115.5296	0.3271		8.5967	8.5967		7.9090	7.9090		31,676.4891	31,676.4891	10.2448		31,932.6095
Total	**20.5955**	**207.7967**	**115.5296**	**0.3271**	**45.3058**	**8.5967**	**53.9025**	**20.8519**	**7.9090**	**28.7608**		**31,676.4891**	**31,676.4891**	**10.2448**		**31,932.6095**

3.3 Grading and Access Road Work - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.4346	14.6828	2.1303	0.0481	483.2829	0.0561	483.3390	48.3794	0.0537	48.4331		5,041.6184	5,041.6184	0.2405		5,047.6296
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	1.9179	1.4681	18.3064	0.0508	578.6362	0.0310	578.6672	58.5197	0.0286	58.5482		5,063.7705	5,063.7705	0.1553		5,067.6518
Total	**2.3525**	**16.1509**	**20.4367**	**0.0990**	**1,061.9191**	**0.0871**	**1,062.0062**	**106.8991**	**0.0822**	**106.9813**		**10,105.3889**	**10,105.3889**	**0.3957**		**10,115.2814**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					20.3876	0.0000	20.3876	9.3833	0.0000	9.3833			0.0000			0.0000
Off-Road	4.0082	17.3689	150.1845	0.3271		0.5344	0.5344		0.5344	0.5344	0.0000	31,676.4890	31,676.4890	10.2448		31,932.6095
Total	**4.0082**	**17.3689**	**150.1845**	**0.3271**	**20.3876**	**0.5344**	**20.9221**	**9.3833**	**0.5344**	**9.9178**	**0.0000**	**31,676.4890**	**31,676.4890**	**10.2448**		**31,932.6095**

3.3 Grading and Access Road Work - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.4346	14.6828	2.1303	0.0481	78.0363	0.0561	78.0924	7.9409	0.0537	7.9946		5,041.6184	5,041.6184	0.2405		5,047.6296
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	1.9179	1.4681	18.3064	0.0508	96.5143	0.0310	96.5453	10.4100	0.0286	10.4386		5,063.7705	5,063.7705	0.1553		5,067.6518
Total	**2.3525**	**16.1509**	**20.4367**	**0.0990**	**174.5506**	**0.0871**	**174.6377**	**18.3509**	**0.0822**	**18.4332**		**10,105.3889**	**10,105.3889**	**0.3957**		**10,115.2814**

3.4 Foundations - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					18.6060	0.0000	18.6060	10.0124	0.0000	10.0124			0.0000			0.0000
Off-Road	5.4305	57.3556	36.5946	0.0664		2.7990	2.7990		2.5751	2.5751		6,437.6913	6,437.6913	2.0821		6,489.7433
Total	**5.4305**	**57.3556**	**36.5946**	**0.0664**	**18.6060**	**2.7990**	**21.4050**	**10.0124**	**2.5751**	**12.5875**		**6,437.6913**	**6,437.6913**	**2.0821**		**6,489.7433**

3.4 Foundations - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2832	0.1653	2.0547	5.1300e-003	301.7512	3.3900e-003	301.7546	30.1718	3.1200e-003	30.1749		510.3984	510.3984	0.0166		510.8137
Total	**0.2832**	**0.1653**	**2.0547**	**5.1300e-003**	**301.7512**	**3.3900e-003**	**301.7546**	**30.1718**	**3.1200e-003**	**30.1749**		**510.3984**	**510.3984**	**0.0166**		**510.8137**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					8.3727	0.0000	8.3727	4.5056	0.0000	4.5056			0.0000			0.0000
Off-Road	0.8920	6.6902	39.7973	0.0664		0.1088	0.1088		0.1088	0.1088	0.0000	6,437.6913	6,437.6913	2.0821		6,489.7433
Total	**0.8920**	**6.6902**	**39.7973**	**0.0664**	**8.3727**	**0.1088**	**8.4815**	**4.5056**	**0.1088**	**4.6143**	**0.0000**	**6,437.6913**	**6,437.6913**	**2.0821**		**6,489.7433**

3.4 Foundations - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2832	0.1653	2.0547	5.1300e-003	48.5754	3.3900e-003	48.5788	4.9081	3.1200e-003	4.9112		510.3984	510.3984	0.0166		510.8137
Total	**0.2832**	**0.1653**	**2.0547**	**5.1300e-003**	**48.5754**	**3.3900e-003**	**48.5788**	**4.9081**	**3.1200e-003**	**4.9112**		**510.3984**	**510.3984**	**0.0166**		**510.8137**

3.5 Concrete Batch Plants - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	4.9158	42.5077	36.3294	0.0991		1.7341	1.7341		1.6471	1.6471		9,367.4770	9,367.4770	2.4096		9,427.7162
Total	**4.9158**	**42.5077**	**36.3294**	**0.0991**		**1.7341**	**1.7341**		**1.6471**	**1.6471**		**9,367.4770**	**9,367.4770**	**2.4096**		**9,427.7162**

3.5 Concrete Batch Plants - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.6657	51.2360	8.4493	0.1951	964.2806	0.2405	964.5211	96.9897	0.2301	97.2198		20,445.5727	20,445.5727	0.5135		20,458.4103
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2832	0.1653	2.0547	5.1300e-003	301.7512	3.3900e-003	301.7546	30.1718	3.1200e-003	30.1749		510.3984	510.3984	0.0166		510.8137
Total	**1.9489**	**51.4013**	**10.5040**	**0.2002**	**1,266.0318**	**0.2439**	**1,266.2757**	**127.1615**	**0.2332**	**127.3947**		**20,955.9711**	**20,955.9711**	**0.5301**		**20,969.2240**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.1583	7.8443	46.5139	0.0991		0.1443	0.1443		0.1443	0.1443	0.0000	9,367.4770	9,367.4770	2.4096		9,427.7162
Total	**1.1583**	**7.8443**	**46.5139**	**0.0991**		**0.1443**	**0.1443**		**0.1443**	**0.1443**	**0.0000**	**9,367.4770**	**9,367.4770**	**2.4096**		**9,427.7162**

3.5 Concrete Batch Plants - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.6657	51.2360	8.4493	0.1951	157.9185	0.2405	158.1590	16.5250	0.2301	16.7551		20,445.5727	20,445.5727	0.5135		20,458.4103
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2832	0.1653	2.0547	5.1300e-003	48.5754	3.3900e-003	48.5788	4.9081	3.1200e-003	4.9112		510.3984	510.3984	0.0166		510.8137
Total	**1.9489**	**51.4013**	**10.5040**	**0.2002**	**206.4939**	**0.2439**	**206.7378**	**21.4330**	**0.2332**	**21.6663**		**20,955.9711**	**20,955.9711**	**0.5301**		**20,969.2240**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	4.2400e-003	0.0279	0.0452	1.9000e-004	0.0124	1.4000e-004	0.0126	3.3300e-003	1.4000e-004	3.4700e-003		19.0991	19.0991	8.1000e-004		19.1194
Unmitigated	4.2400e-003	0.0279	0.0452	1.9000e-004	0.0124	1.4000e-004	0.0126	3.3300e-003	1.4000e-004	3.4700e-003		19.0991	19.0991	8.1000e-004		19.1194

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	1.50	1.50	1.50	5,795	5,795
Total	1.50	1.50	1.50	5,795	5,795

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	14.70	6.60	6.60	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Heavy Industry	0.531326	0.031853	0.180854	0.102256	0.028681	0.006074	0.012848	0.095604	0.001329	0.001212	0.005444	0.001276	0.001244

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668
NaturalGas Unmitigated	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Heavy Industry	57.1781	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668
Total		**6.2000e-004**	**5.6100e-003**	**4.7100e-003**	**3.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**		**6.7268**	**6.7268**	**1.3000e-004**	**1.2000e-004**	**6.7668**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Heavy Industry	0.0571781	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668
Total		**6.2000e-004**	**5.6100e-003**	**4.7100e-003**	**3.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**		**6.7268**	**6.7268**	**1.3000e-004**	**1.2000e-004**	**6.7668**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0278	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	0.0278	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	6.3500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0214					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**0.0278**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	6.3500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0214					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**0.0278**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Fountain Wind Project - First Year of Construction

Shasta County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	1.00	1000sqft	0.02	1,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.7	**Precipitation Freq (Days)**	82
Climate Zone	3			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Fountain Wind Project - First Year of Construction - Shasta County, Annual

Project Characteristics -

Land Use - Land Use data entered for purposes for setting up the model; the assumptions were not used for default construction or operational values.

Construction Phase - Construction equipment assumptions obtained from the applicant.

Off-road Equipment - Equipment assumptions are based on Applicant provided information.

Off-road Equipment - Construction equipment and unit amounts provided by the applicant.

Off-road Equipment - Equipment assumptions obtained from applicant.

Off-road Equipment - 0

Off-road Equipment - Other Material Handling Equipment with 270 hps represent Feller Buncher and Hydro-ax. hp based on John Deere website.

Trips and VMT - Based on "Westwood 2020_0203_Fountain Wind Spreadsheet_Revised by ESA" and requested information, adjusted for construction equipment phases.

On-road Fugitive Dust - See Air Quality Emission Estimate Assumptions.

Grading - Total area contruction disturbance area obtained from Project Description Table 2-1. Material exported represents volume for 72 turbine foundations.

Construction Off-road Equipment Mitigation - Percent reduction for soil stabilizer for unpaved roads obtained from South Coast AQMD Table XI-D

Table Name	Column Name	Default Value	New Value
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	10.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	27.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	9.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final

tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	100.00	70.00
tblConstructionPhase	NumDays	2.00	160.00
tblConstructionPhase	NumDays	1.00	80.00
tblConstructionPhase	NumDays	1.00	70.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	AcresOfGrading	880.00	1,384.00
tblGrading	MaterialExported	0.00	256,000.00
tblOffRoadEquipment	HorsePower	168.00	270.00
tblOffRoadEquipment	HorsePower	168.00	270.00
tblOffRoadEquipment	HorsePower	65.00	280.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	6.00
tblOffRoadEquipment	UsageHours	1.00	8.00
tblOnRoadDust	HaulingPercentPave	100.00	70.00
tblOnRoadDust	HaulingPercentPave	100.00	73.00
tblOnRoadDust	HaulingPercentPave	100.00	88.00

tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	94.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripLength	20.00	22.00
tblTripsAndVMT	HaulingTripLength	20.00	50.00
tblTripsAndVMT	HaulingTripNumber	0.00	13,000.00
tblTripsAndVMT	HaulingTripNumber	0.00	8,830.00
tblTripsAndVMT	HaulingTripNumber	32,000.00	0.00
tblTripsAndVMT	HaulingTripNumber	0.00	7,610.00
tblTripsAndVMT	WorkerTripLength	16.80	10.00
tblTripsAndVMT	WorkerTripLength	16.80	50.00
tblTripsAndVMT	WorkerTripLength	16.80	10.00
tblTripsAndVMT	WorkerTripLength	16.80	10.00
tblTripsAndVMT	WorkerTripNumber	35.00	64.00
tblTripsAndVMT	WorkerTripNumber	78.00	130.00
tblTripsAndVMT	WorkerTripNumber	40.00	64.00
tblTripsAndVMT	WorkerTripNumber	0.00	64.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	2.5906	27.4867	15.4605	0.0576	166.7462	0.9610	167.7071	18.3507	0.8866	19.2373	0.0000	5,178.2488	5,178.2488	1.1218	0.0000	5,206.2927
Maximum	**2.5906**	**27.4867**	**15.4605**	**0.0576**	**166.7462**	**0.9610**	**167.7071**	**18.3507**	**0.8866**	**19.2373**	**0.0000**	**5,178.2488**	**5,178.2488**	**1.1218**	**0.0000**	**5,206.2927**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.7719	7.0922	19.6758	0.0576	28.4974	0.0829	28.5804	3.6796	0.0819	3.7615	0.0000	5,178.2449	5,178.2449	1.1218	0.0000	5,206.2888
Maximum	**0.7719**	**7.0922**	**19.6758**	**0.0576**	**28.4974**	**0.0829**	**28.5804**	**3.6796**	**0.0819**	**3.7615**	**0.0000**	**5,178.2449**	**5,178.2449**	**1.1218**	**0.0000**	**5,206.2888**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**70.20**	**74.20**	**-27.26**	**0.00**	**82.91**	**91.37**	**82.96**	**79.95**	**90.77**	**80.45**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	4-1-2021	6-30-2021	9.0986	2.7904
2	7-1-2021	9-30-2021	14.0474	3.4267
		Highest	14.0474	3.4267

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	3.6795	3.6795	1.4000e-004	4.0000e-005	3.6962
Mobile	6.2000e-004	5.1900e-003	7.1700e-003	3.0000e-005	2.1500e-003	3.0000e-005	2.1800e-003	5.8000e-004	2.0000e-005	6.0000e-004	0.0000	2.9546	2.9546	1.3000e-004	0.0000	2.9579
Waste						0.0000	0.0000		0.0000	0.0000	0.2517	0.0000	0.2517	0.0149	0.0000	0.6236
Water						0.0000	0.0000		0.0000	0.0000	0.0734	0.3640	0.4374	7.5500e-003	1.8000e-004	0.6802
Total	**5.8000e-003**	**6.2100e-003**	**8.0400e-003**	**4.0000e-005**	**2.1500e-003**	**1.1000e-004**	**2.2600e-003**	**5.8000e-004**	**1.0000e-004**	**6.8000e-004**	**0.3251**	**6.9982**	**7.3232**	**0.0227**	**2.2000e-004**	**7.9579**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	3.6795	3.6795	1.4000e-004	4.0000e-005	3.6962
Mobile	6.2000e-004	5.1900e-003	7.1700e-003	3.0000e-005	2.1500e-003	3.0000e-005	2.1800e-003	5.8000e-004	2.0000e-005	6.0000e-004	0.0000	2.9546	2.9546	1.3000e-004	0.0000	2.9579
Waste						0.0000	0.0000		0.0000	0.0000	0.2517	0.0000	0.2517	0.0149	0.0000	0.6236
Water						0.0000	0.0000		0.0000	0.0000	0.0734	0.3640	0.4374	7.5500e-003	1.8000e-004	0.6802
Total	**5.8000e-003**	**6.2100e-003**	**8.0400e-003**	**4.0000e-005**	**2.1500e-003**	**1.1000e-004**	**2.2600e-003**	**5.8000e-004**	**1.0000e-004**	**6.8000e-004**	**0.3251**	**6.9982**	**7.3232**	**0.0227**	**2.2000e-004**	**7.9579**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Fountain Wind Project - First Year of Construction - Shasta County, Annual

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Timber Removal and Grubbing	Site Preparation	4/1/2021	7/2/2021	6	80	
2	Grading and Access Road Work	Grading	5/17/2021	11/18/2021	6	160	
3	Foundations	Site Preparation	8/2/2021	10/21/2021	6	70	Turbine, Transformer, Substation, and O&M Foundations
4	Concrete Batch Plants	Building Construction	8/2/2021	10/21/2021	6	70	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Fountain Wind Project - First Year of Construction - Shasta County, Annual

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Timber Removal and Grubbing	Off-Highway Trucks	8	8.00	402	0.38
Timber Removal and Grubbing	Other Material Handling Equipment	2	8.00	270	0.40
Timber Removal and Grubbing	Other Material Handling Equipment	2	8.00	270	0.40
Timber Removal and Grubbing	Skid Steer Loaders	2	8.00	280	0.37
Grading and Access Road Work	Graders	3	8.00	187	0.41
Grading and Access Road Work	Off-Highway Trucks	8	8.00	402	0.38
Grading and Access Road Work	Off-Highway Trucks	6	8.00	402	0.38
Grading and Access Road Work	Rollers	4	8.00	80	0.38
Grading and Access Road Work	Rubber Tired Dozers	6	8.00	247	0.40
Grading and Access Road Work	Scrapers	4	8.00	367	0.48
Foundations	Cranes	3	4.00	231	0.29
Foundations	Excavators	3	8.00	158	0.38
Foundations	Rollers	4	8.00	80	0.38
Foundations	Rubber Tired Dozers	3	8.00	247	0.40
Foundations	Skid Steer Loaders	3	8.00	65	0.37
Concrete Batch Plants	Cement and Mortar Mixers	10	8.00	9	0.56
Concrete Batch Plants	Generator Sets	3	8.00	84	0.74
Concrete Batch Plants	Off-Highway Trucks	2	8.00	402	0.38
Concrete Batch Plants	Off-Highway Trucks	3	8.00	402	0.38
Concrete Batch Plants	Skid Steer Loaders	3	8.00	65	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Timber Removal and Grubbing	14	64.00	0.00	13,000.00	10.00	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Grading and Access Road Work	31	130.00	0.00	8,830.00	50.00	6.60	22.00	LD_Mix	HDT_Mix	HHDT
Foundations	16	64.00	0.00	0.00	10.00	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Concrete Batch Plants	21	64.00	0.00	7,610.00	10.00	6.60	50.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Timber Removal and Grubbing - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.2713	2.4772	1.5928	5.7100e-003		0.0926	0.0926		0.0852	0.0852	0.0000	501.1819	501.1819	0.1621	0.0000	505.2342
Total	**0.2713**	**2.4772**	**1.5928**	**5.7100e-003**	**0.0000**	**0.0926**	**0.0926**	**0.0000**	**0.0852**	**0.0852**	**0.0000**	**501.1819**	**501.1819**	**0.1621**	**0.0000**	**505.2342**

3.2 Timber Removal and Grubbing - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0485	1.6753	0.2465	5.1900e-003	44.5858	6.1200e-003	44.5919	4.4647	5.8500e-003	4.4706	0.0000	493.0610	493.0610	0.0270	0.0000	493.7351
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.3200e-003	7.0900e-003	0.0690	1.8000e-004	9.3609	1.4000e-004	9.3611	0.9364	1.2000e-004	0.9366	0.0000	16.5970	16.5970	5.3000e-004	0.0000	16.6102
Total	**0.0578**	**1.6824**	**0.3155**	**5.3700e-003**	**53.9468**	**6.2600e-003**	**53.9530**	**5.4012**	**5.9700e-003**	**5.4071**	**0.0000**	**509.6580**	**509.6580**	**0.0275**	**0.0000**	**510.3454**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0700	0.3034	2.5672	5.7100e-003		9.3400e-003	9.3400e-003		9.3400e-003	9.3400e-003	0.0000	501.1813	501.1813	0.1621	0.0000	505.2336
Total	**0.0700**	**0.3034**	**2.5672**	**5.7100e-003**	**0.0000**	**9.3400e-003**	**9.3400e-003**	**0.0000**	**9.3400e-003**	**9.3400e-003**	**0.0000**	**501.1813**	**501.1813**	**0.1621**	**0.0000**	**505.2336**

3.2 Timber Removal and Grubbing - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0485	1.6753	0.2465	5.1900e-003	7.2049	6.1200e-003	7.2110	0.7346	5.8500e-003	0.7404	0.0000	493.0610	493.0610	0.0270	0.0000	493.7351
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.3200e-003	7.0900e-003	0.0690	1.8000e-004	1.5090	1.4000e-004	1.5092	0.1529	1.2000e-004	0.1530	0.0000	16.5970	16.5970	5.3000e-004	0.0000	16.6102
Total	**0.0578**	**1.6824**	**0.3155**	**5.3700e-003**	**8.7139**	**6.2600e-003**	**8.7201**	**0.8875**	**5.9700e-003**	**0.8935**	**0.0000**	**509.6580**	**509.6580**	**0.0275**	**0.0000**	**510.3454**

3.3 Grading and Access Road Work - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					3.6245	0.0000	3.6245	1.6682	0.0000	1.6682	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.6476	16.6237	9.2424	0.0262		0.6877	0.6877		0.6327	0.6327	0.0000	2,298.9142	2,298.9142	0.7435	0.0000	2,317.5021
Total	**1.6476**	**16.6237**	**9.2424**	**0.0262**	**3.6245**	**0.6877**	**4.3122**	**1.6682**	**0.6327**	**2.3009**	**0.0000**	**2,298.9142**	**2,298.9142**	**0.7435**	**0.0000**	**2,317.5021**

3.3 Grading and Access Road Work - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0353	1.2062	0.1797	3.8100e-003	29.9894	4.5300e-003	29.9939	3.0045	4.3400e-003	3.0088	0.0000	362.5705	362.5705	0.0184	0.0000	363.0310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1414	0.1260	1.1538	3.6400e-003	35.9573	2.4800e-003	35.9598	3.6478	2.2900e-003	3.6501	0.0000	328.7300	328.7300	9.5500e-003	0.0000	328.9688
Total	**0.1767**	**1.3322**	**1.3336**	**7.4500e-003**	**65.9467**	**7.0100e-003**	**65.9537**	**6.6523**	**6.6300e-003**	**6.6589**	**0.0000**	**691.3004**	**691.3004**	**0.0280**	**0.0000**	**691.9998**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.6310	0.0000	1.6310	0.7507	0.0000	0.7507	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.3207	1.3895	12.0148	0.0262		0.0428	0.0428		0.0428	0.0428	0.0000	2,298.9115	2,298.9115	0.7435	0.0000	2,317.4993
Total	**0.3207**	**1.3895**	**12.0148**	**0.0262**	**1.6310**	**0.0428**	**1.6738**	**0.7507**	**0.0428**	**0.7934**	**0.0000**	**2,298.9115**	**2,298.9115**	**0.7435**	**0.0000**	**2,317.4993**

3.3 Grading and Access Road Work - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0353	1.2062	0.1797	3.8100e-003	4.8530	4.5300e-003	4.8575	0.4962	4.3400e-003	0.5005	0.0000	362.5705	362.5705	0.0184	0.0000	363.0310
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1414	0.1260	1.1538	3.6400e-003	6.0525	2.4800e-003	6.0550	0.6637	2.2900e-003	0.6659	0.0000	328.7300	328.7300	9.5500e-003	0.0000	328.9688
Total	**0.1767**	**1.3322**	**1.3336**	**7.4500e-003**	**10.9055**	**7.0100e-003**	**10.9125**	**1.1598**	**6.6300e-003**	**1.1665**	**0.0000**	**691.3004**	**691.3004**	**0.0280**	**0.0000**	**691.9998**

3.4 Foundations - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.6512	0.0000	0.6512	0.3504	0.0000	0.3504	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1901	2.0075	1.2808	2.3300e-003		0.0980	0.0980		0.0901	0.0901	0.0000	204.4061	204.4061	0.0661	0.0000	206.0589
Total	**0.1901**	**2.0075**	**1.2808**	**2.3300e-003**	**0.6512**	**0.0980**	**0.7492**	**0.3504**	**0.0901**	**0.4406**	**0.0000**	**204.4061**	**204.4061**	**0.0661**	**0.0000**	**206.0589**

3.4 Foundations - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.1500e-003	6.2100e-003	0.0604	1.6000e-004	8.1908	1.2000e-004	8.1909	0.8194	1.1000e-004	0.8195	0.0000	14.5224	14.5224	4.6000e-004	0.0000	14.5340
Total	**8.1500e-003**	**6.2100e-003**	**0.0604**	**1.6000e-004**	**8.1908**	**1.2000e-004**	**8.1909**	**0.8194**	**1.1000e-004**	**0.8195**	**0.0000**	**14.5224**	**14.5224**	**4.6000e-004**	**0.0000**	**14.5340**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2930	0.0000	0.2930	0.1577	0.0000	0.1577	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0312	0.2342	1.3929	2.3300e-003		3.8100e-003	3.8100e-003		3.8100e-003	3.8100e-003	0.0000	204.4059	204.4059	0.0661	0.0000	206.0586
Total	**0.0312**	**0.2342**	**1.3929**	**2.3300e-003**	**0.2930**	**3.8100e-003**	**0.2969**	**0.1577**	**3.8100e-003**	**0.1615**	**0.0000**	**204.4059**	**204.4059**	**0.0661**	**0.0000**	**206.0586**

3.4 Foundations - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.1500e-003	6.2100e-003	0.0604	1.6000e-004	1.3204	1.2000e-004	1.3205	0.1338	1.1000e-004	0.1339	0.0000	14.5224	14.5224	4.6000e-004	0.0000	14.5340
Total	**8.1500e-003**	**6.2100e-003**	**0.0604**	**1.6000e-004**	**1.3204**	**1.2000e-004**	**1.3205**	**0.1338**	**1.1000e-004**	**0.1339**	**0.0000**	**14.5224**	**14.5224**	**4.6000e-004**	**0.0000**	**14.5340**

3.5 Concrete Batch Plants - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1721	1.4878	1.2715	3.4700e-003		0.0607	0.0607		0.0577	0.0577	0.0000	297.4311	297.4311	0.0765	0.0000	299.3438
Total	**0.1721**	**1.4878**	**1.2715**	**3.4700e-003**		**0.0607**	**0.0607**		**0.0577**	**0.0577**	**0.0000**	**297.4311**	**297.4311**	**0.0765**	**0.0000**	**299.3438**

3.5 Concrete Batch Plants - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0587	1.8635	0.3031	6.8000e-003	26.1955	8.4600e-003	26.2039	2.6399	8.0900e-003	2.6480	0.0000	646.3123	646.3123	0.0171	0.0000	646.7407
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.1500e-003	6.2100e-003	0.0604	1.6000e-004	8.1908	1.2000e-004	8.1909	0.8194	1.1000e-004	0.8195	0.0000	14.5224	14.5224	4.6000e-004	0.0000	14.5340
Total	**0.0669**	**1.8698**	**0.3635**	**6.9600e-003**	**34.3863**	**8.5800e-003**	**34.3949**	**3.4593**	**8.2000e-003**	**3.4675**	**0.0000**	**660.8347**	**660.8347**	**0.0176**	**0.0000**	**661.2747**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0405	0.2746	1.6280	3.4700e-003		5.0500e-003	5.0500e-003		5.0500e-003	5.0500e-003	0.0000	297.4308	297.4308	0.0765	0.0000	299.3435
Total	**0.0405**	**0.2746**	**1.6280**	**3.4700e-003**		**5.0500e-003**	**5.0500e-003**		**5.0500e-003**	**5.0500e-003**	**0.0000**	**297.4308**	**297.4308**	**0.0765**	**0.0000**	**299.3435**

3.5 Concrete Batch Plants - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0587	1.8635	0.3031	6.8000e-003	4.3132	8.4600e-003	4.3217	0.4563	8.0900e-003	0.4644	0.0000	646.3123	646.3123	0.0171	0.0000	646.7407
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.1500e-003	6.2100e-003	0.0604	1.6000e-004	1.3204	1.2000e-004	1.3205	0.1338	1.1000e-004	0.1339	0.0000	14.5224	14.5224	4.6000e-004	0.0000	14.5340
Total	**0.0669**	**1.8698**	**0.3635**	**6.9600e-003**	**5.6336**	**8.5800e-003**	**5.6422**	**0.5902**	**8.2000e-003**	**0.5983**	**0.0000**	**660.8347**	**660.8347**	**0.0176**	**0.0000**	**661.2747**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	6.2000e-004	5.1900e-003	7.1700e-003	3.0000e-005	2.1500e-003	3.0000e-005	2.1800e-003	5.8000e-004	2.0000e-005	6.0000e-004	0.0000	2.9546	2.9546	1.3000e-004	0.0000	2.9579
Unmitigated	6.2000e-004	5.1900e-003	7.1700e-003	3.0000e-005	2.1500e-003	3.0000e-005	2.1800e-003	5.8000e-004	2.0000e-005	6.0000e-004	0.0000	2.9546	2.9546	1.3000e-004	0.0000	2.9579

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	1.50	1.50	1.50	5,795	5,795
Total	1.50	1.50	1.50	5,795	5,795

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	14.70	6.60	6.60	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Heavy Industry	0.531326	0.031853	0.180854	0.102256	0.028681	0.006074	0.012848	0.095604	0.001329	0.001212	0.005444	0.001276	0.001244

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	2.5658	2.5658	1.2000e-004	2.0000e-005	2.5759
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	2.5658	2.5658	1.2000e-004	2.0000e-005	2.5759
NaturalGas Mitigated	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	1.1137	1.1137	2.0000e-005	2.0000e-005	1.1203
NaturalGas Unmitigated	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	1.1137	1.1137	2.0000e-005	2.0000e-005	1.1203

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	20870	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	1.1137	1.1137	2.0000e-005	2.0000e-005	1.1203
Total		**1.1000e-004**	**1.0200e-003**	**8.6000e-004**	**1.0000e-005**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**1.1137**	**1.1137**	**2.0000e-005**	**2.0000e-005**	**1.1203**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	20870	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	1.1137	1.1137	2.0000e-005	2.0000e-005	1.1203
Total		**1.1000e-004**	**1.0200e-003**	**8.6000e-004**	**1.0000e-005**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**1.1137**	**1.1137**	**2.0000e-005**	**2.0000e-005**	**1.1203**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	8820	2.5658	1.2000e-004	2.0000e-005	2.5759
Total		**2.5658**	**1.2000e-004**	**2.0000e-005**	**2.5759**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	8820	2.5658	1.2000e-004	2.0000e-005	2.5759
Total		**2.5658**	**1.2000e-004**	**2.0000e-005**	**2.5759**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Unmitigated	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.1600e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.9100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**5.0700e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.1600e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.9100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**5.0700e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.4374	7.5500e-003	1.8000e-004	0.6802
Unmitigated	0.4374	7.5500e-003	1.8000e-004	0.6802

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	0.23125 / 0	0.4374	7.5500e-003	1.8000e-004	0.6802
Total		**0.4374**	**7.5500e-003**	**1.8000e-004**	**0.6802**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	0.23125 / 0	0.4374	7.5500e-003	1.8000e-004	0.6802
Total		**0.4374**	**7.5500e-003**	**1.8000e-004**	**0.6802**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.2517	0.0149	0.0000	0.6236
Unmitigated	0.2517	0.0149	0.0000	0.6236

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	1.24	0.2517	0.0149	0.0000	0.6236
Total		**0.2517**	**0.0149**	**0.0000**	**0.6236**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	1.24	0.2517	0.0149	0.0000	0.6236
Total		**0.2517**	**0.0149**	**0.0000**	**0.6236**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Fountain Wind Project - Second Year

Shasta County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	1.00	1000sqft	0.02	1,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.7	**Precipitation Freq (Days)**	82
Climate Zone	3			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Fountain Wind Project - Second Year - Shasta County, Summer

Project Characteristics -

Land Use - Surrogate land use information, not used to estimate emissions.

Construction Phase - Construction phases provided by the applicant.

Off-road Equipment - Equipment types and unit amounts provided by the applicant.

Off-road Equipment - Equipment type and unit amounts provided by the applicant.

Off-road Equipment - Equipment types and unit amounts provided by the applicant.

Off-road Equipment - Equipment types and unit amounts provided by the applicant.

Off-road Equipment - Equipment types and unit amounts provided by the applicant.

Off-road Equipment - Equipment types and unit amounts provided by the applicant.

Trips and VMT - Trips based on VMT obtained from Traffic Report.

On-road Fugitive Dust - Average dirt road travel for haul trucks is based on the distance from Highway 299 to the Substation, which is approximately the center of the site.

Vehicle Trips - Worker trips

Road Dust - 94% paved.

Water And Wastewater - Based on PD.

Construction Off-road Equipment Mitigation - Percent reduction for soil stabilizer for unpaved road obtained from South Coast AQMD Table XI-D.

Operational Off-Road Equipment - Per project description. Sweepers represents "mowing equipment."

Stationary Sources - Emergency Generators and Fire Pumps - Emergency generated testing would be limited to 100 hours per year.

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	0.5
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	12.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	20.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	7.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	17.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	7.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	1.00	160.00
tblConstructionPhase	NumDays	1.00	140.00
tblConstructionPhase	NumDays	100.00	20.00
tblConstructionPhase	NumDays	100.00	15.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblOffRoadEquipment	HorsePower	231.00	350.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	6.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	6.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	4.00
tblOnRoadDust	HaulingPercentPave	100.00	98.00
tblOnRoadDust	HaulingPercentPave	100.00	88.00
tblOnRoadDust	HaulingPercentPave	100.00	70.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	94.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOperationalOffRoadEquipment	OperHoursPerDay	8.00	4.00
tblOperationalOffRoadEquipment	OperHoursPerDay	8.00	4.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	2.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	2.00
tblRoadDust	RoadPercentPave	100	94
tblTripsAndVMT	HaulingTripLength	20.00	258.00
tblTripsAndVMT	HaulingTripLength	20.00	50.00
tblTripsAndVMT	HaulingTripNumber	0.00	5,336.00
tblTripsAndVMT	HaulingTripNumber	0.00	364.00
tblTripsAndVMT	HaulingTripNumber	0.00	2,116.00
tblTripsAndVMT	WorkerTripLength	10.80	10.00
tblTripsAndVMT	WorkerTripLength	10.80	50.00
tblTripsAndVMT	WorkerTripLength	10.80	10.00
tblTripsAndVMT	WorkerTripLength	10.80	10.00
tblTripsAndVMT	WorkerTripLength	10.80	10.00

tblTripsAndVMT	WorkerTripLength	10.80	10.00
tblTripsAndVMT	WorkerTripNumber	0.00	38.00
tblTripsAndVMT	WorkerTripNumber	18.00	130.00
tblTripsAndVMT	WorkerTripNumber	33.00	38.00
tblTripsAndVMT	WorkerTripNumber	0.00	38.00
tblTripsAndVMT	WorkerTripNumber	0.00	38.00
tblTripsAndVMT	WorkerTripNumber	0.00	38.00
tblVehicleTrips	CC_TL	7.30	50.00
tblVehicleTrips	CC_TTP	28.00	0.00
tblVehicleTrips	CNW_TL	7.30	50.00
tblVehicleTrips	CNW_TTP	13.00	0.00
tblVehicleTrips	CW_TL	9.50	50.00
tblVehicleTrips	CW_TTP	59.00	0.00
tblVehicleTrips	DV_TP	5.00	0.00
tblVehicleTrips	HO_TL	0.00	50.00
tblVehicleTrips	HS_TL	0.00	50.00
tblVehicleTrips	HW_TL	0.00	50.00
tblVehicleTrips	HW_TTP	0.00	100.00
tblVehicleTrips	PB_TP	3.00	0.00
tblVehicleTrips	PR_TP	92.00	100.00
tblVehicleTrips	ST_TR	1.50	24.00
tblVehicleTrips	SU_TR	1.50	24.00
tblVehicleTrips	WD_TR	1.50	24.00
tblWater	IndoorWaterUseRate	231,250.00	1,825,000.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	19.0486	240.1264	170.7160	0.7499	1,487.0211	7.1480	1,494.1691	153.8538	6.6417	160.4955	0.0000	76,378.0712	76,378.0712	7.1222	0.0000	76,556.1263
Maximum	**19.0486**	**240.1264**	**170.7160**	**0.7499**	**1,487.0211**	**7.1480**	**1,494.1691**	**153.8538**	**6.6417**	**160.4955**	**0.0000**	**76,378.0712**	**76,378.0712**	**7.1222**	**0.0000**	**76,556.1263**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2022	8.8731	119.7330	186.6666	0.7499	162.0063	0.9122	162.9185	20.1247	0.8875	21.0122	0.0000	76,378.0712	76,378.0712	7.1222	0.0000	76,556.1262
Maximum	**8.8731**	**119.7330**	**186.6666**	**0.7499**	**162.0063**	**0.9122**	**162.9185**	**20.1247**	**0.8875**	**21.0122**	**0.0000**	**76,378.0712**	**76,378.0712**	**7.1222**	**0.0000**	**76,556.1262**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**53.42**	**50.14**	**-9.34**	**0.00**	**89.11**	**87.24**	**89.10**	**86.92**	**86.64**	**86.91**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0278	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668
Mobile	0.1679	1.2776	3.0380	0.0128	54.4759	0.0103	54.4862	5.5755	9.7100e-003	5.5852		1,302.0543	1,302.0543	0.0358		1,302.9493
Offroad	0.5335	5.5214	3.7530	8.3100e-003		0.2681	0.2681		0.2467	0.2467		804.9957	804.9957	0.2604		811.5045
Stationary	0.8796	2.4585	2.2428	4.2300e-003		0.1294	0.1294		0.1294	0.1294		449.9796	449.9796	0.0631		451.5568
Total	**1.6094**	**9.2631**	**9.0386**	**0.0254**	**54.4759**	**0.4083**	**54.8841**	**5.5755**	**0.3862**	**5.9617**		**2,563.7566**	**2,563.7566**	**0.3594**	**1.2000e-004**	**2,572.7775**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0278	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668
Mobile	0.1679	1.2776	3.0380	0.0128	54.4759	0.0103	54.4862	5.5755	9.7100e-003	5.5852		1,302.0543	1,302.0543	0.0358		1,302.9493
Offroad	0.5335	5.5214	3.7530	8.3100e-003		0.2681	0.2681		0.2467	0.2467		804.9957	804.9957	0.2604		811.5045
Stationary	0.8796	2.4585	2.2428	4.2300e-003		0.1294	0.1294		0.1294	0.1294		449.9796	449.9796	0.0631		451.5568
Total	**1.6094**	**9.2631**	**9.0386**	**0.0254**	**54.4759**	**0.4083**	**54.8841**	**5.5755**	**0.3862**	**5.9617**		**2,563.7566**	**2,563.7566**	**0.3594**	**1.2000e-004**	**2,572.7775**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Fountain Wind Project - Second Year - Shasta County, Summer

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Turbine and Transformer Installation	Building Construction	4/1/2022	8/18/2022	6	100	
2	Substation and O&M Building Installation	Site Preparation	4/15/2022	11/24/2022	6	160	
3	Underground Collector System	Site Preparation	4/30/2022	11/11/2022	6	140	
4	Overhead Collector System	Building Construction	7/4/2022	11/18/2022	6	100	
5	Transmission Line Connection	Building Construction	9/14/2022	10/11/2022	6	20	
6	Substation Aggregate and Security Fence	Building Construction	11/25/2022	12/15/2022	6	15	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Fountain Wind Project - Second Year - Shasta County, Summer

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Turbine and Transformer Installation	Cranes	6	4.00	231	0.29
Turbine and Transformer Installation	Cranes	4	4.00	350	0.29
Turbine and Transformer Installation	Generator Sets	4	8.00	84	0.74
Turbine and Transformer Installation	Rough Terrain Forklifts	10	8.00	100	0.40
Turbine and Transformer Installation	Rubber Tired Dozers	2	8.00	247	0.40
Substation and O&M Building Installation	Cranes	2	4.00	231	0.29
Substation and O&M Building Installation	Rough Terrain Forklifts	3	8.00	100	0.40
Substation and O&M Building Installation	Skid Steer Loaders	2	8.00	65	0.37
Underground Collector System	Rough Terrain Forklifts	4	8.00	100	0.40
Underground Collector System	Rubber Tired Dozers	1	8.00	247	0.40
Underground Collector System	Skid Steer Loaders	4	8.00	65	0.37
Underground Collector System	Trenchers	4	8.00	78	0.50
Overhead Collector System	Aerial Lifts	6	8.00	63	0.31
Overhead Collector System	Cranes	2	4.00	231	0.29
Overhead Collector System	Other Construction Equipment	3	8.00	172	0.42
Overhead Collector System	Rubber Tired Dozers	1	8.00	247	0.40
Overhead Collector System	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Transmission Line Connection	Aerial Lifts	6	4.00	63	0.31
Transmission Line Connection	Cranes	6	4.00	231	0.29
Transmission Line Connection	Excavators	2	8.00	158	0.38
Transmission Line Connection	Other Construction Equipment	4	8.00	172	0.42
Transmission Line Connection	Rubber Tired Dozers	1	8.00	247	0.40
Substation Aggregate and Security Fence	Skid Steer Loaders	1	8.00	65	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Turbine and Transformer Installatio	26	38.00	0.00	5,336.00	10.00	7.30	258.00	LD_Mix	HDT_Mix	HHDT
Substation and O&M Building Installation	7	130.00	0.00	364.00	50.00	7.30	50.00	LD_Mix	HDT_Mix	HHDT
Underground Collector System	13	38.00	0.00	0.00	10.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Overhead Collector System	16	38.00	0.00	0.00	10.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Transmission Line Connection	19	38.00	0.00	0.00	10.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Substation Aggregate and Security Fence	1	38.00	0.00	2,116.00	10.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Turbine and Transformer Installation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	6.1659	67.0165	58.3483	0.1126		2.8798	2.8798		2.6964	2.6964		10,850.7965	10,850.7965	2.8218		10,921.3406
Total	**6.1659**	**67.0165**	**58.3483**	**0.1126**		**2.8798**	**2.8798**		**2.6964**	**2.6964**		**10,850.7965**	**10,850.7965**	**2.8218**		**10,921.3406**

3.2 Turbine and Transformer Installation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.5177	93.6606	18.9048	0.4557	348.0487	0.4995	348.5482	36.5876	0.4779	37.0655		47,754.7681	47,754.7681	0.3769		47,764.1905
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0874	1.1095	2.9300e-003	179.1648	1.9500e-003	179.1667	17.9145	1.8000e-003	17.9163		292.0715	292.0715	8.7200e-003		292.2895
Total	**3.6733**	**93.7480**	**20.0143**	**0.4586**	**527.2134**	**0.5015**	**527.7149**	**54.5021**	**0.4797**	**54.9818**		**48,046.8396**	**48,046.8396**	**0.3856**		**48,056.4800**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3230	5.7330	65.6699	0.1126		0.1764	0.1764		0.1764	0.1764	0.0000	10,850.7965	10,850.7965	2.8218		10,921.3406
Total	**1.3230**	**5.7330**	**65.6699**	**0.1126**		**0.1764**	**0.1764**		**0.1764**	**0.1764**	**0.0000**	**10,850.7965**	**10,850.7965**	**2.8218**		**10,921.3406**

3.2 Turbine and Transformer Installation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.5177	93.6606	18.9048	0.4557	43.4534	0.4995	43.9529	6.1884	0.4779	6.6663		47,754.7681	47,754.7681	0.3769		47,764.1905
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0874	1.1095	2.9300e-003	17.7392	1.9500e-003	17.7411	1.8039	1.8000e-003	1.8057		292.0715	292.0715	8.7200e-003		292.2895
Total	**3.6733**	**93.7480**	**20.0143**	**0.4586**	**61.1926**	**0.5015**	**61.6941**	**7.9923**	**0.4797**	**8.4720**		**48,046.8396**	**48,046.8396**	**0.3856**		**48,056.4800**

3.3 Substation and O&M Building Installation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.8478	10.4824	11.5319	0.0203		0.3976	0.3976		0.3658	0.3658		1,960.8763	1,960.8763	0.6342		1,976.7310
Total	**0.8478**	**10.4824**	**11.5319**	**0.0203**	**0.0000**	**0.3976**	**0.3976**	**0.0000**	**0.3658**	**0.3658**		**1,960.8763**	**1,960.8763**	**0.6342**		**1,976.7310**

3.3 Substation and O&M Building Installation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0326	0.9600	0.1699	4.0300e-003	16.8198	4.2500e-003	16.8241	1.6929	4.0700e-003	1.6969		422.5447	422.5447	0.0103		422.8023
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	1.7861	1.3092	16.7015	0.0490	578.6362	0.0301	578.6663	58.5197	0.0277	58.5474		4,879.9206	4,879.9206	0.1374		4,883.3558
Total	**1.8187**	**2.2692**	**16.8715**	**0.0530**	**595.4560**	**0.0344**	**595.4904**	**60.2125**	**0.0318**	**60.2443**		**5,302.4653**	**5,302.4653**	**0.1477**		**5,306.1580**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	0.2997	3.1819	13.5690	0.0203		0.0332	0.0332		0.0332	0.0332	0.0000	1,960.8763	1,960.8763	0.6342		1,976.7310
Total	**0.2997**	**3.1819**	**13.5690**	**0.0203**	**0.0000**	**0.0332**	**0.0332**	**0.0000**	**0.0332**	**0.0332**	**0.0000**	**1,960.8763**	**1,960.8763**	**0.6342**		**1,976.7310**

3.3 Substation and O&M Building Installation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0326	0.9600	0.1699	4.0300e-003	1.7194	4.2500e-003	1.7236	0.1858	4.0700e-003	0.1899		422.5447	422.5447	0.0103		422.8023
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	1.7861	1.3092	16.7015	0.0490	60.9061	0.0301	60.9362	6.8492	0.0277	6.8769		4,879.9206	4,879.9206	0.1374		4,883.3558
Total	**1.8187**	**2.2692**	**16.8715**	**0.0530**	**62.6255**	**0.0344**	**62.6598**	**7.0350**	**0.0318**	**7.0668**		**5,302.4653**	**5,302.4653**	**0.1477**		**5,306.1580**

3.4 Underground Collector System - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0221	0.0000	6.0221	3.3102	0.0000	3.3102			0.0000			0.0000
Off-Road	3.0184	31.9480	28.6802	0.0441		1.7198	1.7198		1.5822	1.5822		4,271.4160	4,271.4160	1.3815		4,305.9526
Total	**3.0184**	**31.9480**	**28.6802**	**0.0441**	**6.0221**	**1.7198**	**7.7419**	**3.3102**	**1.5822**	**4.8924**		**4,271.4160**	**4,271.4160**	**1.3815**		**4,305.9526**

3.4 Underground Collector System - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0874	1.1095	2.9300e-003	179.1648	1.9500e-003	179.1667	17.9145	1.8000e-003	17.9163		292.0715	292.0715	8.7200e-003		292.2895
Total	**0.1556**	**0.0874**	**1.1095**	**2.9300e-003**	**179.1648**	**1.9500e-003**	**179.1667**	**17.9145**	**1.8000e-003**	**17.9163**		**292.0715**	**292.0715**	**8.7200e-003**		**292.2895**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.7099	0.0000	2.7099	1.4896	0.0000	1.4896			0.0000			0.0000
Off-Road	0.6426	6.5510	30.7324	0.0441		0.0721	0.0721		0.0721	0.0721	0.0000	4,271.4160	4,271.4160	1.3815		4,305.9526
Total	**0.6426**	**6.5510**	**30.7324**	**0.0441**	**2.7099**	**0.0721**	**2.7820**	**1.4896**	**0.0721**	**1.5617**	**0.0000**	**4,271.4160**	**4,271.4160**	**1.3815**		**4,305.9526**

3.4 Underground Collector System - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0874	1.1095	2.9300e-003	17.7392	1.9500e-003	17.7411	1.8039	1.8000e-003	1.8057		292.0715	292.0715	8.7200e-003		292.2895
Total	**0.1556**	**0.0874**	**1.1095**	**2.9300e-003**	**17.7392**	**1.9500e-003**	**17.7411**	**1.8039**	**1.8000e-003**	**1.8057**		**292.0715**	**292.0715**	**8.7200e-003**		**292.2895**

3.5 Overhead Collector System - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.2133	34.4875	33.0508	0.0554		1.6112	1.6112		1.4823	1.4823		5,361.5343	5,361.5343	1.7340		5,404.8851
Total	**3.2133**	**34.4875**	**33.0508**	**0.0554**		**1.6112**	**1.6112**		**1.4823**	**1.4823**		**5,361.5343**	**5,361.5343**	**1.7340**		**5,404.8851**

3.5 Overhead Collector System - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0874	1.1095	2.9300e-003	179.1648	1.9500e-003	179.1667	17.9145	1.8000e-003	17.9163		292.0715	292.0715	8.7200e-003		292.2895
Total	**0.1556**	**0.0874**	**1.1095**	**2.9300e-003**	**179.1648**	**1.9500e-003**	**179.1667**	**17.9145**	**1.8000e-003**	**17.9163**		**292.0715**	**292.0715**	**8.7200e-003**		**292.2895**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8047	8.0751	37.5904	0.0554		0.0908	0.0908		0.0908	0.0908	0.0000	5,361.5343	5,361.5343	1.7340		5,404.8851
Total	**0.8047**	**8.0751**	**37.5904**	**0.0554**		**0.0908**	**0.0908**		**0.0908**	**0.0908**	**0.0000**	**5,361.5343**	**5,361.5343**	**1.7340**		**5,404.8851**

3.5 Overhead Collector System - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0874	1.1095	2.9300e-003	17.7392	1.9500e-003	17.7411	1.8039	1.8000e-003	1.8057		292.0715	292.0715	8.7200e-003		292.2895
Total	**0.1556**	**0.0874**	**1.1095**	**2.9300e-003**	**17.7392**	**1.9500e-003**	**17.7411**	**1.8039**	**1.8000e-003**	**1.8057**		**292.0715**	**292.0715**	**8.7200e-003**		**292.2895**

3.6 Transmission Line Connection - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.9730	41.8417	35.1323	0.0659		1.9378	1.9378		1.7828	1.7828		6,384.7415	6,384.7415	2.0650		6,436.3654
Total	**3.9730**	**41.8417**	**35.1323**	**0.0659**		**1.9378**	**1.9378**		**1.7828**	**1.7828**		**6,384.7415**	**6,384.7415**	**2.0650**		**6,436.3654**

3.6 Transmission Line Connection - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0874	1.1095	2.9300e-003	179.1648	1.9500e-003	179.1667	17.9145	1.8000e-003	17.9163		292.0715	292.0715	8.7200e-003		292.2895
Total	**0.1556**	**0.0874**	**1.1095**	**2.9300e-003**	**179.1648**	**1.9500e-003**	**179.1667**	**17.9145**	**1.8000e-003**	**17.9163**		**292.0715**	**292.0715**	**8.7200e-003**		**292.2895**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8741	6.0817	42.1475	0.0659		0.1083	0.1083		0.1083	0.1083	0.0000	6,384.7415	6,384.7415	2.0650		6,436.3654
Total	**0.8741**	**6.0817**	**42.1475**	**0.0659**		**0.1083**	**0.1083**		**0.1083**	**0.1083**	**0.0000**	**6,384.7415**	**6,384.7415**	**2.0650**		**6,436.3654**

3.6 Transmission Line Connection - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0874	1.1095	2.9300e-003	17.7392	1.9500e-003	17.7411	1.8039	1.8000e-003	1.8057		292.0715	292.0715	8.7200e-003		292.2895
Total	**0.1556**	**0.0874**	**1.1095**	**2.9300e-003**	**17.7392**	**1.9500e-003**	**17.7411**	**1.8039**	**1.8000e-003**	**1.8057**		**292.0715**	**292.0715**	**8.7200e-003**		**292.2895**

3.7 Substation Aggregate and Security Fence - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.0696	0.9286	1.3872	2.0700e-003		0.0345	0.0345		0.0318	0.0318		200.3913	200.3913	0.0648		202.0115
Total	**0.0696**	**0.9286**	**1.3872**	**2.0700e-003**		**0.0345**	**0.0345**		**0.0318**	**0.0318**		**200.3913**	**200.3913**	**0.0648**		**202.0115**

3.7 Substation Aggregate and Security Fence - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.9700	32.3970	4.8490	0.1123	1,039.7177	0.1110	1,039.8287	104.0685	0.1062	104.1747		11,770.9576	11,770.9576	0.5873		11,785.6391
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0874	1.1095	2.9300e-003	179.1648	1.9500e-003	179.1667	17.9145	1.8000e-003	17.9163		292.0715	292.0715	8.7200e-003		292.2895
Total	**1.1256**	**32.4844**	**5.9585**	**0.1153**	**1,218.8825**	**0.1130**	**1,218.9954**	**121.9830**	**0.1080**	**122.0910**		**12,063.0291**	**12,063.0291**	**0.5960**		**12,077.9286**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.0509	1.1622	1.5694	2.0700e-003		3.3900e-003	3.3900e-003		3.3900e-003	3.3900e-003	0.0000	200.3913	200.3913	0.0648		202.0115
Total	**0.0509**	**1.1622**	**1.5694**	**2.0700e-003**		**3.3900e-003**	**3.3900e-003**		**3.3900e-003**	**3.3900e-003**	**0.0000**	**200.3913**	**200.3913**	**0.0648**		**202.0115**

3.7 Substation Aggregate and Security Fence - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.9700	32.3970	4.8490	0.1123	103.3784	0.1110	103.4894	10.6200	0.1062	10.7262		11,770.9576	11,770.9576	0.5873		11,785.6391
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1556	0.0874	1.1095	2.9300e-003	17.7392	1.9500e-003	17.7411	1.8039	1.8000e-003	1.8057		292.0715	292.0715	8.7200e-003		292.2895
Total	**1.1256**	**32.4844**	**5.9585**	**0.1153**	**121.1176**	**0.1130**	**121.2306**	**12.4239**	**0.1080**	**12.5319**		**12,063.0291**	**12,063.0291**	**0.5960**		**12,077.9286**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.1679	1.2776	3.0380	0.0128	54.4759	0.0103	54.4862	5.5755	9.7100e-003	5.5852		1,302.0543	1,302.0543	0.0358		1,302.9493
Unmitigated	0.1679	1.2776	3.0380	0.0128	54.4759	0.0103	54.4862	5.5755	9.7100e-003	5.5852		1,302.0543	1,302.0543	0.0358		1,302.9493

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	24.00	24.00	24.00	436,800	436,800
Total	24.00	24.00	24.00	436,800	436,800

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	50.00	50.00	50.00	0.00	0.00	0.00	100	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Heavy Industry	0.531326	0.031853	0.180854	0.102256	0.028681	0.006074	0.012848	0.095604	0.001329	0.001212	0.005444	0.001276	0.001244

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668
NaturalGas Unmitigated	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Heavy Industry	57.1781	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668
Total		**6.2000e-004**	**5.6100e-003**	**4.7100e-003**	**3.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**		**6.7268**	**6.7268**	**1.3000e-004**	**1.2000e-004**	**6.7668**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Heavy Industry	0.0571781	6.2000e-004	5.6100e-003	4.7100e-003	3.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004		6.7268	6.7268	1.3000e-004	1.2000e-004	6.7668
Total		**6.2000e-004**	**5.6100e-003**	**4.7100e-003**	**3.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**		**6.7268**	**6.7268**	**1.3000e-004**	**1.2000e-004**	**6.7668**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0278	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	0.0278	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	6.3500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0214					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**0.0278**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	6.3500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0214					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**0.0278**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
Cranes	2	4.00	260	231	0.29	Diesel
Sweepers/Scrubbers	2	4.00	260	64	0.46	Diesel

UnMitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	lb/day										lb/day					
Cranes	0.3514	3.8155	1.8344	5.7700e-003		0.1593	0.1593		0.1466	0.1466		558.8192	558.8192	0.1807		563.3376
Sweepers/Scrubbers	0.1820	1.7059	1.9186	2.5400e-003		0.1088	0.1088		0.1001	0.1001		246.1764	246.1764	0.0796		248.1669
Total	**0.5335**	**5.5214**	**3.7530**	**8.3100e-003**		**0.2681**	**0.2681**		**0.2467**	**0.2467**		**804.9956**	**804.9956**	**0.2604**		**811.5045**

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	1	2	100	268	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	lb/day										lb/day					
Emergency Generator - Diesel (175 - 300 HP)	0.8796	2.4585	2.2428	4.2300e-003		0.1294	0.1294		0.1294	0.1294		449.9796	449.9796	0.0631		451.5568
Total	**0.8796**	**2.4585**	**2.2428**	**4.2300e-003**		**0.1294**	**0.1294**		**0.1294**	**0.1294**		**449.9796**	**449.9796**	**0.0631**		**451.5568**

11.0 Vegetation

Fountain Wind Project - Second Year

Shasta County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	1.00	1000sqft	0.02	1,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.7	**Precipitation Freq (Days)**	82
Climate Zone	3			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Fountain Wind Project - Second Year - Shasta County, Annual

Project Characteristics -

Land Use - Surrogate land use information, not used to estimate emissions.

Construction Phase - Construction phases provided by the applicant.

Off-road Equipment - Equipment types and unit amounts provided by the applicant.

Off-road Equipment - Equipment type and unit amounts provided by the applicant.

Off-road Equipment - Equipment types and unit amounts provided by the applicant.

Off-road Equipment - Equipment types and unit amounts provided by the applicant.

Off-road Equipment - Equipment types and unit amounts provided by the applicant.

Off-road Equipment - Equipment types and unit amounts provided by the applicant.

Trips and VMT - Trips based on VMT obtained from Traffic Report.

On-road Fugitive Dust - Average dirt road travel for haul trucks is based on the distance from Highway 299 to the Substation, which is approximately the center of the site.

Vehicle Trips - Worker trips

Road Dust - 94% paved.

Water And Wastewater - Based on PD.

Construction Off-road Equipment Mitigation - Percent reduction for soil stabilizer for unpaved road obtained from South Coast AQMD Table XI-D.

Operational Off-Road Equipment - Per project description. Sweepers represents "mowing equipment."

Stationary Sources - Emergency Generators and Fire Pumps - Emergency generated testing would be limited to 100 hours per year.

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	0.5
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	12.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	20.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	7.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	17.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	7.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	100.00	20.00
tblConstructionPhase	NumDays	100.00	15.00
tblConstructionPhase	NumDays	1.00	160.00
tblConstructionPhase	NumDays	1.00	140.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblOffRoadEquipment	HorsePower	231.00	350.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	6.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	4.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	6.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	4.00
tblOnRoadDust	HaulingPercentPave	100.00	98.00
tblOnRoadDust	HaulingPercentPave	100.00	88.00
tblOnRoadDust	HaulingPercentPave	100.00	70.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	94.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOnRoadDust	WorkerPercentPave	100.00	68.00
tblOperationalOffRoadEquipment	OperHoursPerDay	8.00	4.00
tblOperationalOffRoadEquipment	OperHoursPerDay	8.00	4.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	2.00
tblOperationalOffRoadEquipment	OperOffRoadEquipmentNumber	0.00	2.00
tblRoadDust	RoadPercentPave	100	94
tblTripsAndVMT	HaulingTripLength	20.00	258.00
tblTripsAndVMT	HaulingTripLength	20.00	50.00
tblTripsAndVMT	HaulingTripNumber	0.00	5,336.00
tblTripsAndVMT	HaulingTripNumber	0.00	364.00
tblTripsAndVMT	HaulingTripNumber	0.00	2,116.00
tblTripsAndVMT	WorkerTripLength	10.80	10.00
tblTripsAndVMT	WorkerTripLength	10.80	50.00
tblTripsAndVMT	WorkerTripLength	10.80	10.00
tblTripsAndVMT	WorkerTripLength	10.80	10.00
tblTripsAndVMT	WorkerTripLength	10.80	10.00

tblTripsAndVMT	WorkerTripLength	10.80	10.00
tblTripsAndVMT	WorkerTripNumber	0.00	38.00
tblTripsAndVMT	WorkerTripNumber	18.00	130.00
tblTripsAndVMT	WorkerTripNumber	33.00	38.00
tblTripsAndVMT	WorkerTripNumber	0.00	38.00
tblTripsAndVMT	WorkerTripNumber	0.00	38.00
tblTripsAndVMT	WorkerTripNumber	0.00	38.00
tblVehicleTrips	CC_TL	7.30	50.00
tblVehicleTrips	CC_TTP	28.00	0.00
tblVehicleTrips	CNW_TL	7.30	50.00
tblVehicleTrips	CNW_TTP	13.00	0.00
tblVehicleTrips	CW_TL	9.50	50.00
tblVehicleTrips	CW_TTP	59.00	0.00
tblVehicleTrips	DV_TP	5.00	0.00
tblVehicleTrips	HO_TL	0.00	50.00
tblVehicleTrips	HS_TL	0.00	50.00
tblVehicleTrips	HW_TL	0.00	50.00
tblVehicleTrips	HW_TTP	0.00	100.00
tblVehicleTrips	PB_TP	3.00	0.00
tblVehicleTrips	PR_TP	92.00	100.00
tblVehicleTrips	ST_TR	1.50	24.00
tblVehicleTrips	SU_TR	1.50	24.00
tblVehicleTrips	WD_TR	1.50	24.00
tblWater	IndoorWaterUseRate	231,250.00	1,825,000.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	1.3550	16.7299	12.0863	0.0500	99.6669	0.5096	100.1765	10.3644	0.4728	10.8372	0.0000	4,609.6301	4,609.6301	0.4696	0.0000	4,621.3704
Maximum	**1.3550**	**16.7299**	**12.0863**	**0.0500**	**99.6669**	**0.5096**	**100.1765**	**10.3644**	**0.4728**	**10.8372**	**0.0000**	**4,609.6301**	**4,609.6301**	**0.4696**	**0.0000**	**4,621.3704**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2022	0.6316	8.2202	13.2494	0.0500	10.9263	0.0613	10.9876	1.3827	0.0597	1.4424	0.0000	4,609.6284	4,609.6284	0.4696	0.0000	4,621.3686
Maximum	**0.6316**	**8.2202**	**13.2494**	**0.0500**	**10.9263**	**0.0613**	**10.9876**	**1.3827**	**0.0597**	**1.4424**	**0.0000**	**4,609.6284**	**4,609.6284**	**0.4696**	**0.0000**	**4,621.3686**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**53.39**	**50.87**	**-9.62**	**0.00**	**89.04**	**87.97**	**89.03**	**86.66**	**87.38**	**86.69**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	4-1-2022	6-30-2022	8.0979	4.5220
2	7-1-2022	9-30-2022	7.3617	3.1861
		Highest	8.0979	4.5220

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	3.6795	3.6795	1.4000e-004	4.0000e-005	3.6962
Mobile	0.0272	0.2436	0.4579	2.1800e-003	9.9070	1.8800e-003	9.9089	1.0129	1.7700e-003	1.0146	0.0000	201.1752	201.1752	5.5100e-003	0.0000	201.3128
Offroad	0.0694	0.7178	0.4879	1.0800e-003		0.0349	0.0349		0.0321	0.0321	0.0000	94.9364	94.9364	0.0307	0.0000	95.7040
Stationary	0.0220	0.0615	0.0561	1.1000e-004		3.2300e-003	3.2300e-003		3.2300e-003	3.2300e-003	0.0000	10.2054	10.2054	1.4300e-003	0.0000	10.2411
Waste						0.0000	0.0000		0.0000	0.0000	0.2517	0.0000	0.2517	0.0149	0.0000	0.6236
Water						0.0000	0.0000		0.0000	0.0000	0.5790	2.8728	3.4518	0.0596	1.4300e-003	5.3682
Total	**0.1237**	**1.0238**	**1.0027**	**3.3800e-003**	**9.9070**	**0.0401**	**9.9470**	**1.0129**	**0.0372**	**1.0500**	**0.8307**	**312.8693**	**313.7000**	**0.1123**	**1.4700e-003**	**316.9459**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	3.6795	3.6795	1.4000e-004	4.0000e-005	3.6962
Mobile	0.0272	0.2436	0.4579	2.1800e-003	9.9070	1.8800e-003	9.9089	1.0129	1.7700e-003	1.0146	0.0000	201.1752	201.1752	5.5100e-003	0.0000	201.3128
Offroad	0.0694	0.7178	0.4879	1.0800e-003		0.0349	0.0349		0.0321	0.0321	0.0000	94.9364	94.9364	0.0307	0.0000	95.7040
Stationary	0.0220	0.0615	0.0561	1.1000e-004		3.2300e-003	3.2300e-003		3.2300e-003	3.2300e-003	0.0000	10.2054	10.2054	1.4300e-003	0.0000	10.2411
Waste						0.0000	0.0000		0.0000	0.0000	0.2517	0.0000	0.2517	0.0149	0.0000	0.6236
Water						0.0000	0.0000		0.0000	0.0000	0.5790	2.8728	3.4518	0.0596	1.4300e-003	5.3682
Total	**0.1237**	**1.0238**	**1.0027**	**3.3800e-003**	**9.9070**	**0.0401**	**9.9470**	**1.0129**	**0.0372**	**1.0500**	**0.8307**	**312.8693**	**313.7000**	**0.1123**	**1.4700e-003**	**316.9459**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Fountain Wind Project - Second Year - Shasta County, Annual

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Turbine and Transformer Installation	Building Construction	4/1/2022	8/18/2022	6	100	
2	Substation and O&M Building Installation	Site Preparation	4/15/2022	11/24/2022	6	160	
3	Underground Collector System	Site Preparation	4/30/2022	11/11/2022	6	140	
4	Overhead Collector System	Building Construction	7/4/2022	11/18/2022	6	100	
5	Transmission Line Connection	Building Construction	9/14/2022	10/11/2022	6	20	
6	Substation Aggregate and Security Fence	Building Construction	11/25/2022	12/15/2022	6	15	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Fountain Wind Project - Second Year - Shasta County, Annual

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Turbine and Transformer Installation	Cranes	6	4.00	231	0.29
Turbine and Transformer Installation	Cranes	4	4.00	350	0.29
Turbine and Transformer Installation	Generator Sets	4	8.00	84	0.74
Turbine and Transformer Installation	Rough Terrain Forklifts	10	8.00	100	0.40
Turbine and Transformer Installation	Rubber Tired Dozers	2	8.00	247	0.40
Substation and O&M Building Installation	Cranes	2	4.00	231	0.29
Substation and O&M Building Installation	Rough Terrain Forklifts	3	8.00	100	0.40
Substation and O&M Building Installation	Skid Steer Loaders	2	8.00	65	0.37
Underground Collector System	Rough Terrain Forklifts	4	8.00	100	0.40
Underground Collector System	Rubber Tired Dozers	1	8.00	247	0.40
Underground Collector System	Skid Steer Loaders	4	8.00	65	0.37
Underground Collector System	Trenchers	4	8.00	78	0.50
Overhead Collector System	Aerial Lifts	6	8.00	63	0.31
Overhead Collector System	Cranes	2	4.00	231	0.29
Overhead Collector System	Other Construction Equipment	3	8.00	172	0.42
Overhead Collector System	Rubber Tired Dozers	1	8.00	247	0.40
Overhead Collector System	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Transmission Line Connection	Aerial Lifts	6	4.00	63	0.31
Transmission Line Connection	Cranes	6	4.00	231	0.29
Transmission Line Connection	Excavators	2	8.00	158	0.38
Transmission Line Connection	Other Construction Equipment	4	8.00	172	0.42
Transmission Line Connection	Rubber Tired Dozers	1	8.00	247	0.40
Substation Aggregate and Security Fence	Skid Steer Loaders	1	8.00	65	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Turbine and Transformer Installatio	26	38.00	0.00	5,336.00	10.00	7.30	258.00	LD_Mix	HDT_Mix	HHDT
Substation and O&M Building Installation	7	130.00	0.00	364.00	50.00	7.30	50.00	LD_Mix	HDT_Mix	HHDT
Underground Collector System	13	38.00	0.00	0.00	10.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Overhead Collector System	16	38.00	0.00	0.00	10.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Transmission Line Connection	19	38.00	0.00	0.00	10.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Substation Aggregate and Security Fence	1	38.00	0.00	2,116.00	10.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Turbine and Transformer Installation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.3700	4.0210	3.5009	6.7600e-003		0.1728	0.1728		0.1618	0.1618	0.0000	590.6206	590.6206	0.1536	0.0000	594.4604
Total	**0.3700**	**4.0210**	**3.5009**	**6.7600e-003**		**0.1728**	**0.1728**		**0.1618**	**0.1618**	**0.0000**	**590.6206**	**590.6206**	**0.1536**	**0.0000**	**594.4604**

3.2 Turbine and Transformer Installation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.2114	5.9066	1.1365	0.0273	16.3062	0.0300	16.3362	1.7349	0.0287	1.7636	0.0000	2,596.9352	2,596.9352	0.0212	0.0000	2,597.4647
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.7000e-003	5.6200e-003	0.0557	1.6000e-004	8.3371	1.2000e-004	8.3372	0.8340	1.1000e-004	0.8341	0.0000	14.2469	14.2469	4.2000e-004	0.0000	14.2574
Total	**0.2191**	**5.9122**	**1.1922**	**0.0275**	**24.6433**	**0.0301**	**24.6734**	**2.5689**	**0.0288**	**2.5977**	**0.0000**	**2,611.1821**	**2,611.1821**	**0.0216**	**0.0000**	**2,611.7220**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0794	0.3440	3.9402	6.7600e-003		0.0106	0.0106		0.0106	0.0106	0.0000	590.6199	590.6199	0.1536	0.0000	594.4597
Total	**0.0794**	**0.3440**	**3.9402**	**6.7600e-003**		**0.0106**	**0.0106**		**0.0106**	**0.0106**	**0.0000**	**590.6199**	**590.6199**	**0.1536**	**0.0000**	**594.4597**

3.2 Turbine and Transformer Installation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.2114	5.9066	1.1365	0.0273	2.1363	0.0300	2.1663	0.3207	0.0287	0.3494	0.0000	2,596.9352	2,596.9352	0.0212	0.0000	2,597.4647
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.7000e-003	5.6200e-003	0.0557	1.6000e-004	0.8275	1.2000e-004	0.8276	0.0846	1.1000e-004	0.0847	0.0000	14.2469	14.2469	4.2000e-004	0.0000	14.2574
Total	**0.2191**	**5.9122**	**1.1922**	**0.0275**	**2.9638**	**0.0301**	**2.9939**	**0.4053**	**0.0288**	**0.4341**	**0.0000**	**2,611.1821**	**2,611.1821**	**0.0216**	**0.0000**	**2,611.7220**

3.3 Substation and O&M Building Installation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0814	1.0063	1.1071	1.9400e-003		0.0382	0.0382		0.0351	0.0351	0.0000	170.7722	170.7722	0.0552	0.0000	172.1530
Total	**0.0814**	**1.0063**	**1.1071**	**1.9400e-003**	**0.0000**	**0.0382**	**0.0382**	**0.0000**	**0.0351**	**0.0351**	**0.0000**	**170.7722**	**170.7722**	**0.0552**	**0.0000**	**172.1530**

3.3 Substation and O&M Building Installation - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.1500e-003	0.0957	0.0167	3.9000e-004	1.2534	4.1000e-004	1.2538	0.1264	3.9000e-004	0.1268	0.0000	36.6350	36.6350	9.4000e-004	0.0000	36.6586
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1585	0.1348	1.2607	4.2000e-003	43.1488	2.8900e-003	43.1516	4.3773	2.6600e-003	4.3800	0.0000	380.1682	380.1682	0.0102	0.0000	380.4221
Total	**0.1616**	**0.2304**	**1.2774**	**4.5900e-003**	**44.4021**	**3.3000e-003**	**44.4054**	**4.5037**	**3.0500e-003**	**4.5068**	**0.0000**	**416.8032**	**416.8032**	**0.0111**	**0.0000**	**417.0807**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0288	0.3055	1.3026	1.9400e-003		3.1800e-003	3.1800e-003		3.1800e-003	3.1800e-003	0.0000	170.7720	170.7720	0.0552	0.0000	172.1528
Total	**0.0288**	**0.3055**	**1.3026**	**1.9400e-003**	**0.0000**	**3.1800e-003**	**3.1800e-003**	**0.0000**	**3.1800e-003**	**3.1800e-003**	**0.0000**	**170.7720**	**170.7720**	**0.0552**	**0.0000**	**172.1528**

3.3 Substation and O&M Building Installation - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.1500e-003	0.0957	0.0167	3.9000e-004	0.1294	4.1000e-004	0.1298	0.0142	3.9000e-004	0.0146	0.0000	36.6350	36.6350	9.4000e-004	0.0000	36.6586
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.1585	0.1348	1.2607	4.2000e-003	4.6126	2.8900e-003	4.6155	0.5313	2.6600e-003	0.5340	0.0000	380.1682	380.1682	0.0102	0.0000	380.4221
Total	**0.1616**	**0.2304**	**1.2774**	**4.5900e-003**	**4.7420**	**3.3000e-003**	**4.7453**	**0.5456**	**3.0500e-003**	**0.5486**	**0.0000**	**416.8032**	**416.8032**	**0.0111**	**0.0000**	**417.0807**

3.4 Underground Collector System - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.5059	0.0000	0.5059	0.2781	0.0000	0.2781	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.2536	2.6836	2.4091	3.7000e-003		0.1445	0.1445		0.1329	0.1329	0.0000	325.4969	325.4969	0.1053	0.0000	328.1287
Total	**0.2536**	**2.6836**	**2.4091**	**3.7000e-003**	**0.5059**	**0.1445**	**0.6503**	**0.2781**	**0.1329**	**0.4110**	**0.0000**	**325.4969**	**325.4969**	**0.1053**	**0.0000**	**328.1287**

3.4 Underground Collector System - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0108	7.8700e-003	0.0780	2.2000e-004	11.6719	1.6000e-004	11.6721	1.1676	1.5000e-004	1.1678	0.0000	19.9457	19.9457	5.8000e-004	0.0000	19.9603
Total	**0.0108**	**7.8700e-003**	**0.0780**	**2.2000e-004**	**11.6719**	**1.6000e-004**	**11.6721**	**1.1676**	**1.5000e-004**	**1.1678**	**0.0000**	**19.9457**	**19.9457**	**5.8000e-004**	**0.0000**	**19.9603**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2276	0.0000	0.2276	0.1251	0.0000	0.1251	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0540	0.5503	2.5815	3.7000e-003		6.0600e-003	6.0600e-003		6.0600e-003	6.0600e-003	0.0000	325.4965	325.4965	0.1053	0.0000	328.1284
Total	**0.0540**	**0.5503**	**2.5815**	**3.7000e-003**	**0.2276**	**6.0600e-003**	**0.2337**	**0.1251**	**6.0600e-003**	**0.1312**	**0.0000**	**325.4965**	**325.4965**	**0.1053**	**0.0000**	**328.1284**

3.4 Underground Collector System - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0108	7.8700e-003	0.0780	2.2000e-004	1.1585	1.6000e-004	1.1586	0.1184	1.5000e-004	0.1185	0.0000	19.9457	19.9457	5.8000e-004	0.0000	19.9603
Total	**0.0108**	**7.8700e-003**	**0.0780**	**2.2000e-004**	**1.1585**	**1.6000e-004**	**1.1586**	**0.1184**	**1.5000e-004**	**0.1185**	**0.0000**	**19.9457**	**19.9457**	**5.8000e-004**	**0.0000**	**19.9603**

3.5 Overhead Collector System - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1912	2.0520	1.9665	3.2900e-003		0.0959	0.0959		0.0882	0.0882	0.0000	289.4022	289.4022	0.0936	0.0000	291.7421
Total	**0.1912**	**2.0520**	**1.9665**	**3.2900e-003**		**0.0959**	**0.0959**		**0.0882**	**0.0882**	**0.0000**	**289.4022**	**289.4022**	**0.0936**	**0.0000**	**291.7421**

3.5 Overhead Collector System - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.6400e-003	5.5700e-003	0.0553	1.6000e-004	8.2676	1.2000e-004	8.2677	0.8271	1.1000e-004	0.8272	0.0000	14.1282	14.1282	4.1000e-004	0.0000	14.1386
Total	**7.6400e-003**	**5.5700e-003**	**0.0553**	**1.6000e-004**	**8.2676**	**1.2000e-004**	**8.2677**	**0.8271**	**1.1000e-004**	**0.8272**	**0.0000**	**14.1282**	**14.1282**	**4.1000e-004**	**0.0000**	**14.1386**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0479	0.4805	2.2366	3.2900e-003		5.4000e-003	5.4000e-003		5.4000e-003	5.4000e-003	0.0000	289.4018	289.4018	0.0936	0.0000	291.7418
Total	**0.0479**	**0.4805**	**2.2366**	**3.2900e-003**		**5.4000e-003**	**5.4000e-003**		**5.4000e-003**	**5.4000e-003**	**0.0000**	**289.4018**	**289.4018**	**0.0936**	**0.0000**	**291.7418**

3.5 Overhead Collector System - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.6400e-003	5.5700e-003	0.0553	1.6000e-004	0.8206	1.2000e-004	0.8207	0.0838	1.1000e-004	0.0840	0.0000	14.1282	14.1282	4.1000e-004	0.0000	14.1386
Total	**7.6400e-003**	**5.5700e-003**	**0.0553**	**1.6000e-004**	**0.8206**	**1.2000e-004**	**0.8207**	**0.0838**	**1.1000e-004**	**0.0840**	**0.0000**	**14.1282**	**14.1282**	**4.1000e-004**	**0.0000**	**14.1386**

3.6 Transmission Line Connection - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0477	0.5021	0.4216	7.9000e-004		0.0233	0.0233		0.0214	0.0214	0.0000	69.5057	69.5057	0.0225	0.0000	70.0677
Total	**0.0477**	**0.5021**	**0.4216**	**7.9000e-004**		**0.0233**	**0.0233**		**0.0214**	**0.0214**	**0.0000**	**69.5057**	**69.5057**	**0.0225**	**0.0000**	**70.0677**

3.6 Transmission Line Connection - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.5400e-003	1.1200e-003	0.0111	3.0000e-005	1.6674	2.0000e-005	1.6674	0.1668	2.0000e-005	0.1668	0.0000	2.8494	2.8494	8.0000e-005	0.0000	2.8515
Total	**1.5400e-003**	**1.1200e-003**	**0.0111**	**3.0000e-005**	**1.6674**	**2.0000e-005**	**1.6674**	**0.1668**	**2.0000e-005**	**0.1668**	**0.0000**	**2.8494**	**2.8494**	**8.0000e-005**	**0.0000**	**2.8515**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0105	0.0730	0.5058	7.9000e-004		1.3000e-003	1.3000e-003		1.3000e-003	1.3000e-003	0.0000	69.5056	69.5056	0.0225	0.0000	70.0676
Total	**0.0105**	**0.0730**	**0.5058**	**7.9000e-004**		**1.3000e-003**	**1.3000e-003**		**1.3000e-003**	**1.3000e-003**	**0.0000**	**69.5056**	**69.5056**	**0.0225**	**0.0000**	**70.0676**

3.6 Transmission Line Connection - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.5400e-003	1.1200e-003	0.0111	3.0000e-005	0.1655	2.0000e-005	0.1655	0.0169	2.0000e-005	0.0169	0.0000	2.8494	2.8494	8.0000e-005	0.0000	2.8515
Total	**1.5400e-003**	**1.1200e-003**	**0.0111**	**3.0000e-005**	**0.1655**	**2.0000e-005**	**0.1655**	**0.0169**	**2.0000e-005**	**0.0169**	**0.0000**	**2.8494**	**2.8494**	**8.0000e-005**	**0.0000**	**2.8515**

3.7 Substation Aggregate and Security Fence - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.3000e-004	8.3600e-003	0.0125	2.0000e-005		3.1000e-004	3.1000e-004		2.9000e-004	2.9000e-004	0.0000	1.6361	1.6361	5.3000e-004	0.0000	1.6494
Total	**6.3000e-004**	**8.3600e-003**	**0.0125**	**2.0000e-005**		**3.1000e-004**	**3.1000e-004**		**2.9000e-004**	**2.9000e-004**	**0.0000**	**1.6361**	**1.6361**	**5.3000e-004**	**0.0000**	**1.6494**

3.7 Substation Aggregate and Security Fence - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	8.8700e-003	0.2984	0.0462	1.0000e-003	7.2581	1.0100e-003	7.2591	0.7271	9.7000e-004	0.7280	0.0000	95.1508	95.1508	5.0700e-003	0.0000	95.2774
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1600e-003	8.4000e-004	8.3600e-003	2.0000e-005	1.2506	2.0000e-005	1.2506	0.1251	2.0000e-005	0.1251	0.0000	2.1370	2.1370	6.0000e-005	0.0000	2.1386
Total	**0.0100**	**0.2993**	**0.0546**	**1.0200e-003**	**8.5087**	**1.0300e-003**	**8.5097**	**0.8522**	**9.9000e-004**	**0.8531**	**0.0000**	**97.2878**	**97.2878**	**5.1300e-003**	**0.0000**	**97.4160**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.6000e-004	0.0105	0.0141	2.0000e-005		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	1.6361	1.6361	5.3000e-004	0.0000	1.6494
Total	**4.6000e-004**	**0.0105**	**0.0141**	**2.0000e-005**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**	**0.0000**	**1.6361**	**1.6361**	**5.3000e-004**	**0.0000**	**1.6494**

3.7 Substation Aggregate and Security Fence - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	8.8700e-003	0.2984	0.0462	1.0000e-003	0.7243	1.0100e-003	0.7253	0.0750	9.7000e-004	0.0759	0.0000	95.1508	95.1508	5.0700e-003	0.0000	95.2774
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1600e-003	8.4000e-004	8.3600e-003	2.0000e-005	0.1241	2.0000e-005	0.1241	0.0127	2.0000e-005	0.0127	0.0000	2.1370	2.1370	6.0000e-005	0.0000	2.1386
Total	**0.0100**	**0.2993**	**0.0546**	**1.0200e-003**	**0.8484**	**1.0300e-003**	**0.8494**	**0.0876**	**9.9000e-004**	**0.0886**	**0.0000**	**97.2878**	**97.2878**	**5.1300e-003**	**0.0000**	**97.4160**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0272	0.2436	0.4579	2.1800e-003	9.9070	1.8800e-003	9.9089	1.0129	1.7700e-003	1.0146	0.0000	201.1752	201.1752	5.5100e-003	0.0000	201.3128
Unmitigated	0.0272	0.2436	0.4579	2.1800e-003	9.9070	1.8800e-003	9.9089	1.0129	1.7700e-003	1.0146	0.0000	201.1752	201.1752	5.5100e-003	0.0000	201.3128

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	24.00	24.00	24.00	436,800	436,800
Total	24.00	24.00	24.00	436,800	436,800

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	50.00	50.00	50.00	0.00	0.00	0.00	100	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Heavy Industry	0.531326	0.031853	0.180854	0.102256	0.028681	0.006074	0.012848	0.095604	0.001329	0.001212	0.005444	0.001276	0.001244

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	2.5658	2.5658	1.2000e-004	2.0000e-005	2.5759
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	2.5658	2.5658	1.2000e-004	2.0000e-005	2.5759
NaturalGas Mitigated	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	1.1137	1.1137	2.0000e-005	2.0000e-005	1.1203
NaturalGas Unmitigated	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	1.1137	1.1137	2.0000e-005	2.0000e-005	1.1203

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	20870	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	1.1137	1.1137	2.0000e-005	2.0000e-005	1.1203
Total		**1.1000e-004**	**1.0200e-003**	**8.6000e-004**	**1.0000e-005**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**1.1137**	**1.1137**	**2.0000e-005**	**2.0000e-005**	**1.1203**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	20870	1.1000e-004	1.0200e-003	8.6000e-004	1.0000e-005		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005	0.0000	1.1137	1.1137	2.0000e-005	2.0000e-005	1.1203
Total		**1.1000e-004**	**1.0200e-003**	**8.6000e-004**	**1.0000e-005**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**	**0.0000**	**1.1137**	**1.1137**	**2.0000e-005**	**2.0000e-005**	**1.1203**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	8820	2.5658	1.2000e-004	2.0000e-005	2.5759
Total		**2.5658**	**1.2000e-004**	**2.0000e-005**	**2.5759**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	8820	2.5658	1.2000e-004	2.0000e-005	2.5759
Total		**2.5658**	**1.2000e-004**	**2.0000e-005**	**2.5759**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Unmitigated	5.0700e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.1600e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.9100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**5.0700e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.1600e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.9100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**5.0700e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	3.4518	0.0596	1.4300e-003	5.3682
Unmitigated	3.4518	0.0596	1.4300e-003	5.3682

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	1.825 / 0	3.4518	0.0596	1.4300e-003	5.3682
Total		**3.4518**	**0.0596**	**1.4300e-003**	**5.3682**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	1.825 / 0	3.4518	0.0596	1.4300e-003	5.3682
Total		**3.4518**	**0.0596**	**1.4300e-003**	**5.3682**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.2517	0.0149	0.0000	0.6236
Unmitigated	0.2517	0.0149	0.0000	0.6236

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	1.24	0.2517	0.0149	0.0000	0.6236
Total		**0.2517**	**0.0149**	**0.0000**	**0.6236**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	1.24	0.2517	0.0149	0.0000	0.6236
Total		**0.2517**	**0.0149**	**0.0000**	**0.6236**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
Cranes	2	4.00	260	231	0.29	Diesel
Sweepers/Scrubbers	2	4.00	260	64	0.46	Diesel

UnMitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Cranes	0.0457	0.4960	0.2385	7.5000e-004		0.0207	0.0207		0.0191	0.0191	0.0000	65.9038	65.9038	0.0213	0.0000	66.4367
Sweepers/Scrubbers	0.0237	0.2218	0.2494	3.3000e-004		0.0141	0.0141		0.0130	0.0130	0.0000	29.0326	29.0326	9.3900e-003	0.0000	29.2673
Total	**0.0694**	**0.7178**	**0.4879**	**1.0800e-003**		**0.0349**	**0.0349**		**0.0321**	**0.0321**	**0.0000**	**94.9364**	**94.9364**	**0.0307**	**0.0000**	**95.7040**

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	1	2	100	268	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Emergency Generator - Diesel (175 - 300 HP)	0.0220	0.0615	0.0561	1.1000e-004		3.2300e-003	3.2300e-003		3.2300e-003	3.2300e-003	0.0000	10.2054	10.2054	1.4300e-003	0.0000	10.2411
Total	**0.0220**	**0.0615**	**0.0561**	**1.1000e-004**		**3.2300e-003**	**3.2300e-003**		**3.2300e-003**	**3.2300e-003**	**0.0000**	**10.2054**	**10.2054**	**1.4300e-003**	**0.0000**	**10.2411**

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C1. Site Characterization Study Report

SITE CHARACTERIZATION STUDY REPORT

Fountain Wind Project
Shasta County, California

Prepared for:

Pacific Wind Development, LLC

Prepared by:

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January 2017

EXECUTIVE SUMMARY

Pacific Wind Development, LLC (Pacific Wind) is considering development of a wind energy facility in northern California, referred to as the Fountain Wind Project (Project). The proposed Project encompasses approximately 32,600 acres (50.9 square miles [mi^2]) of private land in central Shasta County. An initial Site Characterization Study (SCS), which identified potential environmental risks and considerations in the siting of the Project (previously referred to as the McCloud Wind Resource Area), was conducted in 2011 but never released. Since that time, Pacific Wind has refined the project boundary and layout in an effort to avoid potential impacts to environmentally sensitive resources. The objective of this revised SCS is to provide information needed to address questions posed under Tier 1 (Preliminary Site Evaluation) and Tier 2 (Site Characterization) of the United States Fish and Wildlife Service (USFWS) Land-Based Wind Energy Guidelines. The information contained herein reflects a desktop analysis of publicly available information that pertains to plants, animals, and habitat features, within the refined 2017 Project boundary, that may be important considerations during the initial stages of Project planning and development. Environmental resources within the Project boundary (Project Area) and the surrounding 2-mile (3.2-kilometer [km]) buffer (Evaluation Area) were examined through a search of existing data. In addition, an initial reconnaissance-level site visit was conducted in October, 2016, to provide additional cursory, baseline information on landscape and habitat features potentially important during Project development.

The dominant vegetation community within the Project and Evaluation Areas is early seral mixed coniferous forest (post-fire and unburned) with smaller amounts of mixed montane chaparral, logged areas, and mixed montane riparian forest/scrub. Late seral forest is lacking primarily due to effects from fire and management for timber production. Based on review of state and federal databases, no state- or federal-listed or candidate plant species are known to occur within the Project or Evaluation Areas, and only one listed plant species, slender Orcutt grass, is known to occur within 10 miles (16 km) of the Project Area; however, suitable vernal pool habitat appears absent from the Project Area and this species is unlikely to occur. Four plant species designated as rare or sensitive by the California Native Plant Society (CNPS) have been documented within the Project Area, and based on habitats present, several other CNPS-sensitive plants have at least some potential to occur. No sensitive habitats or sensitive river drainages are known to occur within the Project or Evaluation Areas, however, two sensitive habitats, alkali seep and northern interior cypress forest, have at least some potential to occur.

There are 17 diurnal raptor species, 11 owl species, and one vulture species that may occur in or near the Project Area at some point during the year. Of the raptor and vulture species with potential to occur within the Project Area, one species is state endangered (bald eagle), one species is state threatened (Swainson's hawk), three species are state fully protected (golden eagle, American peregrine falcon, and white-tailed kite), four species are state Species of Special Concern (SSC; northern harrier, northern goshawk, California spotted owl, and long-eared owl), and four species are maintained on the California Department of Fish and Wildlife's

(CDFW) watch list (Cooper's hawk, ferruginous hawk, merlin, prairie falcon, osprey, and sharp-shinned hawk). Nesting habitat for forest-dependent raptor species is present within the Project Area.

Seventeen bat species have the potential to occur in and around the Project Area. The likelihood of occurrence for these species varies as most prefer habitat with particular characteristics during certain different life history stages (e.g., breeding, roosting, drinking, and migrating). Five of these species are considered California SSC by the CDFW including: pallid bat, spotted bat, Townsend's big-eared bat, western red bat, and western mastiff bat. None of these species are considered threatened or endangered by the USFWS.

The USFWS lists seven species protected by, or under review through, the Endangered Species Act with at least some potential (i.e., unlikely, possible, or likely) to occur in the Project Area: Yellow-billed cuckoo, gray wolf, Sierra Nevada red fox, western pond turtle, California red-legged frog, Shasta crayfish, and Valley elderberry longhorn beetle. Eight state listed or fully protected birds (American peregrine falcon, bald eagle, bank swallow, golden eagle, greater sandhill crane, Swainson's hawk, tricolored blackbird, and willow flycatcher), three state listed mammals (Sierra Nevada red fox, gray wolf, and California wolverine), one amphibian (Shasta salamander), and one invertebrate (Shasta crayfish) have at least some potential to occur in the Project Area. Additionally, 29 species designated as state SSC or watch list species have at least some potential to occur in the Project Area including 13 birds, nine mammals, five amphibians, one reptile, and one fish.

Based on this SCS, significant adverse impacts to species of concern are not anticipated; however, due to the potential for occurrence of some sensitive plant and wildlife species within the Project Area, it is recommended that Tier 3 site-specific studies be conducted to further refine potential risk assessments for these species. The following Tier 3 studies are recommended prior to construction in order to more clearly assess the potential risk to sensitive plants and wildlife: year-round large bird/eagle use surveys, small bird use surveys, raptor nest surveys with particular emphasis on bald and golden eagles, bat acoustic surveys, and a habitat assessment/rare plant survey. Additional species-specific surveys may be warranted following consultation with wildlife agencies and a more detailed habitat assessment.

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INTRODUCTION

Pacific Wind Development, LLC (Pacific Wind) is considering development of a wind energy facility in central Shasta County, California referred to as the Fountain Wind Project (Project). Many wind energy developers now choose to utilize the United States Fish and Wildlife Service (USFWS) voluntary wind project development guidelines, which provide a template for a staged planning process when exploring a potential wind energy project. The Land-based Wind Energy Guidelines (WEG; USFWS 2012a) are intended to function in concert with the USFWS Eagle Conservation Plan Guidance (ECPG; USFWS 2013), and promote intentional tiered project development which strategically minimizes impacts to wildlife. This tiered approach includes: Tier 1 - Preliminary Site Evaluation; Tier 2 - Site Characterization; Tier 3 - Field Studies to Document Site Wildlife and Habitat and Predict Project Impacts; Tier 4 - Post-construction Studies to Document Impacts; Tier 5 - Other Post-construction Studies.

In 2011, prior to the release of the WEG, an initial Site Characterization Study (SCS), which identified potential environmental risks and considerations in the early siting of the Project (previously referred to as the McCloud Wind Resource Area), was prepared but never released. Since that time, Pacific Wind has refined the Project boundary and layout in an effort to avoid potential impacts to environmentally sensitive resources. The original 2011 project boundary in relation to the current (2017) Project boundary is illustrated in Figure 1. In late 2016, Pacific Wind contracted Western Ecosystems Technology, Inc. (WEST) to prepare a revised SCS to describe and evaluate environmental resources within the refined Fountain Wind Project (Project Area) and the surrounding 2-mile (mi; 3.2-kilometer [km]) buffer (Evaluation Area; Figure 2) to address questions posed under Tier 1 and Tier 2 of the WEG. The overall purpose of this revised SCS is to identify the biotic and abiotic environmental characteristics of the Project and Evaluation Areas, evaluate potential impacts to these resources from wind energy development, and inform whether additional environmental resource surveys or assessments are warranted. Identification of resource issues early in the planning process allows developers of wind energy facilities to identify, avoid, and minimize future problems which may occur.

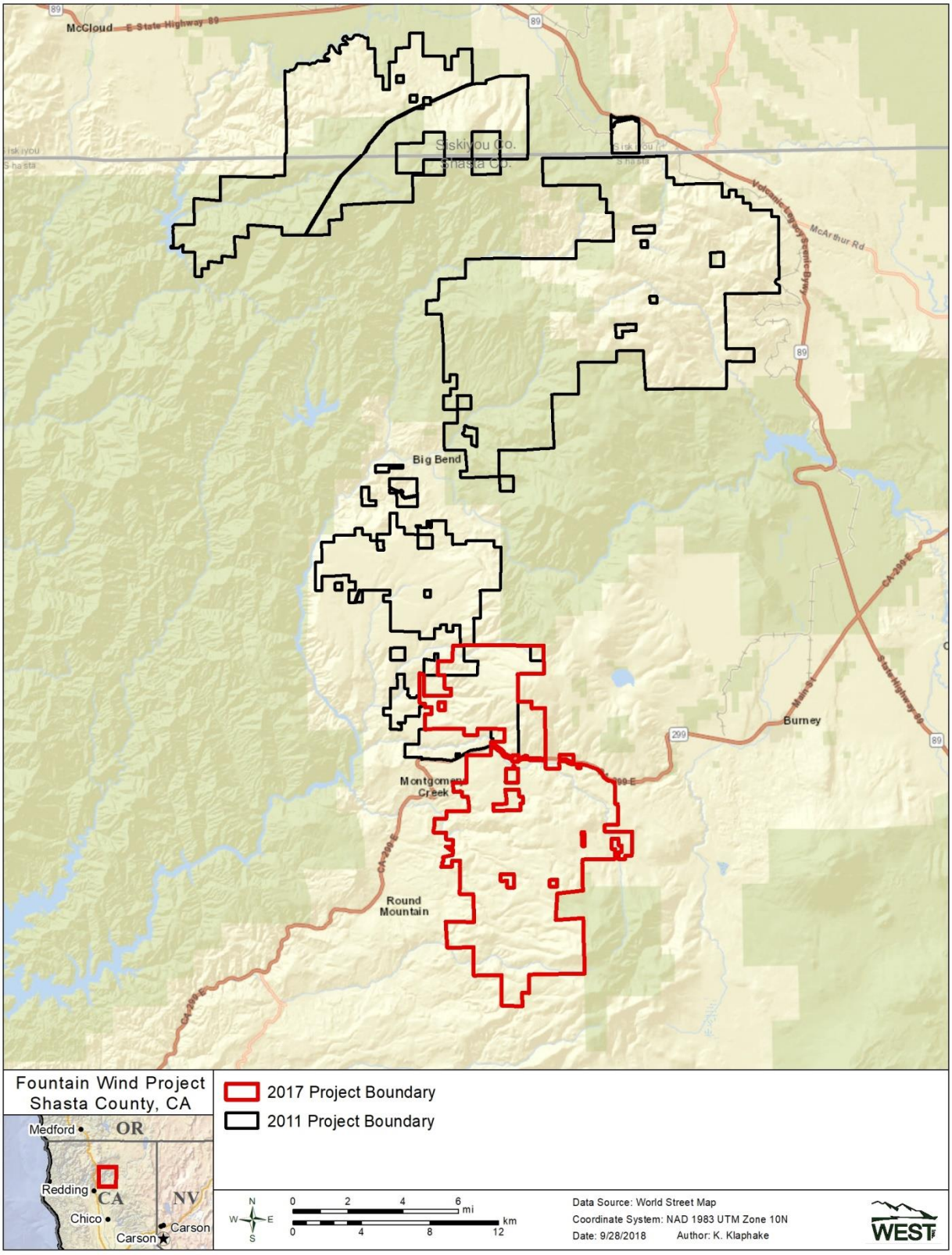


Figure 1. Location of the Fountain Wind Project in relation to the original 2011 project boundary (previously referred to as the McCloud Wind Resource Area).

STUDY AREA

The Project Area currently encompasses approximately 32,600 acres (50.9 square miles [mi^2]) within Shasta County in northern California west of the community of Burney and northeast of the larger community of Redding (Figure 2). The east-west running California State Route 299 bisects the northern portion of the Project Area, and the Hatchet Ridge Wind Farm (Hatchet Ridge), in operation since 2010, is located immediately to the north and east. The Lassen National Forest is located to the southeast of the Project and the Shasta-Trinity National Forest is located to the north and east (Figure 2). The Project Area is privately owned and actively managed for timber production.

The proposed Project falls within the Cascades Ecological Region (ecoregion; Griffith et al. 2016), which is a Level III ecoregion primarily covering parts of Oregon and Washington but also including a discontinuous land area near Mt. Shasta in California. This ecoregion is characterized by underlying volcanic rock strata and a physiography defined by recurring periods of glaciation. With high plateaus and valleys that trend east, this ecoregion includes steep ridges as well as both active and dormant volcanoes, and is marked by a generally mesic, temperate climate which supports productive coniferous forests. At higher elevations, subalpine meadows provide habitat for unique flora and fauna.

Topography within the Project Area is characterized by gently rolling hills that transition to relatively steep, low mountains, with elevations ranging from approximately 2,156 feet (ft; 657 meters [m]) in the southwestern corner of the Project Area to 6,814 ft (2,077 m) near Snow Mountain in the southeast (Figures 3 and 4). Significant waterways within the Project Area include the north and south forks of Montgomery Creek. The dominant vegetation community within the Project is Sierran mixed conifer forest; however, the structure and species composition of this community varies greatly with slope, aspect, elevation, and disturbance (e.g., fire and forest management). Dominant overstory species include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*).

The site drains to the north and west into the Pit River and Sacramento River watersheds. A number of permanent and intermittent streams run throughout the Project Area, flowing primarily to the west and northwest. The primary drainages in the north are Hatchet Creek and Montgomery Creek (north and south forks), while Cedar Creek and Little Cow Creek drain the southern portions of the Project Area. Riparian vegetation along these creeks includes various willow species (*Salix* spp.), thinleaf alder (*Alnus incana* ssp. *tenuifolia*), several species of maple (*Acer* spp.), mountain dogwood (*Cornus nuttallii*), and California hazel (*Corylus cornata* var. *californica*). Soils within the Project Area are primarily composed of the Cohasset, Windy, McCarthy and Lyonsville-Jiggs series and range from stony to clay loams that have formed in

residuum weathered from volcanic rock (USDA Natural Resources Conservation Service [NRCS] 2017).

Modern land use of the Project Area is primarily management for timber production. Timber management and harvest operations are currently being conducted primarily within the southern half of the site. As such, the entire Project Area is essentially a managed forest system (see Figure 5). In late August, 1992, the Fountain Fire burned approximately 64,000 acres (100 mi^2) in and around the Project, including an area encompassing the central half of the Project (see Figures 5 and 6). Post-fire management included salvage logging, site preparation, and planting in the year following the fire. Within 5 years of the fire, approximately 17 million seedlings were planted in areas previously supporting timber (Zhang et al. 2008). Species planted included ponderosa pine, Douglas-fir, and white fir at 10-ft (3.0-m) spacing, with incense cedar planted along stream buffers. To reduce competition for (tree) seedling establishment, growth regulator herbicides were applied in many areas that had been colonized by manzanita (*Arctostaphylos* spp.) and California-lilac (*Ceanothus* spp.; Zhang et al. 2008).

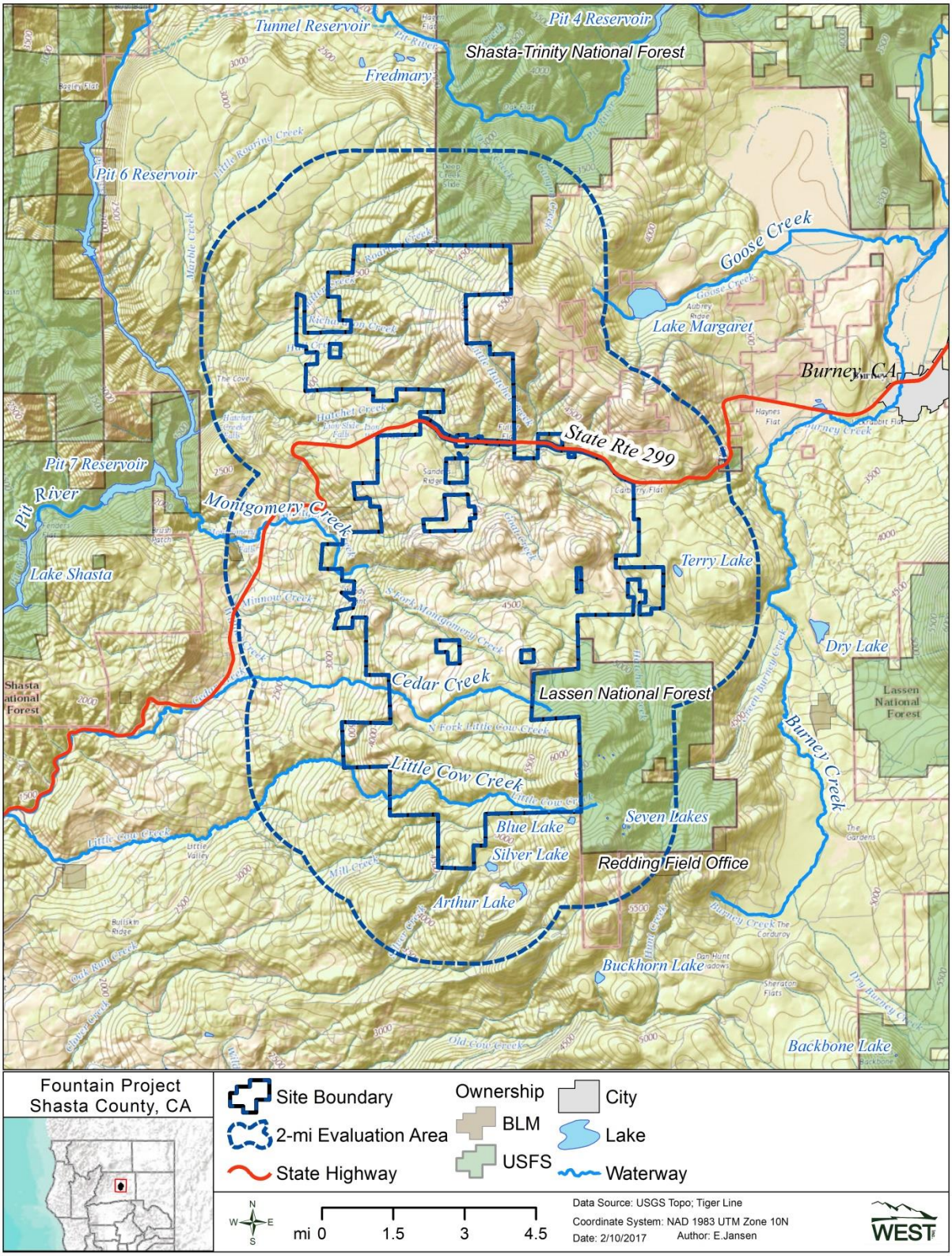


Figure 2. Overview of the Fountain Wind Project Area and surrounding Evaluation Area.

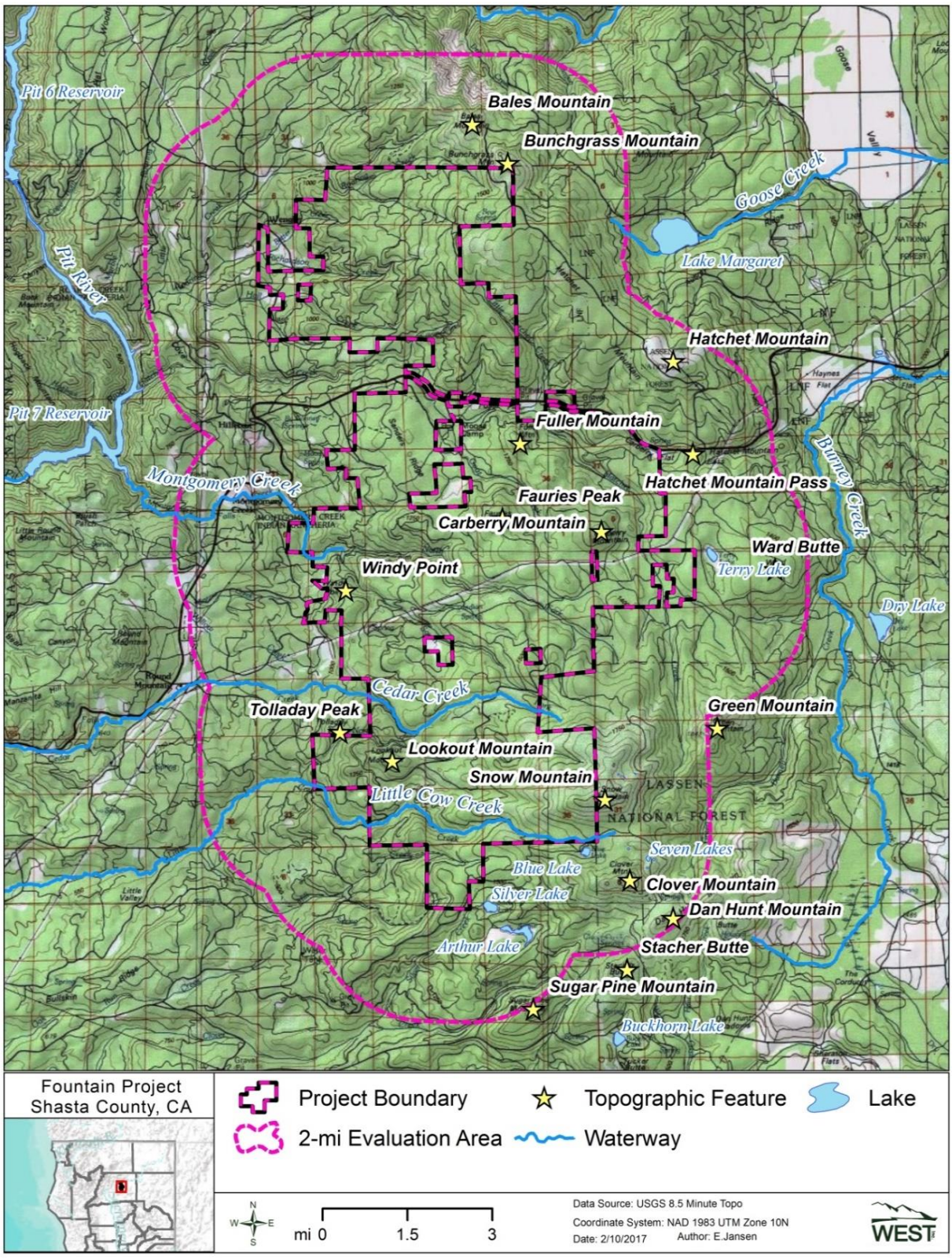


Figure 3. Major topographic and water features within the Fountain Wind Project Area and surrounding Evaluation Area.

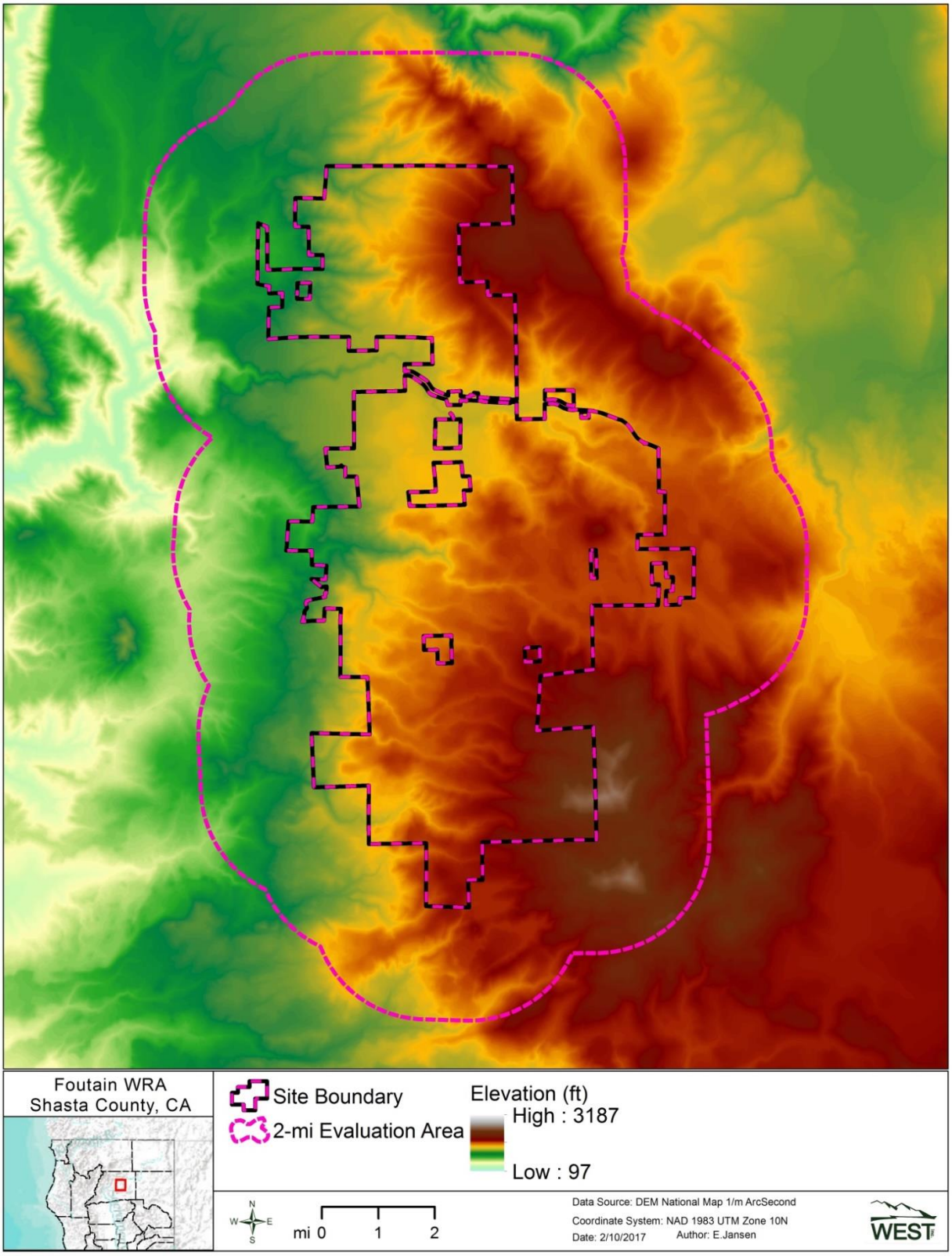


Figure 4. Digital elevation model of the Fountain Wind Project Area and surrounding Evaluation Area.

METHODS

Environmental resources within the Project Area and surrounding Evaluation Area were examined through a search of existing publicly available data and an initial reconnaissance-level site visit. The initial site visit occurred October 19–21, 2016 and entailed a preliminary examination of the area from accessible public and private roads. Biological features and potential wildlife habitat surveyed during the site visit included plant communities, topographic and geological features, potential raptor nesting habitat, habitat for prey populations, and potential bat roosting and foraging habitat. However, due to the relatively late seasonal timing of the site visit, little information was gathered on plant communities. Photographs of the Project and Evaluation Areas are presented in Appendix A.

Published literature, field guides, and public data sets were among the resources reviewed to identify known environmental resources within the Project Area and Evaluation Area. The information presented in this analysis was obtained from the following sources:

- Previous (not released) SCS prepared in 2011 for an earlier version of the Project (referred to as the McCloud Wind Resource Area);
- Bat Conservation International (BCI) species accounts and range maps (BCI 2017);
- California Wildlife Habitat Relationships (CWHR) information system, life history accounts and range maps, maintained by the California Department of Fish and Wildlife (CDFW; CWHR 2017);
- California Natural Diversity Database (CNDDB), maintained by the CDFW, county-level species occurrence information (CNDDB 2017);
- California Native Plant Society's (CNPS) *Online Inventory of Rare and Endangered Plants of California* (CNPS 2017);
- List of Important Bird Areas (IBAs) by the National Audubon Society (Audubon 2017);
- USDA Soil Survey Geographic (SSURGO) data (NRCS 2017);
- U.S. Fish and Wildlife Service (USFWS) Critical Habitat designations (USFWS 2017a);
- USFWS National Wetland Inventory (NWI) data (USFWS NWI 2016);
- USFWS county-level species occurrence information (USFWS 2017b);
- U.S. Geological Survey (USGS) regional Breeding Bird Survey (BBS) data (USGS 1999; Sauer et al. 2014);
- USGS National Land Cover Dataset (NLCD; USGS NLCD 2011); and
- USGS topographic maps and digital elevation data (USGS 2015, USGS DEM 2016).

WEST determined the likelihood a sensitive animal or plant species may occur within the Project by considering the species' range, habitat suitability within the Project, species' mobility, population size, and records of occurrence within or adjacent to the Project. Based on these factors, the likelihood of occurrence was defined for each sensitive species using the following categories:

- None – Project outside the species known range, no suitable habitat within the Project, restricted mobility and small population size.
- Unlikely – Project outside the species known range and suitable habitat appears absent within the Project; however, due to the species mobility and population size, species may occur within the Project during migration or other times of the year.
- Possible – Project is located within the range of the species but contains marginal suitable habitat; species highly mobile and may occur year-round.
- Likely – Project is located within the range of the species and contains suitable habitat; records of species occurrence in the surrounding area but absent from the Project.
- Occurs – Records of species occurrence within the Project based on CNDDB data or other survey data.

LAND COVER AND VEGETATION

The proposed Project Area encompasses 32,613 acres (50.96 mi^2). According to the NLCD (USGS NLCD 2011), the dominant cover type within the Project Area is evergreen forest, covering 17,906.65 acres (27.98 mi^2), or 54.9% of the Project Area (Table 1; Figure 5). A further 38.3% of the Project Area is composed of shrub/scrub (12,501.61 acres [19.53 mi^2]), and 4.5% of herbaceous land cover types (1,478.82 acres [2.21 mi^2]). The remaining 2.2% of the Project Area is covered by small amounts of deciduous forest (334.85 acres [0.52 mi^2]), barren land (194.63 acres [0.30 mi^2]), mixed forest (91.14 acres [0.14 mi^2]), developed lands (80.04 acres [0.13 mi^2]), emergent wetlands (20.40 acres [0.03 mi^2]), and cultivated cropland (5.29 acres [0.01 mi^2]; Table 1; Figure 5).

The Evaluation Area encompasses 95,199 acres (148.75 mi^2). Composition of the Evaluation Area is generally similar to that of the Project Area with evergreen forest, scrub/shrub, and herbaceous cover types composing the majority of the land cover (59.2%, 32.1%, and 4.8%, respectively; Table 1; Figure 6). The Evaluation Area does contain small amounts of open water (78.47 acres [0.12 mi^2]), medium and high intensity developed lands (24.26 acres [0.04 mi^2]), and woody wetlands (9.14 acres [0.01 mi^2]) that are not present within the Project Area.

Table 1. Land use and habitat types present within the Fountain Wind Project Area and Evaluation Area.

	Project Area		Evaluation Area*	
Cover Type	**Acres**	**Percent (%)**	**Acres**	**Percent (%)**
Evergreen Forest	17,906.65	54.9	56,356.78	59.2
Shrub/Scrub	12,501.61	38.3	30,523.34	32.1
Herbaceous	1,478.82	4.5	4,599.68	4.8
Deciduous Forest	334.85	1.0	1,560.33	1.6
Barren Land	194.63	0.6	380.61	0.4
Mixed Forest	91.14	0.3	408.03	0.4
Developed, Open Space	73.20	0.2	947.35	1.0
Emergent Herbaceous Wetlands	20.40	0.1	85.26	0.1
Developed, Low Intensity	6.84	< 0.1	71.73	0.1
Cultivated Crops	5.29	< 0.1	154.07	0.2
Open Water	-	-	78.47	0.1
Developed, Medium Intensity	-	-	15.79	< 0.1
Woody Wetlands	-	-	9.14	< 0.1
Developed, High Intensity	-	-	8.47	< 0.1
Total	**32,613.43**	**100**	**95,199.05**	**100**

Data obtained from USGS NLCD, compiled from satellite imagery (USGS NLCD 2011).
*Project Area plus surrounding 2-mile buffer.

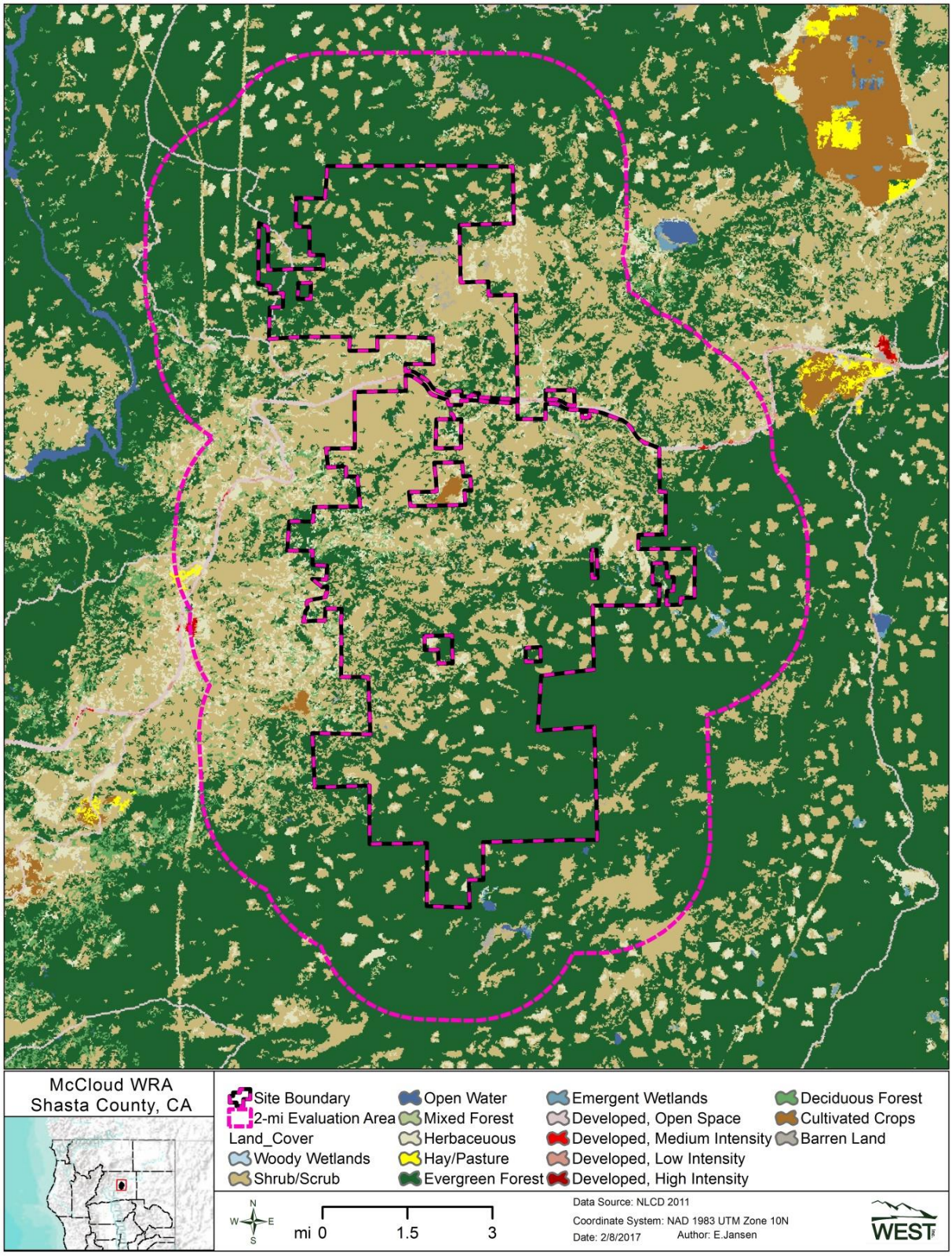


Figure 5. Land cover within the Fountain Wind Project Area and Evaluation Area (USGS NLCD 2011).

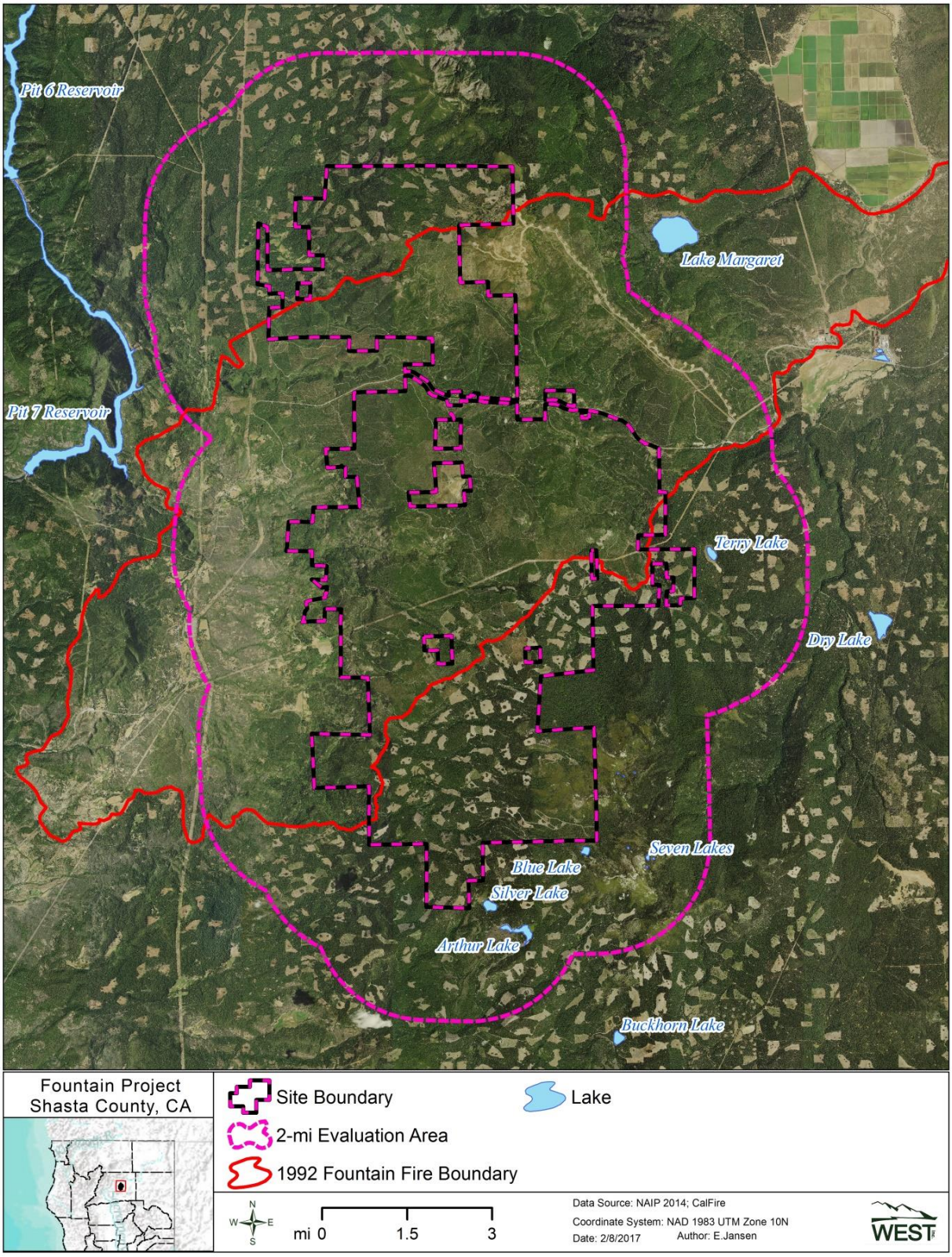


Figure 6. Aerial photograph of the Fountain Wind Project Area and Evaluation Area with 1992 Fountain Fire boundary.

Special Status Plant Species

Plants can be directly impacted by wind energy facilities due to loss of individuals or populations from construction and habitat alteration. Based on data from the CNPS, 191 plant species that occur in Shasta County are considered sensitive. The extensive listing of rare plants was narrowed through cross-reference of databases (CNPS 2017, CNDDB 2017, USFWS 2017b) and identification of range of occurrence, habitat types, and elevational ranges for the Project Area. Based on this review, two federal-listed plant species were identified with at least some potential to occur within the Project Area: Greene's tuctoria (*Tuctoria greenei*) and slender Orcutt grass (*Orcuttia tenuis*; Table 2). However, based on the absence of vernal pools and open grasslands within the Project Area, these species are unlikely to occur. Federally designated critical habitat for slender Orcutt grass is located approximately 6.0 miles (9.7 km) north of the Project Area. This species is discussed in more detail below. No federal-listed or candidate plant species are known to occur within the Project Area or Evaluation Area.

At the state level, based on review of the CNDDB and CNPS databases, 61 state-listed or rare, or CNPS sensitive plants with at least some potential to occur within the Project Area were identified (Table 3). Of these 61 special status plant species, four have been documented within the Project Area: Butte County morning-glory (*Calystegia atriplicifolia* ssp. *buttensis*), rattlesnake fern (*Botrypus virginianus*), northern clarkia (*Clarkia borealis* ssp. *borealis*), and English Peak greenbriar (*Smilax jamesii*; Figure 7). These four species are designated as sensitive by the CNPS, and are tracked by the CNPS, but are not covered by state or federal management regulations.

Table 2. Federal listed plant species with potential for occurrence in or near the Fountain Wind Project.

Listed Species	Federal Status*	CA Endemic	Habitat Requirements	Potential for Occurrence within the Project Area
Greene's tuctoria *Tuctoria greenei*	E	Yes	Dry bottoms of vernal pools in open grassland; 30 – 1,070 m (98 – 3,510 ft)	**Unlikely.** Suitable vernal pool habitat absent
slender Orcutt grass *Orcuttia tenuis*	T	Yes	Vernal pools	**Unlikely.** Suitable vernal pool habitat absent; CNDDB documents occurrence 6.0 miles (9.7 km) to the northeast of the site

*E: federally-listed endangered species; T: federally-listed threatened species
Information from CNDDB 2017, USFWS 2017b

Slender Orcutt Grass

An annual grass restricted to vernal pools, slender Orcutt grass is endemic to California and is listed as both a federal threatened and state endangered species (CNPS 2017, USFWS 2017b). Slender Orcutt grass can be found in valley grassland, foothill woodland, freshwater wetland, and wetland-riparian communities. It is threatened by agriculture, residential development, grazing, recreational activity, logging, fire, and non-native plant invasion (Calflora 2017). The species has not been documented within the Project or Evaluation Areas, and due to the

apparent lack of suitable vernal pool habitat, the species is unlikely to occur. The CNDDB lists occurrences of this species approximately 6.0 mi to the northeast of the Project Area, in the Goose Valley area (CNPS 2017). The USFWS has designated critical habitat for this species on the northeastern side of Goose Valley, approximately 6 miles from the Project (USFWS 2017a).

Table 3. State listed/rare and CNPS sensitive plant species with potential to occur in or near the Fountain Wind Project.

Species	State Status*	CNPS Status**	CA Endemic	Habitat Requirements	Potential for Occurrence within the Project Area
Shasta ageratina *Agertina shastensis*		1B.2	Yes	Rocky, often carbonate sites; lower montane coniferous forest	**Possible.** CNDDB documents species occurrence 10 miles west of site
vanilla-grass *Anthoxanthum nitens* ssp. *nitens*		2B.3	No	Meadows and seeps	**Possible.** Suitable wetland habitat limited within site
Klamath manzanita *Arctostaphylos klamathensis*		1B.2	Yes	Chaparral and upper montane and subalpine coniferous forests; rocky outcrops and slopes	**Possible.** Suitable habitat present within the site; CNDDB documents only 2 occurrences in Shasta County
marbled wild-ginger *Asarum marmoratum*		2B.3	No	Understory of lower montane coniferous forests	**Possible.** Suitable habitat present within the site
northern spleenwort *Asplenium septentrionale*		2B.3	No	Chaparral and montane coniferous forests; form grass-like tufts in granitic rock crevices	**Possible.** Suitable habitat present within the site
upswept moonwort *Botrychium ascendens*		2B.3	No	Lower montane coniferous forests; grassy fields and woodlands near springs and creeks	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County
scalloped moonwort *Botrychium crenulatum*		2B.2	No	Lower montane coniferous forests; moist meadows near creeks; marshes	**Possible.** CNDDB documents species occurrence three miles(five km) south of site
mingan moonwort *Botrychium minganense*		2B.2	No	Creek banks in mixed conifer forests	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County
western goblin *Botrychium montanum*		2B.1	No	Creek banks in old-growth coniferous forests	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County
northwestern moonwort *Botrychium pinnatum*		2B.3	No	Montane coniferous forests; in meadows or along creek banks	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County

Table 3. State listed/rare and CNPS sensitive plant species with potential to occur in or near the Fountain Wind Project.

Species	State Status*	CNPS Status**	CA Endemic	Habitat Requirements	Potential for Occurrence within the Project Area
rattlesnake fern *Botrypus virginianus*		2B.2	No	Streams; bogs and fens; lower montane coniferous forest; meadows and seeps	**Occurs.** CNDDB documents species occurrence near southern boundary of site and locations to north and south of site
watershield *Brasenia schreberi*		2B.3	No	Freshwater marshes and swamps	**Possible.** Potentially suitable wetland habitat limited within site; CNDDB documents presence seven miles east of site
long-haired star-tulip *Calochortus longebarbatus* var. *longebarbatus*		1B.2	No	Clay, mesic sites in Great Basin scrub, lower montane coniferous forest openings, meadows and seeps	**Possible.** CNDDB documents species presence 3.5 miles (5.6 km) east of site
Callahan's mariposa lily *Calochortus syntrophus*		1B.1	Yes	Cismontane woodland; vernally mesic valley and foothill grassland	**Possible.** CNDDB documents species presence 2.5 miles (4.0 km)south of site
Butte County morning-glory *Calystegia atriplicifolia* ssp. *buttensis*		4.2	Yes	Rocky, sometimes roadsides; lower montane coniferous forest	**Occurs.** CNDDB documents species presence in northwestern portion of site and numerous locations to north and east of site
Castle Crags harebell *Campanula shelteri*		1B.3	Yes	In protected rock crevices in granite; lower montane coniferous forests	**Possible,** if suitable granitic rock outcrops present
bristly sedge *Carex comosa*		2B.1	No	Marshes and swamps (lake margins); valley and foothill grasslands	**Possible.** Suitable wetland habitat limited within site, but CNDDB documents species presence six miles (10 km) north of site
woolly-fruited sedge *Carex lasiocarpa*		2B.3	No	Bogs and fens; freshwater marshes and swamps, lake margins	**Possible.** Potentially suitable wetland habitat limited within site; CNDDB documents presence six miles north of site
Shasta clarkia *Clarkia borealis* ssp. *arida*		1B.1	Yes	Cismontane woodlands	**Possible.** CNDDB documents species presence seven miles to east of site
northern clarkia *Clarkia borealis* ssp. *borealis*		1B.3	Yes	Cismontane woodland; lower montane coniferous forest	**Occurs.** CNDDB documents species occurrence near western boundary of site and at numerous locations to northeast

Table 3. State listed/rare and CNPS sensitive plant species with potential to occur in or near the Fountain Wind Project.

Species	State Status*	CNPS Status**	CA Endemic	Habitat Requirements	Potential for Occurrence within the Project Area
silky cryptantha *Cryptantha crinite*		1B.2	Yes	Gravelly streambeds of cismontane woodlands, valley foothill grasslands, lower montane coniferous forests, and riparian forests	**Possible.** CNDDB documents occurrence 8.5 miles (13.7 km)south of site
English sundew *Drosera anglica*		2B.3	No	Bogs and fens; meadows	**Possible.** Suitable wetland habitat limited within site; CNDDB documents species presence seven miles to northeast of site
Oregon fireweed *Epilobium oreganum*		1B.2	No	Montane coniferous forests; in and near springs and bogs; sometimes on serpentine	**Possible;** but suitable wetland habitat limited within site
Tracy's eriastrum *Eriastrum tracyi*	R	1B.2	Yes	Chaparral, cismontane woodlands; gravelly shale or clay, often in open areas	**Possible.** Potential suitable habitat within site; nearest known occurrence is 20+ miles to northeast of site
blushing wild buckwheat *Eriogonum ursinum var. erubescens*		1B.3	Yes	Rocky sites within lower montane coniferous forest and montane chaparral	**Possible.** Suitable rocky habitat may be present within site
Shasta limestone monkeyflower *Erythranthe taylorii*		1B.1	Yes	Openings, carbonate crevices and rocky outcrops of cismontane woodlands and lower montane coniferous forest	**Possible.** Suitable rocky habitat may be present within site
Klamath fawn lily *Erythronium klamathense*		2.2	No	Meadows and seeps; upper montane coniferous forest	**Possible.** Suitable wetland habitat limited within site
Shasta fawn lily *Erythronium shastense*		1B.2	Yes	Usually carbonate, rocky, north-facing or shaded slopes in cismontane woodland and lower montane coniferous forest	**Possible.** Suitable habitat may be present within site
Butte County fritillary *Fritillaria eastwoodiae*		3.2	Yes	Chaparral, cismontane woodlands, lower montane coniferous forest; usually on dry slopes; serpentine, red clay or sandy soil	**Likely.** CNDDB documents species presence in southwest corner of site and numerous locations in site vicinity

Table 3. State listed/rare and CNPS sensitive plant species with potential to occur in or near the Fountain Wind Project.

Species	State Status*	CNPS Status**	CA Endemic	Habitat Requirements	Potential for Occurrence within the Project Area
Boggs Lake hedge-hyssop *Gratiola heterosepala*	E	1B.2	No	Freshwater marshes and swamps, vernal pools; clay soils	**Unlikely.** Suitable wetland habitat very limited within site
Stebbins' harmonia *Harmonia stebbinsii*		1B.2	Yes	Chaparral and lower montane coniferous forests; in ultramafic soils, often along roads	**Possible,** if ultramafic soils present within appropriate habitats on site
little hulsea *Hulsea nana*		2B.3	No	Alpine boulder and rock fields, subalpine coniferous forests; volcanic substrates	**Unlikely.** Suitable habitat not present; CNDDB documents species presence nine (15 km) miles to east of site.
Castle Crags ivesia *Ivesia longibracteata*		1B.3	Yes	Crevices in granitic cliffs; lower montane coniferous forests	**Possible**. Suitable cliff habitat may be present
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*		1B.1	Yes	Vernally mesic meadows and seeps; valley and foothill grassland; vernal pools	**Possible.** Suitable habitat present on site; CNDDB documents species occurrence seven miles to northeast of site
Santa Lucia dwarf rush *Juncus luciensis*		1B.2	Yes	Vernal pools, ephemeral drainages, wet meadows habitats and streamsides	**Possible.** Suitable habitat present on site; CNDDB documents occurrence five miles (eight km) to east of site
Cantelow's lewisia *Lewisia cantelovii*		1B.2	Yes	Mesic, granite; lower montane coniferous forest; cismontane woodland	**Possible.** Suitable habitat may be present within site
Bellinger's meadowfoam *Limnanthes floccosa* ssp. *bellingeriana*		1B.2	No	Mesic; cismontane woodland; meadows and seeps	**Possible.** Suitable wetland habitat limited within site
woolly meadowfoam *Limnanthes floccosa* ssp. *floccosa*		4.2	No	Vernally mesic; cismontane woodland; valley and foothill grassland; vernal pools	**Possible.** Suitable habitat present within site; CNDDB documents occurrence 8.5 miles northeast of site
tufted loosestrife *Lysimachia thyrsiflora*		2B.3	No	Meadows and seeps; mesic; upper montane coniferous forest	**Possible.** Suitable habitat present within site; CNDDB documents occurrence seven miles east of site
three-ranked hump moss *Meesia triquetra*		4.2	No	Bogs and fens; mesic; subalpine and upper montane coniferous forests	**Possible.** Suitable wetland habitat limited within site

Table 3. State listed/rare and CNPS sensitive plant species with potential to occur in or near the Fountain Wind Project.

Species	State Status*	CNPS Status**	CA Endemic	Habitat Requirements	Potential for Occurrence within the Project Area
broad-nerved hump moss *Meesia uliginosa*		2B.2	No	Moss on damp soil within meadows and seeps, bogs and fens, upper montane coniferous forest, and subalpine coniferous forest	**Possible.** Suitable wetland habitat limited within site
Egg Lake monkeyflower *Diplacus pygmaeus*		4.2	No	Vernally mesic, streamsides, volcanic, clay	**Possible.** Potentially suitable habitat present within site
Shasta snow-wreath *Neviusia cliftonii*		1B.2	Yes	Lower montane coniferous forests, riparian woodlands; shady, north-facing or sheltered canyons	**Possible.** Suitable habitat present within site; CNDDB documents occurrence six miles west of site
slender Orcutt grass *Orcuttia tenuis*	E	1B.1	Yes	Vernal pools	**Unlikely.** Suitable vernal pool habitat absent; CNDDB documents occurrence seven miles to northeast of site
Cascade grass-of-Parnassus *Parnassia cirrata* var. *intermedia*		2B.2	No	Rock serpentine soils; montane coniferous forests, meadows and seeps, bogs and fens; 780 – 1,980 m	**Possible.** Suitable wetland habitat limited within site
thread-leaved beardtongue *Penstemon filiformis*		1B.3	Yes	Cismontane woodlands and lower montane coniferous forests; dry stony sites, grassy openings, and meadows	**Possible.** Potential suitable habitat present within site
Scott Mountain howellanthus *Howellanthus dalesianus*		4.3	Yes	Subalpine, lower, and upper montane coniferous forest; meadows and seeps	**Possible,** but suitable wetland habitat limited within site
Engelmann spruce *Picea engelmannii*		2B.2	No	Upper montane coniferous forest	**Possible.** Potential suitable habitat on site; nearest CNDDB occurrence approximately 16 miles northeast of site
Sierra blue grass *Poa sierra*		1B.3	Yes	Lower montane coniferous forests; shady, moist, rock slopes; often in canyons	**Possible.** Potential suitable habitat present within site; CNDDB documents occurrence six miles to west of site

Table 3. State listed/rare and CNPS sensitive plant species with potential to occur in or near the Fountain Wind Project.

Species	State Status*	CNPS Status**	CA Endemic	Habitat Requirements	Potential for Occurrence within the Project Area
Modoc County knotweed *Polygonum polygaloides* ssp. *esotericum*		1B.1	Yes	Mesic; Great Basin scrub; lower montane coniferous forest	**Possible.** Potential suitable habitat within site
Pacific fuzz wort *Ptilidium californicum*		4.3	No	Epiphytic on trees and decaying logs in lower and upper montane coniferous forest	**Possible.** Potential suitable habitat may be present within site; CNDDB reports species occurrence within 10 miles (north) of site
marsh sckullcap *Scutellaria galericulata*		2B.2	No	Marshes and swamps of lower montane coniferous forests	**Possible.** Suitable wetland habitat limited within site
Canyon Creek stonecrop *Sedum obtusatum* ssp. *paradisum*		1B.3	Yes	In crevices of exposed granite; chaparral and coniferous forests; 1,060 – 1,860 m	**Possible,** if suitable exposed granite habitat present
long-stiped campion *Silene occidentalis* ssp. *longistipitata*		1B.2	Yes	Lower and upper montane coniferous forest	**Possible.** Suitable habitat present within site; CNDDB documents occurrence within five miles to east and northeast of site
Klamath Mountain catchfly *Silene salmonacea*		1B.2	Yes	Openings, usually serpentine, within lower montane coniferous forest	**Possible.** Potential suitable habitat within site
English Peak greenbriar *Smilax jamesii*		4.2	Yes	Streambanks and lake margins; lower and upper montane forest	**Occurs.** CNDDB documents species presence at numerous locations in the north end of the Project
hairy marsh hedge-nettle *Stachys pilosa*		2B.3	No	Mesic sites in Great Basin scrub	**Unlikely.** Suitable scrub habitat not present; CNDDB documents species presence four miles (six km) east of site
long-leaved starwort *Stellaria longifolia*		2B.2	No	Meadows and seeps, riparian woodlands	**Possible.** CNDDB documents species presence seven miles to northeast of site
obtuse startwort *Stellaria obtusa*		4.3	No	Montane coniferous forests and riparian woodlands; along streams or seeps	**Possible.** Potential suitable habitat within site; nearest known occurrence approximately 30 miles southeast of site

Table 3. State listed/rare and CNPS sensitive plant species with potential to occur in or near the Fountain Wind Project.

Species	State Status*	CNPS Status**	CA Endemic	Habitat Requirements	Potential for Occurrence within the Project Area
Shasta huckleberry *Vaccinium shastense* ssp. *shastense*		1B.3	Yes	Acidic, mesic site; often on streambanks; sometimes on rocky outcrops, seeps, roadsides, and disturbed areas within chaparral, lower montane and subalpine coniferous forest, and riparian forest	**Possible.** Suitable habitat may be present within site
oval-leaved viburnum *Viburnum ellipticum*		2B.3	No	Chaparral, cismontane woodlands, and lower montane coniferous forests	**Possible.** Potential suitable habitat within site; nearest known occurrence approximately 16 miles southwest of site

Information from CNPS 2017, CNDDB 2017, USFWS 2017b.

*E: State-listed endangered species; R: State-listed rare species (CNDDB 2017)

**CNPS: California Native Plant Society rare species categories (CNPS 2001):

CNPS 1B.1: Plants seriously threatened in California and at a minimum rare elsewhere.
CNPS 1B.2: Plants fairly threatened in California and at a minimum rare elsewhere.
CNPS 1B.3: Plants not vey threatened in California and at a minimum rare elsewhere.
CNPS 2B.1: Plants seriously threatened in California but more common elsewhere
CNPS 2B.2: Plants fairly threatened in California but more common elsewhere.
CNPS 2B.3: Plants which are not very threatened in California and are more common elsewhere.
CNPS 3.2: Plants believed to be fairly threatened in California, but about which more information is needed.
CNPS 4.2: Fairly threatened plants with a limited distribution in California.
CNPS 4.3: Plants which are not very threatened but have a limited distribution in California.

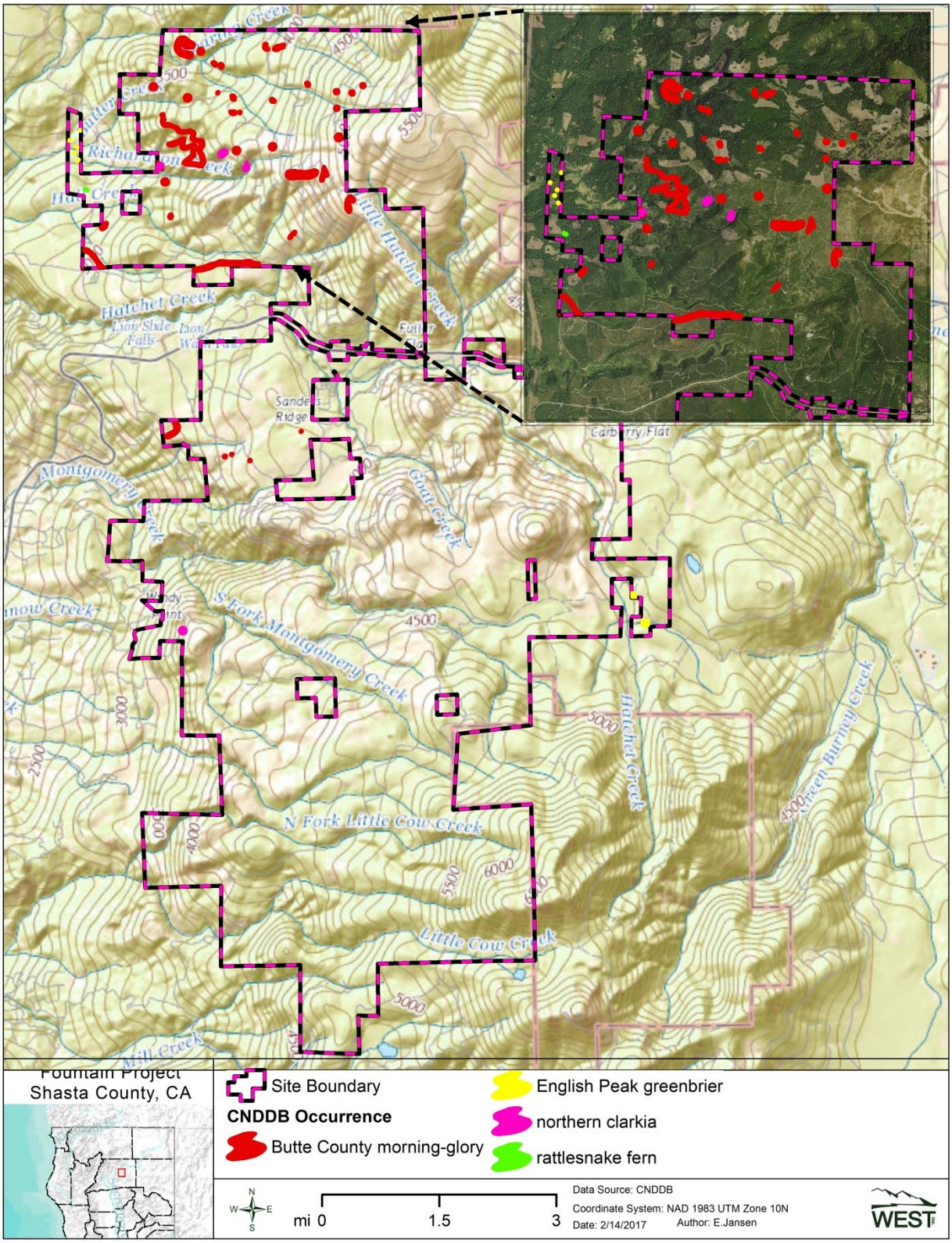


Figure 7. Records of previously-documented state sensitive plant species within the Fountain Wind Project.

Sensitive Habitats

The CNDDB (2017) identified three sensitive natural communities and one river drainage important to sensitive fish species within 10 miles of the Project Area (Table 4). The sensitive communities are: alkali seep, northern basalt flow vernal pool, and northern interior cypress forest. While none of these have been documented as occurring within the Project or Evaluation Areas, alkali seep and northern cypress forest have at least some potential to occur within the Project Area. The sensitive river drainage is the lower Pit River/Canyon River drainage, which was designated for the conservation of the hardhead (*Mylopharodon conocephalus*) and Tule perch (*Hysterocarpus traskii*). This section of the Pit/Canyon River is located approximately 2.5 miles (4 km) to the northwest of the Project Area and streams located within the Project Area are generally not suitable for these two fish species.

Table 4. State designated sensitive habitats and drainages occurring within 10 miles of the Fountain Wind Project.

Habitats	Description	Potential for Occurrence in the Project Area
Alkali seep	Permanently wet or moist alkaline soils; scattered throughout the desert regions of California but less common in other areas	**Unlikely.** Closest occurrence in CNDDB is approximately 5.7 miles from southwest corner of Project Area
Northern basalt flow vernal pool	Occur in small depressions on top of massive basalt flows; pools fill and empty many times during the winter, and have extremely thin soils over the solid bedrock that prevents downward rainwater percolation	**None.** Vernal pool habitat absent from the Project Area; closest occurrence in CNDDB is 7 miles from the northeast corner of the Project.
Northern interior cypress forest	An open, fire-maintained scrubby "forest" dominated by one of several *Cupressus* species; typified by dry, rocky, sterile, often ultramafic soils, in mesic sites associated with montane coniferous forest	**Possible.** CNDDB identifies two sites within several miles, east and west of the Project Area
Drainages	**Species of Interest**	**Potential for Occurrence in the Project Area**
Lower Pit River/Canyon River	hardhead, Tule perch	**None.** Portion of river occurs approximately 2.5 miles to the west and north of Project Area; streams in Project Area generally not suitable for species of interest

Data obtained from CNDDB 2017

Wetlands and Riparian Areas

Digital NWI data (USFWS NWI 2016) were assessed for the Project and Evaluation Areas. According to the NWI, only 2.0% of the Project Area is composed of wetland habitat (Table 5; Figure 8). Forested/shrub wetland is the dominant wetland type in the Project Area, composing 55.0% (351.24 acres [0.55 mi^2]) of all wetland habitat. Riverine habitats compose a further

41.4% (263.90 acres [0.41 mi^2]), and the remaining 3.1% of wetlands is composed of very small areas of emergent wetland (22.86 acres [0.04 mi^2]) and pond (0.20 acres [less than 0.01 mi^2]) habitat. A number of permanent and intermittent creeks run throughout the Project Area, flowing primarily to the west and northwest. The primary drainages in the north of the Project Area are Hatchet Creek and Montgomery Creek, while Cedar Creek and Little Cow Creek drain the southern portions of the site (Figure 4).

The Evaluation Area has a slightly smaller proportion of wetland habitat than the Project Area (1.3%) with forested/shrub wetland composing 50.7% (1,206.85 acres [1.89 mi^2]), and riverine composing a further 30.8% (733.05 acres [1.15 mi^2]; Table 5; Figure 8). The remaining 18.5% of wetlands are composed of smaller amounts of emergent wetlands (350.69 acres [0.55 mi^2]) and pond habitat (91.19 acres [0.14 mi^2]). At its closest points, the Pit River occurs about 2.5 miles (4.0 km) to the west of the Project and 2.5 miles to the north (Figure 8). Additionally, a small lake with associated emergent wetlands occurs approximately 2.5 miles to the northeast (Lake Margaret) and Goose Valley, with more extensive emergent wetlands, occurs approximately 5.0 miles (8.0 km) to the northeast of the Project (Figure 8).

Table 5. Wetland types present within the Fountain Wind Project Area and Evaluation Area. Data were obtained from the USFWS National Wetlands Inventory (USFWS NWI 2016).

	Project Area		Evaluation Area	
Cover Type	**Acres**	**Percent (%)**	**Acres**	**Percent (%)**
Forested/Shrub Wetland	351.24	55.0	1,206.85	50.7
Riverine	263.90	41.4	733.05	30.8
Emergent Wetland	22.86	3.5	350.69	14.7
Pond	0.20	0.1	91.19	3.8
Total	**638.20**	**100**	**2,381.78**	**100**

Data obtained from NWI database (USFWS NWI 2016).

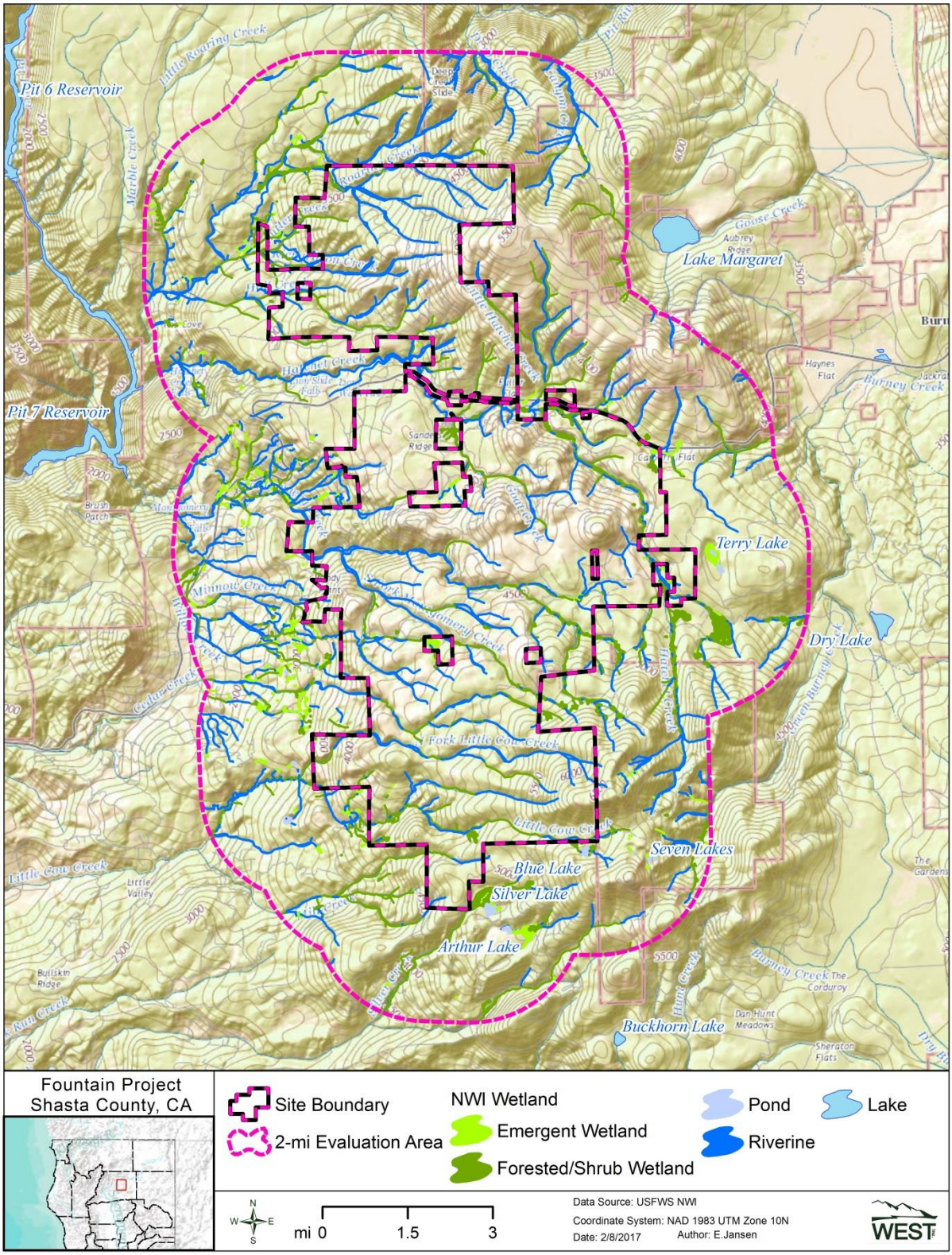


Figure 8. National Wetland Inventory map of the Fountain Wind Project Area and Evaluation Area (USFWS NWI 2016).

Vegetation Summary and Conclusions

The primary vegetation community within the Project Area is mixed conifer forest, a large portion (59%) of which burned in the 1992 Fountain Fire and is currently in a state of post-fire regeneration or succession. Smaller areas of mixed montane chaparral and logged areas (i.e., clear cuts) are scattered throughout both the Project and Evaluation Areas, and include the majority of remaining habitat. Riparian and wetland vegetation is present in the form of mixed montane riparian forest/shrub and riverine habitats, with much smaller areas of wet montane meadow and open water. Based on the NWI (USFWS NWI 2016), only 2.0% of the Project Area is classified as wetland habitat. No federal and/or state listed or candidate plant species are known to occur within the Project or Evaluation Areas; however one species, slender Orcutt grass (a federal threatened and state endangered species; CNPS 2017, CNDDB 2017, USFWS 2017b) is known to occur within 10 miles of the Project. Four CNPS sensitive species are also known to occur within the Project Area, and based on habitats present, there is potential for several other sensitive species to occur as well. Two sensitive habitats, alkali seep and northern cypress forest, have at least some potential to occur within the Project Area. A habitat assessment and rare/sensitive plant survey, as well as a Wetland and Waters of the U.S. survey, are recommended once the Project layout is determined.

WILDLIFE RESOURCES

Raptors

Species Likely to Occur in the Area

Information on the distribution of diurnal raptors, owls, and vultures was collected from the CWHR System (CWHR 2017). Seventeen raptor species have the potential to occur in the Project and Evaluation Areas. In addition, one species of vulture, and 11 species of owl may occur (Table 8).

Of the 17 diurnal raptors with at least some potential to occur within the Project (Table 8), seven species are likely to breed within the Project and/or Evaluation Areas: American kestrel (*Falco sparverius*), bald eagle (*Haliaeetus leucocephalus*), Cooper's hawk (*Accipiter cooperii*), northern goshawk (*Accipiter gentilis*), osprey (*Pandion haliaetus*), red-tailed hawk (*Buteo jamaicensis*), and sharp-shinned hawk (*Accipiter striatus*). Golden eagle (*Aquila chrysaetos*), American peregrine falcon (*Falco peregrines*), and prairie falcon (*Falco mexicanus*) are considered uncommon permanent residents of the region; however, suitable nesting and foraging habitat is generally absent from the Project Area and these species are likely to occur only as uncommon visitors and/or migrants. Swainson's hawk (*Buteo swainsoni*), northern harrier (*Circus cyaneus*), and white-tailed kite (*Elanus leucurus*) likely breed in grassland, agricultural areas, and other open habitats adjacent to the Project Area and may also migrate through the area, but are unlikely to occur within the forested habitats which dominate the Project Area. Four additional species may occur as winter residents in the region: ferruginous hawk (*Buteo regalis*), merlin (*Falco columbarius*), red-shouldered hawk (*Buteo lineatus*), and rough-legged hawk (*Buteo*

lagopus). Each of these species has the potential to occur within the Project Area; however, ferruginous and rough-legged hawks would more typically be found in open habitat in the surrounding landscape. Additionally, turkey vultures (*Cathartes aura*) may breed within the Project and Evaluation Areas.

Nine owl species potentially nest within the Project Area or surrounding area: barn owl (*Tyto alba*), barred owl (*Strix varia*), flammulated owl (*Otus flammeolus*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), northern pygmy owl (*Glaucidium gnoma*), northern saw-whet owl (*Aegolius acadicus*), California spotted owl (*Strix occidentalis occidentalis*), and western screech-owl (*Megascops kennicottii*; Table 8). Additionally, short-eared owl (*Asio flammeus*) may be a permanent resident and breeder regionally, and burrowing owl (*Athene cunicularia*) may be a winter resident regionally but neither is likely to be found in the forested habitats of the Project or Evaluation Areas.

Both bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA; BGEPA 1940), and in California the bald eagle is a state endangered species and the golden eagle is a state fully-protected species (CDFW 2017). Currently, the relative level of eagle use of the Project Area is unknown; bald eagles are known to occur in the Project vicinity (CNDDB 2017). Year round eagle use surveys, consistent with the USFWS Eagle Conservation Plan Guidance (ECPG; USFWS 2013) and the WEG (USFWS 2012a), will help estimate the use of the Project Area by eagles and other raptor species. Of the non-eagle diurnal raptor and vulture species potentially occurring within the Project Area, one species is state threatened (Swainson's hawk), two species are state fully protected (white-tailed kite and American peregrine falcon), two species are state Species of Special Concern (SSC; northern harrier and northern goshawk), and six species are maintained on the CDFW's watch list (Cooper's hawk, ferruginous hawk, merlin, prairie falcon, osprey, and sharp-shinned hawk; CDFW 2017). Of the owl species potentially occurring within the Project Area, two species are considered state SSC: California spotted owl and long-eared owl (CDFW 2017).

At the Hatchet Ridge Wind Farm located immediately to the east of the Project Area, a total of three raptor fatalities (two red-tailed hawks and one sharp-shinned hawk) and one turkey vulture fatality were documented during two years of fatality monitoring at each of Hatchet Ridge's 44 turbines (Tetra Tech 2013a), providing insight into relative raptor use of an adjacent area.

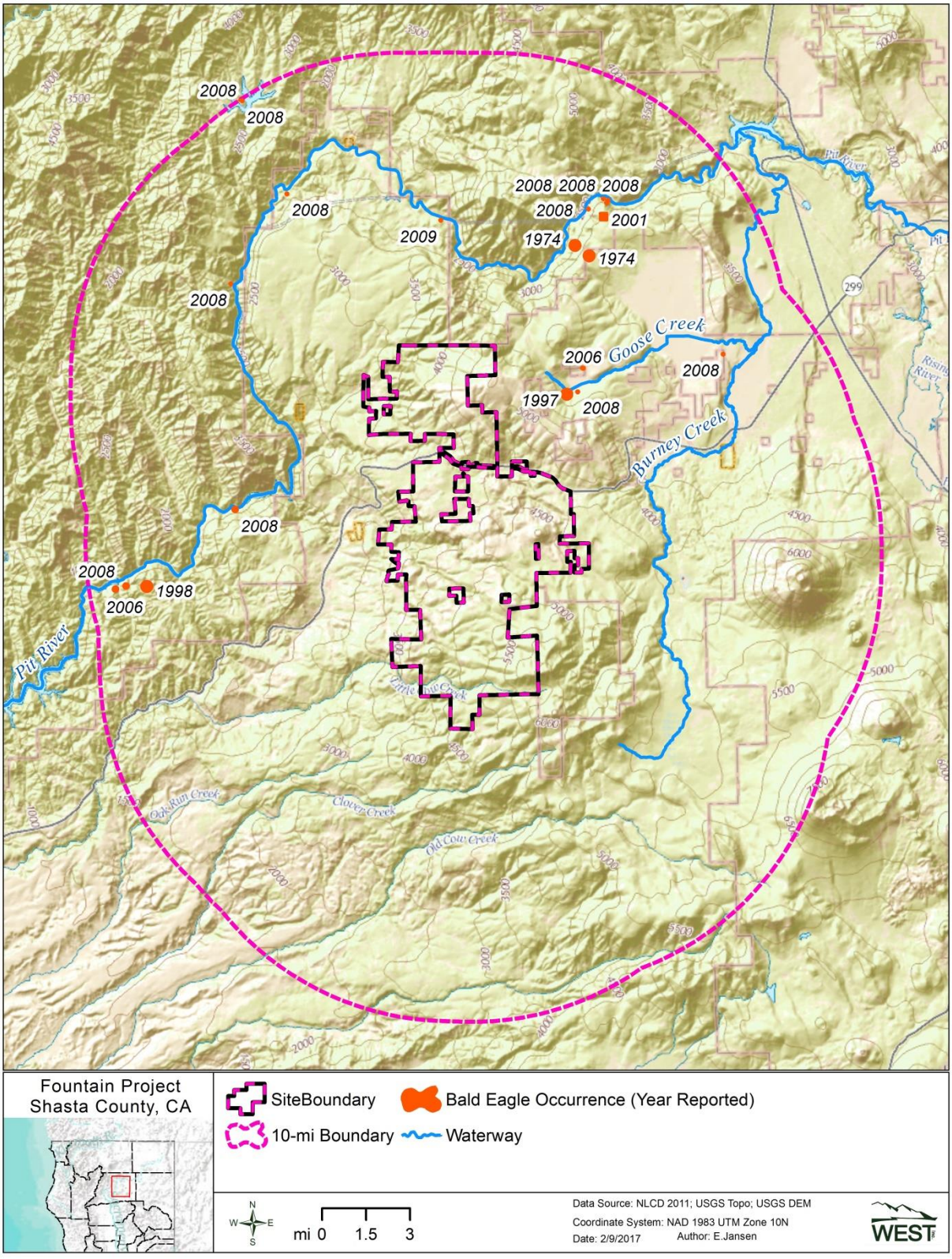


Figure 9. Bald eagle records within 10 miles of the Fountain Wind Project (CNDDB 2017).

Table 6. Diurnal raptor species, owl species, and vulture species with potential to occur within the Fountain Wind Project.

Species	Habitat	Potential for occurrence within the Project Area
Raptors		
American kestrel *Falco sparverius*	Occurs in most open habitats in a variety of shrub and early successional forest habitats and forest openings; nests in cavities	**Likely.** Likely breeder and year-round resident of Project Area
American peregrine falcon *Falco peregrinus anatum*	Uncommon resident and migrant; frequents bodies of water in open areas with cliff and canyons nearby for cover and nesting	**Likely.** May occur as transient or migrant; suitable foraging/nesting habitat generally absent from Project Area
bald eagle *Haliaeetus leucocephalus*	Permanent resident in California; requires large, old-growth trees or snags in remote, mixed stands near water; roosts communally in winter	**Likely.** Nesting and foraging habitat generally absent from Project Area but present in site vicinity
Cooper's hawk *Accipiter cooperii*	Dense stands of oak, deciduous riparian, or other forest habitats near water used most	**Likely.** Likely breeder and year-round resident; observed during September site visits
ferruginous hawk *Buteo regalis*	Winters throughout much of California; requires large, open tracts of grassland, sparse shrub or desert habitats for foraging	**Unlikely.** Regional winter resident but not likely to forage in forested habitats of Project Area; potential to migrate over Project Area
golden eagle *Aquila chrysaetos*	Uncommon permanent resident and migrant throughout California; uses rolling foothills and mountainous terrain, open mountain slopes, and cliffs and rock outcrops	**Possible.** Nesting habitat generally absent in area but potential to occur as transient or migrant within Project Area
merlin *Falco columbarius*	Frequents open habitats at low elevations near water and tree stands; favors coastlines, lakeshores, and wetlands	**Possible.** May occur as winter resident and/or migrant
northern goshawk *Accipiter gentilis*	Prefers mid- and high-elevations, and mature, dense conifer forests	**Occurs.** Number of historic observations within Project Area. Potential breeder and year-round resident
northern harrier *Circus cyaneus*	Frequents meadows, grasslands, open rangelands, fresh and saltwater emergent wetlands; seldom found in wooded habitats	**Unlikely.** Occurs regionally but not likely to occur in forested habitats of Project Area
osprey *Pandion haliaetus*	Associated strictly with large, fish-bearing waters primarily in pine and mixed-conifer forests; nests in large trees and snags near open water	**Occurs.** Nesting and foraging habitat generally absent from Project Area but present in site vicinity; may occur as transient or migrant through site

Table 6. Diurnal raptor species, owl species, and vulture species with potential to occur within the Fountain Wind Project.

Species	Habitat	Potential for occurrence within the Project Area
prairie falcon *Falco mexicanus*	Nests in open terrain with canyons, cliffs, escarpments, and rock outcrops; uses open habitat for foraging (grassland, savannahs, rangelands, and desert scrub)	**Possible.** May occur as transient or migrant; suitable foraging/nesting habitat generally absent from Project Area
red-shouldered hawk *Buteo lineatus*	Dense riparian areas with adjacent edges, swamps, marshes, and wet meadows for hunting	**Possible.** Occurs regionally as breeder and winter resident; suitable habitat generally not present within the Project Area
red-tailed hawk *Buteo jamaicensis*	Nearly all habitats at all elevations including grasslands, cropland, open brush habitats, and open woodlands	**Likely.** Observed during site visits; common permanent resident, breeder, and migrant
rough-legged hawk *Buteo lagopus*	Winters throughout much of California; frequents open areas near riparian or other wooded habitats	**Possible.** May occur in as winter resident or migrant
sharp-shinned hawk *Accipiter striatus*	Breeds in fairly dense conifer and broad-leaved forests; fairly common migrant and winter resident throughout California except in areas with deep snow	**Likely.** Potential breeder and year-round resident
Swainson's hawk *Buteo swainsoni*	Open desert, grassland, or cropland containing scattered, large trees or small groves	**Possible.** Preferred habitat absent but may occur as transient or migrant within Project Area
white-tailed kite *Elanus leucurus*	Costal and valley lowlands; open stages of most habitats mainly in cismontane California, often near agricultural areas	**Unlikely.** Occurs regionally, but not likely to occur in forested habitats of Project Area
Vultures		
turkey vulture *Cathartes aura*	Open stages of most habitats that provide adequate cliff or large trees for nesting, roosting, and resting	**Likely.** Observed during site visits; common summer resident and potential uncommon to rare winter resident
Owls		
barn owl *Tyto alba*	Occurs in open habitats including grassland, chaparral, riparian, and other wetlands; nests/roosts in trees, snags, and cavities in cliffs	**Likely.** May occur as breeder and year-round resident.
barred owl *Strix varia*	Range has expanded into California in past 20 years; inhabits a variety of forest types including redwood (*Sequoia* spp.), Douglas fir, and mixed-conifer	**Possible.** May occur as year-round resident

Table 6. Diurnal raptor species, owl species, and vulture species with potential to occur within the Fountain Wind Project.

Species	Habitat	Potential for occurrence within the Project Area
burrowing owl *Athene cunicularia*	Resident of open, dry grassland and desert habitats and in open stages of pinyon-juniper (*Pinus-Juniperus* spp.) and pine habitats	**Unlikely.** Winter resident regionally; but unlikely to occur in forested habitats of Project Area
California spotted owl *Strix occidentalis occidentalis*	In northern California, associated with dense, old-growth, multi-layered mixed-conifer, redwood, and Douglas fir forests	**Occurs.** Project Area located at edge of range and high quality nesting/roosting habitat generally not present; may forage within or disperse through site; historical records of occurrence in Project Area (CDFG 2011a)
flammulated owl *Otus flammeolus*	Inhabits a variety of conifer habitats from ponderosa pine to red fir forests with low to intermediate canopy closure	**Likely.** Likely occurs as summer resident
great horned owl *Bubo virginianus*	Uses a variety of forests with meadows and other openings from valley foothill hardwood to mixed conifer forest	**Likely.** Likely breeder and year-round resident of the Project Area
long-eared owl *Asio otus*	Frequents dense, riparian and live oak (*Quercus agrifolia*) thickets near meadow edges, and nearby woodland and forest habitats; also found in dense conifer stands at higher elevations	**Possible.** May occur as breeder and year-round resident
northern pygmy owl *Glaucidium gnoma*	Occurs in most forest habitats in California especially valley foothill hardwood, mixed conifer, valley foothill riparian, and montane riparian	**Likely.** Likely occurs as year-round resident
northern saw-whet owl *Aegolius acadicus*	Common in mature riparian, oak, and mixed-conifer habitats with intermediate canopy closure	**Likely.** Likely occurs as year-round resident
short-eared owl *Asio flammeus*	Found in open, treeless areas with elevated sites for perching, and dense vegetation for roosting and nesting	**Unlikely.** Regional year-round or winter resident but not likely to occur in forested habitats of Project Area
western screech-owl *Megascops kennicottii*	Yearlong resident of open oak, pinyon-juniper, riparian, and mixed-conifer habitats; nests and roost in tree cavities	**Likely.** Likely occurs as year-round resident

Potential Raptor Nesting Habitat

Abundant nesting habitat for forest-nesting raptor species is present within the Project and Evaluation Areas. Those raptor species most likely to be found nesting within the Project's mixed conifer forest, based on habitat alone, are: Cooper's hawk, sharp-shinned hawk, northern goshawk, California spotted owl, flammulated owl, northern pygmy owl, and northern saw-whet owl. The Fountain Fire, which burned much of the central half of the Project Area in 1992, has limited the amount of nesting habitat for some forest-nesting species, but may be suitable for species preferring more open forest and scrub habitats (i.e., early seral) for nesting (e.g., American kestrel, red-tailed hawk, great horned owl, and western screech-owl). Nesting habitat for bald and golden eagles is generally absent from the Project Area; however, bald eagles likely nest within several miles of the Project Area at sites associated with larger rivers and water bodies.

Areas of Potentially High Prey Density

Rodents (e.g., woodrats [*Neotoma* spp.], chipmunks, and squirrels), lagomorphs (e.g., snowshoe hare), and passerines (i.e., songbirds) are the prey categories most likely to occur within the Project Area. The numerous, scattered clear cuts within the Project and Evaluation Areas likely provide excellent edge habitat for these species and may provide a concentrated food source for some raptors. Fish are also prey for raptors such as osprey and bald eagles. However, larger rivers and streams preferred by these species are absent from the Project and Evaluation Areas.

Proposed California Condor Reintroduction in Northern California

The California condor, which historically ranged throughout the western U.S., steadily declined throughout the 20th century and was close to extinction by the 1980's. The last known occurrence of a condor in northern California was in the early 20th century. In 1987, the last of the free-flying condors were taken into captivity. As a result of reintroduction efforts that began in southern California in 1992, the current range of the California condor includes California's southern coastal ranges from Big Sur to Ventura County, east through the Transverse Range and the southern Sierra Nevada, with other populations now occurring northern Baja California and in the Grand Canyon ecoregion in Arizona. The total populations in these areas now number more than 420 birds (USFWS 2016).

In early 2016 the USFWS initiated a formal agreement with the Yurok Tribe of Northern California, the National Park Service's Redwood National Park, California State Parks, and the Ventana Wildlife Society to assess the feasibility of releasing California condors in coastal northern California and southern Oregon with the idea that more widely dispersed populations will enhance recovery efforts. Public meetings are scheduled for January of 2017 and if approved, the reintroduction Plan could be initiated as early as 2018.

While the proposed reintroduction site, the Bald Hills of Redwood National Park, is located approximately 105 miles (169 km) west of the Project, the California condor is a wide-ranging

species known to cover up to 140 miles (225 km) in a day, particularly outside of nesting season. During breeding season, reproductive pairs typically fly less than 44 miles from the nest site (Snyder and Schmitt 2002). If reintroduction efforts are successful, the presence of condors in more inland portions of the state, including the Project Area, is a possibility; however, the likelihood of occurrence within the Project Area is not currently known. If the reintroduction plan is approved, reintroduced condors would be considered an experimental population, defined as members of a listed species that are geographically separate from other populations of the same species. It is unknown what designation this experimental condor population would have (i.e., essential or non-essential) and, therefore, what level of protection the population may be provided under the Endangered Species Act (ESA; ESA 1973) and the California Endangered Species Act (CESA; CESA 1984). An experimental population that is deemed nonessential may be subject to relaxed restrictions compared to other populations of the same species. Currently, the reintroduced condor population occurring in Arizona, Nevada, and Utah is designated as a nonessential experimental population (USFWS 2016).

Bird Migration

The Project is located within the Pacific Flyway, a major north-south flyway for migratory birds which extends from Alaska to Patagonia and spans the western U.S. from the Pacific Ocean inland to the Rocky Mountains. . The Project and Evaluation Areas contains stopover habitat (i.e., habitat where migratory species may stop to rest, drink, and refuel) for raptors, songbirds, waterfowl, and shorebirds in the form of forest, grassland, shrub-scrub, and smaller areas of riparian and wetland habitat.

Migrating Raptors

Several factors influence the migratory paths of raptors; one of the most significant influences is geography. Ridgelines and the shorelines of large bodies of water are used by migrating raptors because they provide conditions necessary for energy-efficient travel over long distances (Liguori 2005) and serve as navigational aids. For these reasons, raptors tend to follow corridors or pathways along prominent ridges with defined edges or along shorelines during migration. While it is certain that raptors migrate through the Project Area, higher, north-south trending ridgelines are generally east of the Project Area. There does not appear to be any specific features in the Project or Evaluation Areas that would concentrate or funnel raptors during migration. Additionally, there are no significant open river corridors or large lakes within the Project or Evaluation Areas that would attract or concentrate raptor movements. At its closest point, the Pit River runs approximately 0.5 miles to the west and north of the Evaluation Area and Lake Margaret lies approximately 0.5 miles to the east of the Evaluation Area (see Figure 3).

Migrating Passerines

Passerines are by far the most abundant bird group in most terrestrial ecosystems (NRC 2007). In inland areas, it is generally assumed that nocturnal migrating passerines move in broad fronts rather than along specific topographical features (Gauthreaux et al. 2003, NRC 2007). Many species of songbirds migrate at night and may collide with tall man-made structures, though no

large mortality events on the scale of those observed at communication towers (National Wind Coordinating Collaborative [NWCC] 2004) have been documented at wind energy facilities in North America. Based on the two-year fatality monitoring study conducted at Hatchet Ridge, seasonal avian mortality was observed to be low (Tetra Tech 2013a). During the first year of monitoring (2010-2011) a total of 30 songbird fatalities were documented with 23 of the fatalities (77%) found during the spring and fall migration period. During the second year of study (2011-2012), nine songbird fatalities were documented with five of the fatalities (56%) recorded during the spring and fall (Tetra Tech 2013a). It should be noted that many of the songbird fatalities found at Hatchet Ridge were resident species, rather than nocturnal migrants, and increased mortality in spring may simply reflect a general increase in avian activity. The results of the Hatchet Ridge fatality study suggest generally low risk to passerines and no disproportionate impacts to nocturnal migrants at the Project.

Breeding Birds

Important Bird Areas

The Audubon Society has identified Important Bird Areas (IBAs) throughout the Western Hemisphere that provide essential habitat for birds (Audubon 2017). These IBAs include sites for breeding, wintering, and migrating birds and can range from only a few acres to thousands of acres in size. There are no identified IBAs within 20 miles of the Project Area. The closest IBAs to the Project are the Fall River Valley IBA, located 20 miles (32 km) to the northeast, and the Upper McCloud IBA located 28 miles (45 km) to the north-northwest. These two IBAs are discussed below.

The Fall River Valley IBA is formed by the Pit and Fall Rivers. This is an area of transition between the Cascade Mountains and the Modoc Plateau, resulting in important habitat diversity including mixed oak-coniferous forest, oak-dominated chaparral, and large, shallow lakes with extensive marshy borders (Audubon 2017). This 54,000 acre (84 mi^2) site supports a high diversity of ducks and shorebirds, including breeding sandhill cranes (*Grus canadensis*). Thousands of ducks and geese over-winter here, and the site provides a staging area for migrating species such as the cackling Canada goose (*Branta hutchinsii*), a rare subspecies. The Pit and Fall rivers support large populations of breeding and wintering bald eagles and osprey and the open valley provides important winter foraging habitat for raptors. Swainson's hawks, long-billed curlews (*Numenius americanus*), burrowing owls, black swifts (*Cypseloides niger*), and tricolored blackbirds (*Agelaius tricolor*) are known to nest in the valley, while bank swallows (*Riparia riparia*), a state threatened species (CDFW 2017), are known to nest along the Pit River (Audubon 2017). The majority of this area is privately owned and used for grazing and irrigated agriculture although there are two state parks within the valley.

The Upper McCloud River IBA is located southeast of Mt. Shasta in Siskiyou County and supports a diverse breeding bird community representative of the Cascade Mountain ecoregion. This IBA encompasses 835 acres (1.3 mi^2) of extensive riparian and wetland habitat supporting populations of species dependent upon these habitats. The site is notable for a large population of breeding willow flycatchers (*Empidonax traillii*), a state endangered species (Audubon 2017,

CDFW 2017). The land is primarily managed by the USDA Forest Service, with some private inholdings.

USFWS Birds of Conservation Concern

The USFWS lists 11 birds of conservation concern within the Sierra Nevada Bird Conservation Region (USFWS 2008). These species do not receive special protection unless they are also listed by the USFWS under the ESA (1973) or by the CDFW, but have been identified as vulnerable to population declines in the Conservation Region by the USFWS. Of these, four species are diurnal raptors or owls (bald eagle, American peregrine falcon, flammulated owl, and spotted owl) and have the potential to occur within the Project Area (see Raptors section above). The remaining seven species on the list also have at least some potential to occur within the Project Area. These species include: black swift (*Cypseloides niger*), calliope hummingbird (*Stellula calliope*), Cassin's finch (*Carpodacus cassinii*), Lewis's woodpecker (*Melanerpes lewis*), olive-sided flycatcher (*Contopus cooperi*), Williamson's sapsucker (*Sphyrapicus thyroideus*), and willow flycatcher. The willow flycatcher is listed as a state endangered species (CDFW 2017), and while high quality nesting habitat for the species appears to be absent from the Project Area, there is potential for individuals to migrate through the area. Both black swift and olive-sided flycatcher are also state SSC (CDFW 2017).

USGS Breeding Bird Survey

The closest USGS BBS (USGS 1999) routes to the Project are the Hat Creek Route, which starts 12 miles (19 km) to the east of the Project Area and extends southward, and the Shasta Lake Route, which is located 13 miles (21 km) northwest of the Project Area (Figure 10). Breeding bird survey routes are 24.5 miles (39.4 km) long and consist of 50 stations distributed along the length of the route where three minute counts are conducted (USGS 2001). Information gathered from the survey allows some indication of species that may use the Project Area and surrounding region either transiently or for breeding habitat during the summer.

The Hat Creek route has been monitored for 37 years between 1973 and 2013, while the Shasta Lake route has been monitored for 36 years between 1972 and 2012 (Sauer et al. 2014). A total of 144 unique species were observed along these two routes including 15 vulture or raptor species (turkey vulture, osprey, bald eagle, northern harrier, sharp-shinned hawk, Cooper's hawk, northern goshawk, red-shouldered hawk, red-tailed hawk, golden eagle, American kestrel, (American) peregrine falcon, western screech-owl, great horned owl, and northern pygmy owl; Sauer et al. 2014). The most common species seen along these BBS routes, with an average of more than 30 individuals sighted per year, are: cliff swallow (*Petrochelidon pyrrhonota*), black-headed grosbeak (*Pheucticus melanocephalus*), mountain chickadee (*Poecile gambeli*), western tanager (*Piranga ludoviciana*), orange-crowned warbler (*Vermivora celata*), spotted towhee (*Pipilo maculates*), black-throated gray warbler (*Setophaga nigrescens*), and acorn woodpecker (*Melanerpes formicivorus*). One state endangered species (bald eagle) and two state fully protected species (golden eagle and [American] peregrine falcon) have been observed along these routes (CDFW 2017). Additionally, nine state SSC (northern harrier, northern goshawk, olive-sided flycatcher, black swift, Vaux's swift [*Chaetura*

vauxi], purple martin [*Progne subis*], yellow warbler [*Setophaga petechial*], yellow-headed blackbird [*Xanthocephalus xanthocephalus*], and yellow-breasted chat [*Icteria virens*]) and three state watch list species (osprey, Cooper's hawk, and sharp-shinned hawk) have also been observed (CDFW 2017). Seven species designated by the USFWS as species of conservation concern within the Sierra Nevada Region have been observed along these routes: bald eagle, (American) peregrine falcon, black swift, calliope hummingbird, Williamson's sapsucker, olive-sided flycatcher, and Cassin's finch (USFWS 2008, Sauer et al. 2014).

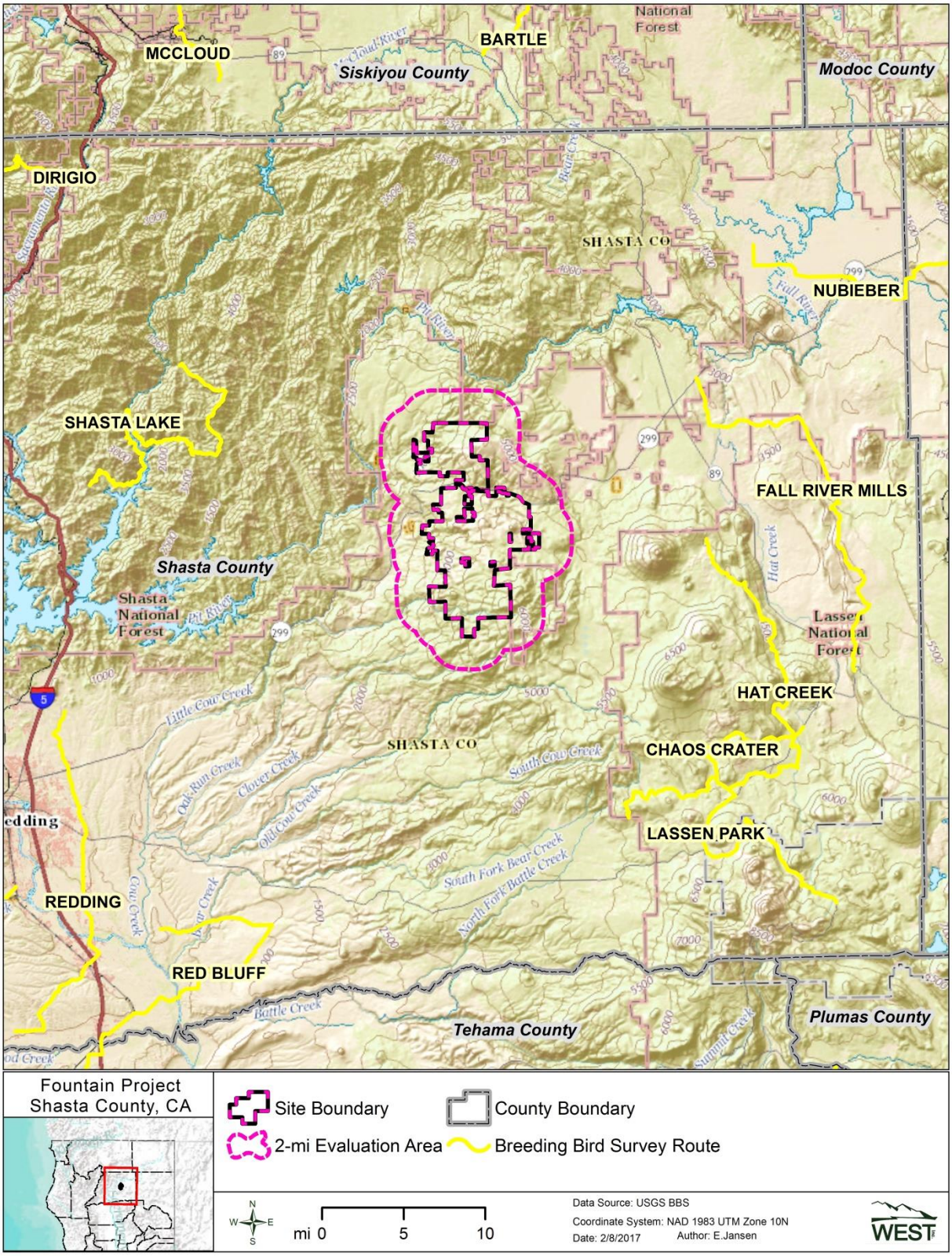


Figure 10. Breeding Bird Survey (BBS) routes closest to Fountain Wind Project.

Bats

Species Likely to Occur in the Area

Due to the lack of complete understanding of bat populations in North America, species and relative abundance of bats occurring within the Project Area are difficult to determine. Based on range maps and species accounts from BCI (2016) and the CWHR (2017), 23 species of bat are known to occur in California, with 17 species having an approximate range and habitat requirements that include the Project and Evaluation Areas (Table 7). All of these species would find suitable habitat within the Project Area, many for breeding, and have the potential to occur within the Project at some time during the year. Five bat species with potential to occur within the Project Area are designated as SSC by the CDFW (2017): Pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), spotted bat (*Euderma maculatum*), western mastiff bat (*Eumops perotis*), and western red bat (*Lasiurus blossevillii*).

Table 7. Bat species within potential to occur within the Fountain Wind Project.

Species	Habitat	Potential for Occurrence in the Project Area
big brown bat *Eptesicus fuscus*	Found in all vegetation types; roosts in buildings and man-made structures	**Likely.** Year-round resident
Brazilian free-tailed bat *Tadarida brasiliensis*	Woodlands, mixed conifer forests; roosts in caves, mines, tunnels, crevices	**Likely.** Summer or year-round resident, however suitable roosting habitat appears limited
California bat *Myotis californicus*	Woodland and forest from sea level through mixed conifer; crevice roosting, buildings, under bark, caves and mines	**Likely.** May occur as year-round resident
canyon bat *Parastrellus hesperus*	Common in arid brushlands, grasslands, and woodlands; uncommon in conifer forests; roosts in rocky canyon walls and cliffs	**Unlikely.** Preferred desert scrub and grassland habitat not present within Project Area; roosting habitat absent
fringed bat *Myotis thysandodes*	Valley foothill hardwood and hardwood-conifer; 4,000-7,000 ft (1,219-2,134 m); roosts in caves, buildings, crevices, and mines	**Possible.** May occur as year-round resident; roosting habitat limited
hoary bat *Lasiurus cinereus*	Woodland and forest with dense foliage; solitary, tree-roosting species; long-distance migrant	**Likely.** Summer resident and migrant
little brown bat *Myotis lucifugus*	Mid- to high-elevation forests; roosts in buildings, trees, under rock or wood; limited by roost sites	**Likely.** Year-round resident
long-eared bat *Myotis evotis*	Coniferous woodland, and forest habitat preferred; roosts in buildings, crevices, snags and under bark	**Likely.** Year-round resident
long-legged bat *Myotis volans*	Woodland and forest habitats above 4,000 ft (1,219 m); roosts in rock crevices, buildings, tree bark	**Likely.** Year-round resident

Table 7. Bat species within potential to occur within the Fountain Wind Project.

Species	Habitat	Potential for Occurrence in the Project Area
pallid bat* *Antrozous pallidus*	Woodlands, forests; roosts in caves, crevices, mines, hollow trees	**Possible.** May occur as year-round resident
silver-haired bat *Lasionycteris noctivagans*	Montane coniferous forest, valley foothill woodlands; roosts in hollow trees, snags, buildings, rock crevices, under bark; long-distance migrant	**Occurs.** Summer or year-round resident and migrant through Project Area. Historic records of occurrence within the Project Area
spotted bat* *Euderma maculatum*	Grasslands, mixed conifer forests, sea level to 10,000 ft (3,048 m); prefers rock crevices, cliffs optimal	**Possible.** May occur as year-round resident; roosting habitat limited within Project Area
Townsend's big-eared bat* *Corynorhinus townsendii*	All habitats except alpine and sub-alpine; caves, mines, tunnels, etc.; roosting sites most important limiting resource	**Possible.** May occur as year-round resident; roosting habitat limited within Project Area
western mastiff bat* *Eumops perotis*	Open semi-arid to arid habitats including conifer and deciduous woodlands; roosts in high rock crevices, cliffs, and tall buildings	**Possible.** May forage within Project Area year-round; roost sites appear to be absent
western red bat* *Lasiurus blossevillii*	Forests and woodlands from sea level up through mixed conifer forests; roosts primarily in trees; migratory	**Likely.** Summer resident and migrant
western small-footed bat *Myotis ciliolabrum*	Arid wooded and brushy uplands, sea level to 8,900ft (2,713 m); caves, buildings, mines, crevices, occasionally under bridges and bark	**Possible.** May occur as summer or year-round resident
Yuma bat *Myotis yumanensis*	Open forests and woodlands are preferred habitats; foraging closely tied to water sources; roosts in caves, buildings, mines, under bridges	**Possible.** May occur as year-round resident; open water foraging habitat limited within site

* California Species of Special Concern (CDFW 2017)
Species list based on range maps and species accounts from BCI (2017) and CWHR (2017)

Bat fatalities at wind energy facilities were first noted during bird surveys in the early 1990s (Orloff and Flannery 1992). However, it was not until reports estimated high numbers of bat fatalities at sites in West Virginia (Kerns and Kerlinger 2004) and Tennessee (Fiedler 2004) that concern was elevated and alliances such as the Bats and Wind Energy Cooperative (BWEC) were established to determine the extent of bat mortality at wind power facilities and to develop solutions to the potential problem (Arnett 2007). The NRC published findings of the Committee on Environmental Impacts of Wind Energy Projects, whose task was to provide a comprehensive review of scientific literature pertaining to the effects of wind energy facilities on the local environment (NRC 2007). Bat casualties have been reported from most wind energy facilities where post-construction fatality data are publicly available. Reported estimates of bat mortality at wind energy facilities have ranged from 0.02 – 53.3 fatalities per megawatt (MW) per year (Arnett et al. 2008). Although some wind power facilities have comparatively high numbers of bat fatalities (Arnett et al. 2008), these figures may be underestimates due to relatively high

levels of scavenger removal rates (over 70 percent of bat carcasses removed within 24 hours) and low searcher efficiency, especially where vegetation is relatively high (Arnett 2005b). The small body size of bats also contributes to a lower detection rate compared to that of larger carcasses (e.g., raptors).

Studies conducted at other wind energy facilities have documented use of areas within and around the facilities by resident or breeding bats during the summer reproductive period. However, these species are rarely found as casualties at turbines (Johnson 2005). To date, most bat casualties at wind energy facilities are migratory species (e.g., hoary, silver-haired, and eastern red bats), which conduct relatively long fall migrations between summer roosts and wintering areas (Gruver 2002, Johnson et al. 2003b). For unknown reasons, bat mortality rates are disproportionately high during the fall compared with the spring migration period. However, it may be that tree-roosting bats fly at lower altitudes (AGL) during spring migration than during fall migration. For example, hoary bats fly 3 to 16 ft (1 to 5 m) above the ground while migrating through New Mexico in the spring, but apparently not in the fall (Cryan and Veilleux 2007). Similarly, a hoary bat collided with an aircraft above Oklahoma at an altitude of 8,000 ft (2,438 m) in October of 2001 (Peurach 2003), which may support the theory that bats generally fly at higher altitudes in the fall.

At least 19 bat species have been recovered during carcass searches or incidentally at wind energy facilities throughout the U.S. and of these, nine species are potential residents or migrants within the Project (Table 8). At the adjacent Hatchet Ridge site, a total of 42 bat fatalities were documented during two years of fatality monitoring from 2010 – 2012, for an estimated annual fatality rate of 5.13 bats/turbine/year for the first year of the study and 12.02 bats/turbine/year for the second year (Tetra Tech 2013a). Consistent with the trend observed at other western wind energy projects, the majority of bat fatalities found at Hatchet Ridge were migratory species, with the majority of fatalities found during the fall migration period. It is estimated that impacts to bats at the Project may be similar to that observed at Hatchet Ridge; however, due to an overall lack of knowledge regarding bat and wind turbine interactions, it is difficult to determine definitive risk to bats posed by development of the Project.

Table 8. Summary of bat fatalities (by species) from wind energy facilities in North America.

Common Name	Scientific Name	# Fatalities[1]	% Composition
hoary bat[2]	*Lasiurus cinereus*	5,498	36.6
eastern red bat	*Lasiurus borealis*	3,711	24.7
silver-haired bat[2]	*Lasionycteris noctivagans*	2,594	17.3
little brown bat[2]	*Myotis lucifugus*	1,038	6.9
tricolored bat	*Perimyotis subflavus*	644	4.3
big brown bat[2]	*Eptesicus fuscus*	582	3.9
Mexican free-tailed bat[2]	*Tadarida brasiliensis*	517	3.4
unidentified bat		326	2.2
unidentified *Myotis*	*Myotis* spp.	39	0.3
northern long-eared bat	*Myotis septentrionalis*	30	0.2
Seminole bat	*Lasiurus seminolus*	14	0.1
western red bat[2]	*Lasiurus blossevillii*	13	0.1
evening bat	*Nycticeius humeralis*	7	<0.1
big free-tailed bat	*Nyctinomops macrotis*	6	<0.1
unidentified free-tailed bat		3	<0.1
western yellow bat	*Lasiurus xanthinus*	3	<0.1
eastern small-footed bat	*Myotis leibii*	2	<0.1
Indiana bat	*Myotis sodalis*	2	<0.1
pocketed free-tailed bat	*Nyctinomops femorosacca*	2	<0.1
unidentified Lasiurus bat	*Lasiurus* spp.	2	<0.1
canyon bat[2]	*Pipistrellus hesperus*	1	<0.1
cave bat	*Myotis velifer*	1	<0.1
long-legged bat[2]	*Myotis volans*	1	<0.1
Total	**19 species**	**15,036**	**100**

[1] These are raw data and are not corrected for searcher efficiency or scavenging.
[2] Potential resident or migrant in the Project (Harvey et al. 1999, BCI 2016).
Cumulative fatalities and species from data compiled by Western EcoSystems Technology, Inc. from publicly available fatality documents (see Appendix B).
Additional notes on bat species and numbers:
Indiana bat fatalities in this table are also reported by USFWS (2010, 2011a). Five additional Indiana bat fatalities have been reported (USFWS 2011b, 2012b, 2012c; Pruitt and Okajima 2014), but as little additional data is available, they are not included in this summary of bats found as fatalities.
One long-eared bat (*Myotis evotis*) was an incidental fatality recorded at Tehachapi, California (Anderson et al. 2004), but was not part of a formal search and is not included above.
An additional 677 bat fatalities (evening bat, eastern red bat, hoary bat, tricolored bat, Mexican free-tailed bat, and unidentified bat) have been found in Texas (Hale and Karsten 2010), but the number of fatalities by species is not reported.
Canyon bat formerly known as western pipistrelle (*Pipistrellus hesperus*), and tricolored bat formerly known as eastern pipistrelle (*Pipistrellus subflavus*; BCI 2015a, 2015b).

Federal Listed Species

Thirteen federal endangered, threatened, or candidate wildlife species have been documented as occurring within Shasta County based on data obtained from the USFWS (2017b) and the CNDDB (2017; Table 9). Most of these species have highly restricted ranges or occupy specialized habitats which do not occur within the Project or Evaluation Areas, and therefore have little or no likelihood of occurrence. The Sierra Nevada red fox (*Vulpes vulpes necator*) and the California red-legged frog (*Rana draytonii*) have at least some potential to occur within the Project Area as suitable habitats may to present; however, both species are rare in the region and have not been documented as occurring in the Project or Evaluation Areas (CNDDB

2017). The gray wolf (*Canis lupus*), extirpated from California in the 1920's, is not currently known to occur in the Project Area, although populations in Oregon are expanding and wolves were recorded in Shasta and Lassen Counties in 2015 and 2016. It is possible that this wide-ranging species will eventually occupy habitats within the Project Area (Kovacs et al. 2016). The western pond turtle is currently under review for potential listing under the ESA (USFWS 2017b), is known to occur just southwest of the Project Area (Figure 11), and suitable habitat is present within the Project Area. The yellow-billed cuckoo (*Coccyzus americanus*), Shasta crayfish (*Pacifastacus fortis*), and Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) each have a very low likelihood of occurrence based on current known ranges and habitat requirements. Federal listed species with at least some potential (i.e., unlikely or possible) to occur within the Project Area are discussed in greater detail below.

Table 9. Federal listed, candidate, or under review wildlife species with potential to occur within the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence in the Project Area
Birds			
northern spotted owl *Strix occidentalis caurina*	T	Mature forest, multi-layered mixed conifers	**None.** In Shasta County, northern subspecies occurs only north of the Pit River, which is outside of the Project Area
yellow-billed cuckoo *Coccyzus americanus*	T	Riparian forest along the broad, lower flood-bottoms of larger river systems; nests in riparian jungles of willow often mixed with cottonwoods	**Unlikely.** Rare breeder throughout California. Not known to occur near Project Area; suitable riparian habitat generally not present within the Project Area
Mammals			
gray wolf *Canis lupus*	E	Habitat generalists, historically occupying diverse habitats including tundra, forests, grasslands, and deserts	**Possible.** No documented observations in the CNDDB for Shasta County since 1924; however, populations in Oregon are expanding and natural recolonization of northern California is occurring, with confirmed presence in Siskiyou and Lassen Counties in 2015 and 2016, respectively; suitable habitat is present within the Project Area

Table 9. Federal listed, candidate, or under review wildlife species with potential to occur within the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence in the Project Area
Sierra Nevada red fox *Vulpes vulpes necator*	C	Historically found from the Cascades down to the Sierra Nevada. Inhabit a variety of habitats from wet meadows to forested areas, typically at elevations above 5,000 feet. Currently restricted to several small populations in California and Oregon.	**Unlikely.** Known from only a few observations in CNDDB; Project falls within historical range but outside of species known occupied range.
Amphibians			
California red-legged frog *Rana draytonii*	T	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation	**Unlikely.** No known occurrences within Shasta County (CNDDB 2017); however, some suitable stream habitat may be present within Project Area
Reptiles			
western pond turtle *Emys marmorata*	UR	Aquatic species requiring ponds, marshes, rivers, streams, and irrigation ditches, usually with aquatic vegetation	**Possible.** Suitable aquatic habitat limited within the Project Area, but may be present within pools of larger creeks or ponds; CNDDB documents species presence near southwest corner of Project Area
Fish			
bull trout *Salvelinus confluentus*	T	Deep pools in cold rivers and large tributary streams, often in moderate to fast currents; also large coldwater lakes and reservoirs; historically found only in the McCloud River system	**None.** No suitable stream habitat present within Project Area; believed to be extinct in California
Chinook salmon *Oncorhynchus tshawytscha*	T (spring-run) E (winter-run)	Large freshwater streams and rivers and estuaries for spawning; require deep, cold, flowing water	**None.** No suitable stream habitat present within Project Area
steelhead (Central Valley DPS) *Oncorhynchus mykiss irideus*	T	Sacramento and San Joaquin rivers and their tributaries	**None.** Range lies to the west and south of the Project Area; no suitable stream habitat present within Project Area
Invertebrates			
conservancy fairy shrimp *Branchinecta conservatio*	E	Turbid, slightly alkaline, large, deep, vernal pools and winter lakes in California grassland areas	**None.** Suitable vernal pool habitat absent within Project Area

Table 9. Federal listed, candidate, or under review wildlife species with potential to occur within the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence in the Project Area
Shasta crayfish *Pacifastacus fortis*	E	Cool, spring-fed headwaters with clean, volcanic cobbles, over sand and gravel substrates	**Unlikely.** Known only from the Fall River and Hat Creek subdrainages of the Pit River system
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T	Occurs only in the Central Valley of California, in association with blue elderberry (*Sambucus mexicana*)	**Unlikely.** Known only to occur in locations west and south of Project Area in California's Central Valley
vernal pool fairy shrimp *Branchinecta lynchi*	T	Small, clear-water depression pools and grassed swales; endemic to grasslands of the Central Valley, central coast mountains, and south coast mountains	**None.** Known only from isolated locations in lower elevations of Shasta County; suitable vernal pool habitat absent from Project Area
vernal pool tadpole shrimp *Lepidurus packardi*	E	Vernal pools and swales in the Sacramento Valley containing clear to highly turbid water	**None.** Known only from isolated locations in lower elevations of Shasta County; suitable vernal pool habitat absent from Project Area

E: federally-listed endangered species; T: federally-listed threatened species; C: federal candidate species for listing; UR: under review (petitioned for listing but 90-day/12-month finding not published, also possible candidate but Candidate Notice of Review [CNOR] not signed)
Species status from USFWS 2017b, CNDDB 2017

Yellow-billed Cuckoo

The yellow-billed cuckoo is a federal threatened species (USFWS 2017b), as well as a California state endangered species (CDFW 2017). This species inhabits deciduous riparian thickets or forests with dense, low-level or understory foliage which occur adjacent to slow-moving watercourses. Willow is almost always a dominant component of the vegetation (CWHR 2017). The western subspecies (*C. a. occidentalis*) has disappeared over much of it former range in California and other western states, primarily due to habitat loss. In California, yellow-billed cuckoos now occur only as rare summer residents of valley foothill and desert riparian habitats in scattered locations across the state (CWHR 2017). The species' current range in California is generally south of the Project, and riparian willow habitats used by the cuckoo are not present in the Project, though they may occur in the surrounding region. The CNDDB (2017) lists no known occurrences of the species in the Project; however, the USFWS (2017b) lists the species as occurring or potentially occurring in Shasta County. The potential for yellow-billed cuckoos to occur in the Project Area is unlikely given their highly-restricted range and lack of suitable habitat.

Gray Wolf

The gray wolf is currently an endangered species at both the federal (USFWS 2017b) and state level (CDFW 2017). The species was believed to be extirpated from the state of California in the 1920's and from much of its range in the United States by the mid-1930's. In 1995 and 1996, populations were reintroduced in Idaho and Yellowstone National Park in Wyoming and have expanded rapidly. As of 2014, Washington's wolf population was estimated to be 68 individuals, while Oregon's population was estimated to be 81 individuals (Kovacs et al. 2016). A lone wolf dispersed into northern California from Oregon in 2011, prompting the state listing of the gray wolf under CESA in 2014. In 2015, cameras deployed in Siskiyou County recorded two adult wolves and four pups, suggesting the natural recolonization of northern California by gray wolves (Kovacs et al. 2016); since that time wolves have also been documented in Lassen County. Gray wolves are habitat generalists, historically occupying diverse habitats including tundra, forests, grasslands, and deserts. Primary habitat requirements are the presence of adequate ungulate prey, water, and low human contact (CWHR 2017). It is possible that gray wolves currently inhabit (or travel through) the Project Area, and the probability of occurrence will likely increase in the future as populations in the Pacific Northwest in general, and California specifically, continue to expand.

Sierra Nevada Red Fox

The Sierra Nevada red fox is a candidate for federal listing (USFWS 2017b) as well as a state-listed threatened species (CDFW 2017). Its historical range is believed to include an area from the Oregon Cascades southward to the northern Sierra Nevada and then south along the Sierran crest to Tulare County (CWHR 2017). Red foxes appear to prefer red fir (*Abies magnifica*) and lodgepole pine (*Pinus contorta*) forests in the subalpine zone and alpine fellfields of the Sierra Nevada, but may also use wet meadows, mixed conifer, montane chaparral, and pine habitats. They may hunt in forest openings, meadows, and barren rocky areas associated with high elevation habitats, typically above 5,000 ft (1,524 m), using dense vegetation and rocky areas for cover and den sites (CWHR 2017). The Project lies outside the known occupied range of the Sierra Nevada red fox; the species is currently known to occur in California in two loosely clustered "sighting areas" (i.e., Lassen and Sonoran Pass; USFWS 2015). There are no known records of the species occurring within 10 miles of the Project (CNDDB 2017). Given their highly restricted range, Sierra Nevada red fox are unlikely to occur in the Project Area.

California Red-legged Frog

The California red-legged frog is a federal threatened species (USFWS 2017b) occurring along the coast ranges from Mendocino County south and in portions of the Sierra Nevada and Cascades, usually below 3,900 ft (1,200 m) in elevation (CWHR 2017). California red-legged frogs inhabit quiet pools of streams, marshes, and occasionally ponds, preferring shorelines with extensive vegetation (CWHR 2017). The species requires permanent or nearly permanent pools for larval development; therefore intermittent streams must retain water in pools year-round for the species' survival. The Project Area lies at the northern extent of the species' range and suitable aquatic habitat may be present within the Project Area; however, no California red-legged frog occurrences have been documented in Shasta County (CNDDB 2017).

Western Pond Turtle

The western pond turtle is currently Under Review (UR) by the USFWS (2017b), a status applied to species petitioned for listing but for which a 90-day or 12-month finding has not been published in the Federal Register. This status may also apply to species under review through the candidate process, but for which the Candidate Notice of Review (CNOR) has not been signed. The western pond turtle is a medium-sized pooled water dwelling turtle that historically ranged from southern California north to Puget Sound in Washington, including much of California's Central Valley. It prefers habitat with plentiful aquatic vegetation, with either rocky or muddy bottoms, and where exposed banks are present for basking. Although in decline across much of their range due to habitat loss and competition with red-eared sliders (*Trachemys scripta elegans*) and painted turtles (*Chrysemys picta*), western pond turtles are still found throughout northwestern California south to San Francisco bay, including much of Shasta County (CHWR 2017). Western pond turtles occur from sea level up to approximately 6,700 ft (2,042 m) in a variety of aquatic habitats (CHWR 2017). Because this species still occupies a variety of habitats in California, including a known location just southwest of the Project (Figure 11), it is possible that it may occur in the Project Area.

Shasta Crayfish

The Shasta crayfish is listed as both a federal and state endangered species (CDFW 2017, USFWS 2017b). The species inhabits cool, clear, spring-fed lakes, rivers, and streams, usually at or near a spring inflow source where waters show little annual fluctuation in temperature and remain cool during summer. In general, Shasta crayfish habitat is defined by the availability of volcanic rock cobble and boulders on sand or gravel to provide refuge from predators (USFWS 1998). While potential food resources, water temperature, and water chemistry may also influence the species distribution, the range of conditions where Shasta crayfish occur is considerable and detailed information of the species ecology is limited. Currently the species range is limited to the midsections of the Pit River drainage, primarily the Fall River and Hat Creek subdrainages in Shasta County. Isolated populations identified within these subdrainages occur between 12 and 28 miles (19.3 to 45.1 km) to the east and northeast of the Project (USFWS 1998).

Valley Elderberry Longhorn Beetle

The Valley elderberry longhorn beetle, a federal threatened species (USFWS 2017b), is a medium-sized beetle endemic to the Central Valley of California. The beetle is found only in association with its host plant, blue elderberry (*Sambucus mexicanus*; USFWS 2006). Currently, the beetle ranges from southern Shasta County south to Fresno County within the Central Valley; however, range-wide population trend data is scarce. While the beetle's host plant, blue elderberry, likely occurs within the Project Area, the beetle is currently known only from lower elevations south and southwest of the Project and has not been identified as occurring within 10 miles.

State Listed Species

The CNDDB (2017b) lists 16 state endangered, threatened, candidate, or fully protected species with documented occurrence in Shasta County, including eight birds, three mammals, one amphibian, three fish, and one invertebrate (Table 10). With the exception of the three fish species which require larger streams and rivers than those present within the Project Area, each of the species has at least some potential (i.e., unlikely, possible, likely, or known) to occur within the Project Area at some point in the year, either as residents or migrants within the site, and nine species have at least a moderate potential to occur. With the exception of the Sierra Nevada red fox, gray wolf, and the Shasta crayfish, which are also federal listed or candidate species and therefore presented above, state listed species with at least some potential to occur within the Project Area are discussed in greater detail below.

Table 10. State listed or candidate wildlife species with potential to occur within the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence in the Project Area
Birds			
American peregrine falcon *Falco peregrines anatum*	FP	Uncommon resident and migrant; frequents bodies of water in open areas with cliff and canyons nearby for cover and nesting	**Possible.** May occur as transient or migrant; suitable foraging/nesting habitat generally absent from Project Area
bald eagle *Haliaeetus leucocephalus*	E	Requires large, old-growth trees or snags in remote, mixed stands near water; roosts communally in winter	**Possible.** Nesting and foraging habitat generally absent from Project Area but present in site vicinity; CNDDB documents several occurrences within five miles of Project Area
bank swallow *Riparia riparia*	T	Nests colonially in riparian and lowland habitats; requires vertical banks/cliffs with fine-textured soils near streams, rivers, lakes to dig nest cavity	**Possible.** Not known to occur in site vicinity and suitable nesting habitat unlikely to occur on site; may forage within, or migrate through Project Area
golden eagle *Aquila chrysaetos*	FP	Uncommon permanent resident and migrant throughout California; uses rolling foothills and mountainous terrain, open mountain slopes, and cliffs and rock outcrops	**Possible.** Nesting habitat generally absent within site and vicinity but potential to occur as transient or migrant within Project Area
greater sandhill crane *Grus canadensis tabida*	T	Wet meadows, shallow lacustrine, and emergent wetlands for nesting and foraging; winters in Central Valley	**Possible.** Probable migrant over Project Area; suitable nesting/stopover habitat generally absent from site but may breed in open wetlands in region
Swainson's hawk *Buteo swainsoni*	T	Open desert, grassland, or cropland containing scattered, large trees or small groves	**Possible.** Preferred habitat absent but may occur as migrant over Project Area
tricolored blackbird *Agelaius tricolor*	C	Highly colonial species, most numerous in Central Valley & vicinity; requires open water, protected nesting substrate, & nearby foraging area	**Unlikely.** Breeds regionally, but suitable nesting habitat appears absent within Project Area; known to nest within the Fall River Valley approximately 20 miles to northeast of site; may occur as migrant through site
willow flycatcher *Empidonax traillii*	E	Wet meadow and montane riparian habitat 2,000-8,000 ft (610-2,438 m); most often in broad open river valley or large mountain meadows with lush growth of shrubby willows	**Possible.** Nesting habitat appears to be absent, but may occur as spring/fall migrant in riparian habitats within Project Area

Table 10. State listed or candidate wildlife species with potential to occur within the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence in the Project Area
Mammals			
Sierra Nevada red fox* *Vulpes vulpes necator*	T	Historically found from the Cascades down to the Sierra Nevada. Inhabit a variety of habitats from wet meadows to forested areas, typically at elevations above 5,000 feet. Currently restricted to several small populations in California and Oregon.	**Unlikely.** Known from only a few observations in CNDDB; Project falls within historical range but outside of species known occupied range.
California wolverine *Gulo gulo*	T	Scarce resident of North Coast Mountains and Sierra Nevada; uses mixed-conifer, red fir, and lodgepole habitats in northern Sierra	**Unlikely.** Known range is generally to north and east of Project Area; however, some suitable habitat may occur on site; CNDDB documents occurrence in 1968 along the northeastern boundary of Project Area
gray wolf* *Canis lupus*	E	Habitat generalists, historically occupying diverse habitats including tundra, forests, grasslands, and deserts	**Possible.** No documented observations in the CNDDB for Shasta County since 1924; however, populations in Oregon are expanding and natural recolonization of northern California is occurring, with confirmed presence in Siskiyou and Lassen Counties in 2015 and 2016, respectively; suitable habitat is present within the Project Area
Amphibians			
Shasta salamander *Hydromantes shastae*	T	Cool, wet rivers and valleys near limestone fissures or caves; occurs in valley foothill, hardwood conifers, ponderosa pine, and mixed conifer habitats in vicinity of Shasta Reservoir	**Unlikely.** Site is outside of species known range; suitable habitat appears to be absent; CNDDB documents species presence five miles to west of Project Area
Fishes			
bull trout *Salvelinus confluentus*	E	Deep pools in cold rivers and large tributary streams, often in moderate to fast currents; also large coldwater lakes and reservoirs; historically found only in the McCloud River system	**None.** No suitable stream habitat present within Project Area; believed to be extinct in California
Chinook salmon *Oncorhynchus tshawytscha*	T (spring-run) E (winter-run)	Large freshwater streams and rivers and estuaries for spawning; require deep, cold, flowing water	**None.** No suitable stream habitat present within Project Area

Table 10. State listed or candidate wildlife species with potential to occur within the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence in the Project Area
rough sculpin *Cottus asperrimus*	T	Primarily on muddy bottoms of large streams; restricted to Pit River and the Hat Creek and Fall River subdrainages	**None.** Suitable large stream habitat absent from Project Area is out of species known range
Invertebrates			
Shasta crayfish* *Pacifastacus fortis*	E	Cool, spring-fed headwaters with clean, volcanic cobbles, over sand and gravel substrates	**Unlikely.** Known only from the Fall River and Hat Creek subdrainages of the Pit River system

E: state-listed endangered species; T: state-listed threatened species; C: state candidate species for listing; FP: fully-protected species
Species status from CNDDB 2017, CDFW 2017
*species account included in federal listed species section above

American Peregrine Falcon

An uncommon breeding resident and uncommon migrant, the peregrine falcon was delisted as a federal endangered species in 1999 and as a California endangered species in 2009. The peregrine falcon remains, however, a state fully-protected species (CDFW 2017). Active nesting sites are known to exist in the mountains of northern California and the species is often found wintering inland. Additionally, individuals may migrate into California from more northerly breeding sites. This species commonly breeds in woodlands and forests, with wetlands and riparian habitats being an important year-round component of occupied habitat (CWHR 2017). Nests are typically situated on ledges of vertical rocky cliffs or river bluffs; however, tundra mounds, tree hollows, large stick nests of other species, and man-made structures (e.g., ledges of tall city buildings) may be used for nesting. When not breeding, peregrine falcons occur in areas with high prey concentrations such as farmlands, marshes, lakeshores, tidal flats, broad river valleys, and cities (CWHR 2017). The CNDDB currently has no record(s) of the peregrine falcon occurring within 10 miles of the Project Area; however, the species has been observed on the nearby Shasta Lake BBS Route (Sauer et al. 2014). No obvious suitable nesting habitat was observed within the Project Area during the preliminary site visit although isolated nest sites on the Project and in the surrounding region may occur. There is also potential for the species to forage within the site and surrounding area, particularly within wetlands and riparian habitats, or to pass through the Project during migration.

Bald Eagle

The bald eagle is listed as a state endangered species and is considered a fully protected species in California (CDFW 2017). The species is further projected under the federal BGEPA (1940). Historically, bald eagles occurred throughout California. However, current breeding distribution is limited primarily to mountainous habitat in the northern quarter of the state (CWHR 2017). Bald eagle nesting territories are typically found in pine and mixed conifer forests associated with lakes, reservoirs, rivers, or other large water bodies with abundant fish (CWHR 2017). While there are suitable nesting sites within the Project Area, there are no large water bodies that would typically be necessary to support nesting bald eagles in northern California. Suitable nesting, foraging, and wintering habitat may be available on lakes and rivers in the surrounding region, and bald eagles may occasionally fly over the Project while migrating or commuting between or among foraging areas. The CNDDB (2017) documents the occurrence of bald eagles to the north, northeast, and west of the Project, primarily in association with larger rivers and lakes in the region, and bald eagle have been observed on the nearby Shasta Lake BBS Route (Sauer et al. 2014).

Bank Swallow

Found primarily in riparian and other lowland habitats, the bank swallow, a state threatened species (CDFW 2017), was historically relatively common in California. Currently, scattered colonies exist throughout central and northern California, including Shasta County (CWHR 2017). This species also occurs as a migrant in the California interior and in mixed flocks with other swallow species. Primarily a colonial breeder, the bank swallow requires cliffs, bluffs, and

river banks with fine-textured or sandy soils in which to excavate nest burrows. It typically feeds over grassland, shrubland, savannah, and open riparian areas (CWHR 2017). The nearest known colony of bank swallows occurs along the Pit River within the Fall River Valley IBA, 20 miles east of the Project. Bank swallows may forage within the Project Area, and may fly over the Project during migration; however, waterways within the site do not appear to provide suitable habitat for nesting colonies.

Golden Eagle

The golden eagle, a state fully protected species (CDFW 2017) further protected under the BGEPA (1940), is an uncommon permanent resident and migrant throughout all of California, except the central portions of the Central Valley (CWHR 2017). The species is generally more common in southern California than in the northern part of the state. Golden eagles inhabit rolling foothill and mountainous terrain, including prairies, arctic and alpine tundra, wide, arid plateaus deeply cut by streams and canyons, and open mountain slopes. Golden eagles construct large platform nests of sticks and greenery on rock ledges or cliffs, or in large trees within open habitats. While suitable cliffs and open woodlands preferred for nesting are limited within the Project Area, there is potential for golden eagles to forage within the site or to pass through the Project during migration. There is also potential for the species to nest within suitable habitats in the surrounding region.

Greater Sandhill Crane

Historically, greater sandhill cranes (*Grus canadensis tabida*) were common breeders on the Modoc Plateau of northeastern California. Now listed as threatened by the CDFW (2017), their numbers and breeding range have been greatly reduced. The species nests in open areas of wet meadows that are typically interspersed with tall, emergent marsh vegetation. Sandhill cranes forage in pastures, flooded grain fields, and seasonal wetlands during migration and on their wintering grounds, and forage in emergent marsh and meadow habitats during the nesting season, preferring relatively treeless plains (CWHR 2017). During the spring, sandhill cranes are known to use habitats in the Fall River Valley IBA 20 miles east of the Project Area. While appropriate habitat for the species is generally absent from the Project and Evaluation Areas, the species likely uses open areas in the surrounding landscape and may pass over the Project Area during migration.

Swainson's Hawk

The Swainson's hawk, a state threatened species (CDFW 2017), is an uncommon breeding resident and migrant in northeastern California. The species breeds in North America and migrates to Central and South American for the winter. In California, the hawk is restricted to portions of the Central Valley and Great Basin where suitable foraging habitat is available (CDFW 2017). Swainson's hawks typically nest in trees along riparian corridors or in isolated trees or small groves in sparsely vegetated flatlands. They forage in adjacent grassland, shrubland, suitable grain or alfalfa fields, or livestock pastures. The forested habitats composing the majority of the Project Area are generally not suitable for nesting or foraging; however, more

open areas adjacent to the Project may provide suitable habitat. This species is a likely migrant throughout the Project Area in spring and fall.

Tricolored Blackbird

The tricolored blackbird is a candidate for state endangered listing in California (CDFW 2017). The species in highly colonial, breeding near freshwater, preferably in emergent wetland with tall dense cattails or tules, but also in thickets of willow, blackberry, and tall herbs (CWHR 2017). They forage on insects primarily in grassland and cropland habitat within a few kilometers of their breeding locations (CWHR 2017). Tricolored blackbirds are most numerous in the Central Valley of California but also occur locally in northeastern California (CWHR 2017). While the species is not migratory over most of it range, populations in the northeast of the state are believed to migrate south in winter. Flocks become nomadic in fall in search of food. There are a number of documented occurrences of tricolored blackbirds in Shasta County, although none within 10 mi (16 km) of the Project Area (CNDDB 2017; Figure 11). The species is known to occur within the Fall River IBA, approximately 20 miles northeast of the Project. Breeding habitat for the species is generally absent from the Project and Evaluation Areas; however, tricolored blackbirds may occur in the area during fall and winter as migrants or during foraging.

Willow Flycatcher

The willow flycatcher is listed as an endangered species by the state of California (CDFW 2017). Historically, the willow flycatcher was a common summer resident throughout California, with a breeding range extending wherever extensive willow thickets occurred (CDFW 2017). Currently, only small, scattered nesting populations exist in isolated wet meadows and riparian areas of the Sierra Nevada and Cascade ranges, and along the Kern, Santa Margarita, San Luis Rey, and Santa Ynez Rivers in southern California. The species requires dense willow thickets for nesting and roosting and low exposed branches from which to sing and perch while foraging. It is consistently absent from habitat where heavy livestock grazing has removed the lower branches of woody riparian vegetation. The willow flycatcher is also a fairly common spring and fall migrant, especially in riparian habitats, at lower elevations throughout the state. Some willow riparian areas are found in the vicinity of the Project, notably along Hatchet Creek and within several small meadows within the Project Area. These riparian areas could potentially provide suitable breeding habitat for the species, as could riparian habitat along Burney Creek, approximately 3 miles (4.8 km) to the northeast. It is likely that the species occurs within the Project Area during migration, particularly within riparian areas.

California Wolverine

The California wolverine is currently a state-threatened species in California (CDFW 2017). Within mixed conifer, red fir, and lodgepole pine habitats in the northern Sierra Nevada, the wolverine is generally found between 4,300 and 7,300 ft (1,311 and 2,225 m). Wolverines feed primarily on carrion and small mammals but will take larger prey as opportunity allows and have been known to force bears (*Ursus* spp.) and mountain lions (*Puma concolor*) off carcasses (CWHR 2017). The species prefers habitats with little human interference, hunting in open areas and using dense forest cover and snow for rest and reproduction. It is generally scarce

throughout its range but can travel vast distances (CWHR 2017). Suitable forested habitat and winter snow cover are available within southeastern portions of the Project; however, intense human activity in the form of logging likely deters use of the Project Area by wolverines. The CNDDB (2017) documents several occurrences of wolverines to the east of the Project Area, including along the northeastern boundary of the Project Area; however, these records are dated from 1966 to 1975.

Shasta Salamander

The distribution of the Shasta salamander (*Hydromantes shastae*), a state-listed threatened species (CDFW 2017), is discontinuous in limestone areas of Shasta County. It is uncommon, with numerous, isolated populations occurring in limestone areas in valley-foothill hardwood-conifer, ponderosa pine, and mixed-conifer habitat from 1,100 to 2,550 ft (335 to 777 m; CWHR 2017). Shasta salamanders appear to be active during the rainy periods of fall, winter, and spring, using logs, rocks, limestone slabs and talus as surface cover (CWHR 2017). During dry periods it retreats to limestone fissures and caverns or deep limestone talus. The Shasta salamander has a restricted range occurring only in the vicinity of Shasta Reservoir to the west of the Project, and suitable habitat for the species does not appear to be present within the Project Area.

State Species of Concern and Watch List Species

Based on data obtained from the CNDDB (2017), as well as on known species distributions and habitat requirements, 32 species or subspecies designated as state SSC or species maintained on the CDFW's watch list, have at least some potential to occur within the region (Table 11). Of the 32 species or subspecies listed in the table below, 26 species have at least a moderate potential to occur within the Project Area, including 12 birds, nine mammals, four amphibians, and one reptile. The remaining species have highly restricted ranges or occupy specialized habitats which do not occur within the Project or Evaluation Areas, and therefore have little or no likelihood of occurrence within the Project.

Table 11. California species of special concern and watch list species with potential to occur in the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence within Project Area
Birds			
black swift *Cypseloides niger*	SSC	Nests in small colonies on cliffs behind or adjacent to waterfalls in deep canyons and sea-bluffs above the surf; breeds very locally in Sierra Nevada and Cascades	**Unlikely.** Suitable nesting habitat absent from Project Area, may forage within site; known to nest within the Fall River Valley approx. 20 miles to northeast
California spotted owl *Strix occidentalis occidentalis*	SSC	Mature forest, multi-layered mixed conifers	**Possible.** Historical occurrence in Project Area (CNDDB 2017); may occur as year-round resident in mixed conifer forests, particularly in southern Project Area
Cooper's hawk *Accipiter cooperii*	WL	Dense stands of oak, deciduous riparian, or other forest habitats near water used most	**Likely.** Potential breeder and year-round resident of Project Area
merlin *Falco columbarius*	WL	Frequents open habitats at low elevations near water and tree stands; favors coastlines, lakeshores, and wetlands	**Possible.** May occur as winter resident and/or migrant in Project Area
northern goshawk *Accipiter gentilis*	SSC	Prefers mid- and high-elevations, and mature, dense conifer forests	**Likely.** Potential breeder and year-round resident; CNDDB documents several occurrences within the Project Area
northern harrier *Circus cyaneus*	SSC	Frequents meadows, grasslands, open rangelands, fresh and saltwater emergent wetlands; seldom found in wooded habitats	**Possible.** Occurs regionally; may forage within more open habitats of the Project Area
osprey *Pandion haliaetus*	WL	Associated strictly with large, fish-bearing waters primarily in pine and mixed-conifer forests; nests in large trees and snags near open water	**Likely.** Nesting and foraging habitat generally absent from Project Area but present in site vicinity; CNDDB documents several occurrences within 5 miles of Project Area
prairie falcon *Falco mexicanus*	WL	Nests in open terrain with canyons, cliffs, escarpments, and rock outcrops; uses open habitat for foraging (grassland, savannahs, rangelands, and desert scrub)	**Possible.** May occur as transient or migrant; suitable foraging/nesting habitat generally absent from Project Area

Table 11. California species of special concern and watch list species with potential to occur in the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence within Project Area
purple martin *Progne subis*	SSC	Inhabits open woodlands and low elevation coniferous forests; nests in old woodpecker cavities, but also human-made structures, often in tall isolated tree/snag	**Possible.** Suitable habitat appears to be present within Project Area; potential summer resident or migrant; CNDDB documents species presence seven miles west of site along the Pit River
sharp-shinned hawk *Accipiter striatus*	WL	Breeds in fairly dense conifer and broad-leaved forests; fairly common migrant and winter resident throughout California expect in areas with deep snow	**Likely.** Potential breeder and year-round resident of Project Area
Vaux's swift *Chaetura vauxi*	SSC	Summer resident of northern California and fairly common spring/fall migrant throughout state; prefers redwood and Douglas fir forests; occasionally in other conifer forest types; nests and roosts in large hollow trees and snags; preference for foraging over rivers and lakes	**Possible.** Suitable habitat present within Project Area; potential breeder and migrant
yellow-breasted chat *Icteria virens*	SSC	Uncommon summer resident of coastal California and interior foothills; inhabits riparian thickets of willow and other brushy vegetation near watercourses; nests in dense shrubs along rivers and streams	**Likely.** Suitable habitat present within Project Area; potential breeder and migrant
yellow warbler *Setophaga petechia*	SSC	Uncommon summer resident and fairly common migrant throughout much of California; nests in riparian woodlands from coastal and desert lowlands up to 8,000 ft (2,500 m) in Sierra Nevada; also nests in montane chaparral and open conifer forests with brushy understory	**Likely.** Suitable habitat present within Project Area; potential breeder and migrant
Mammals			
American badger *Taxidea taxus*	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soil for digging burrows	**Possible.** Open habitats preferred by species are generally absent from Project Area; CNDDB documents species presence 6.5 miles (10.5 km) east of site

Table 11. California species of special concern and watch list species with potential to occur in the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence within Project Area
fisher (Northern California ESU) *Pekania pennanti*	SSC	Intermediate to large-tree stages of coniferous forest; deciduous riparian habitat	**Likely.** May occur as uncommon permanent resident; CNDDB documents several occurrences within and near the Project Area; Northern California ESU (covers the Project) considered not warranted for listing, while Southern Sierra ESU was state listed as threatened in 2016; fisher in/adjacent to Project Area have only SSC status
Oregon snowshoe hare *Lepus americanus klamathensis*	SSC	Prefers edge, heterogeneous habitats, and areas with dense understory, particularly in riparian habitats	**Possible.** Suitable habitat appears present within the Project Area
Sierra Nevada mountain beaver *Aplodontia rufa californica*	SSC	Dense riparian-deciduous and open, brushy stages of most forest types	**Possible.** Suitable riparian habitat appears to occur in Project Area.
pallid bat *Antrozous pallidus*	SSC	Woodlands, forests; roosts in caves, crevices, mines, hollow trees	**Possible.** May occur as year-round resident in Project Area
spotted bat *Euderma maculatum*	SSC	Grasslands, mixed conifer forests, sea level to 10,000 ft (3,048 m); prefers rock crevices, cliffs optimal	**Possible.** May occur as year-round resident, however, roosting habitat limited within Project Area
Townsend's big-eared bat *Corynorhinus townsendii*	SSC	All habitats except alpine and sub-alpine; caves, mines, tunnels, etc.; roosting sites most important limiting resource	**Possible.** May occur as year-round resident; roosting habitat limited within Project Area
western mastiff bat *Eumops perotis*	SSC	Open semi-arid to arid habitats including conifer and deciduous woodlands; roosts in high rock crevices, cliffs, and tall buildings	**Possible.** May forage within Project Area year-round; roost sites appear to be absent
western red bat *Lasiurus blossevillii*	SSC	Forests and woodlands from sea level up through mixed conifer forests; roosts primarily in trees; migratory	**Likely.** Summer resident and migrant in Project Area
Amphibians			
Cascades frog *Rana cascadae*	SSC	Montane aquatic habitat such as mountain lakes, small streams, and ponds in meadows; open coniferous forests; standing water required for reproduction; hibernates in mud on bottom of lake/pond during winter	**Possible.** Suitable aquatic habitats limited within site, but may occur within several small ponds within and adjacent to Project Area; outside of species known range; CNDDB documents species presence 0.7 miles (1.1 km) south of site

Table 11. California species of special concern and watch list species with potential to occur in the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence within Project Area
foothill yellow-legged frog *Rana boylii*	SSC	Partly shaded shallow streams and riffles with a rock substrate in variety of habitats	**Possible.** Potentially suitable shallow stream habitat present throughout Project Area; CNDDB documents species presence 4 miles south of site
Pacific tailed frog *Ascaphus truei*	SSC	Restricted to perennial montane streams; occurs in montane hardwood-conifer, redwood, Douglas-fir and ponderosa pine habitats	**Likely.** Potentially suitable stream habitat present within southern portions of the Project Area; CNDDB documents species presence near center of Project Area
southern long-toed salamander *Ambystoma macrodactylum sigillatum*	SSC	High elevation meadows and lakes in the Sierra Nevada, Cascade, and Klamath mountains.	**Possible.** Suitable habitat may be present in Project Area
western spadefoot *Spea hammondii*	SSC	Ranges throughout the Central Valley and adjacent foothills; occurs primarily in grasslands, but occasional populations also occur in valley-foothill hardwood woodlands	**Unlikely.** Range is west and south of the Project; suitable habitat does not appear to be present
Reptiles			
western pond turtle *Emys marmorata*	SSC	Aquatic species requiring ponds, marshes, rivers, streams, and irrigation ditches, usually with aquatic vegetation	**Possible.** Suitable aquatic habitat limited within the Project Area, but may be present within pools of larger creeks or ponds; CNDDB documents species presence near southwest corner of site; under review for federal listing

Table 11. California species of special concern and watch list species with potential to occur in the Fountain Wind Project.

Species	Status	Habitat	Potential for Occurrence within Project Area
Fishes			
bigeye marbled sculpin *Cottus klamathensis macrops*	SSC	Large, cool spring-fed streams, but has adapted to conditions in some reservoirs	**None.** Suitable stream habitat not present within the Project Area
hardhead *Mylopharodon conocephalus*	SSC	Undisturbed areas of large mid to low-elevation streams and reservoirs; clear, deep pools with sand/gravel/boulder bottoms and slow water velocity	**None.** Suitable stream habitat not present within the Project Area
McCloud River redband trout *Oncorhynchus mykiss* ssp. 2	SSC	Small spring-fed tributaries of the McCloud River	**None.** Project Area is outside of the species current range
Pacific lamprey *Entosphenus tridentatus*	SSC	Swift-current gravel-bottomed areas of cold, clear streams and rivers	**None.** Suitable stream habitat not present within the Project Area
Pit roach *Lavinia symmetricus mitrulus*	SSC	Found in upper Pit River and its tributaries, and tributaries to Goose Lake; inhabits deep pools, but also in areas of low flows, moderate gradients, warm temperatures and mats of vegetation	**Unlikely.** Suitable stream habitat appears absent from Project Area; CNDDB documents species occurrence 2.7 miles (4.3 km) north of site within the Pit River

SSC: California species of special concern; WL: California watch list species
Species status and information from CNDDB 2017

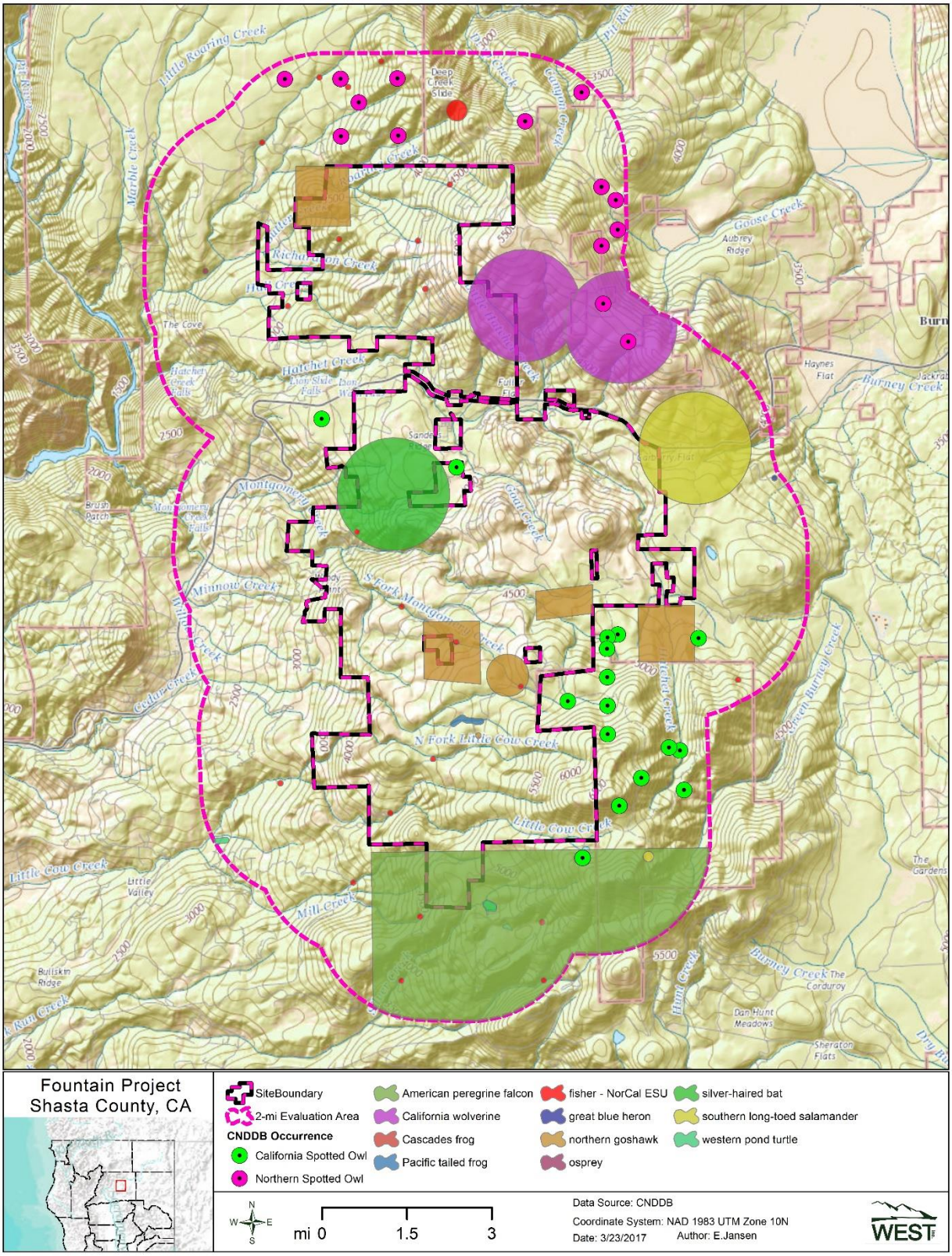


Figure 11. Records of previously documented state sensitive wildlife species within the Fountain Wind Project and surrounding Evaluation Area.

SUMMARY

Table 12 summarizes key wildlife considerations for the Project. Of the wildlife species protected by or under review through the federal ESA (1973), seven species have at least some potential to occur within the Project Area (yellow-billed cuckoo, gray wolf, Sierra Nevada red fox, western pond turtle, California red-legged frog, Shasta crayfish, and Valley elderberry longhorn beetle), although only the Sierra Nevada red fox, gray wolf, and western pond turtle have at least a moderate potential for occurrence. Thirteen species with state threatened, endangered, or fully-protected status have at least some potential to occur in the Project Area: American peregrine falcon, bald eagle, bank swallow, greater sandhill crane, golden eagle, Swainson's hawk, tricolored blackbird, willow flycatcher, California wolverine, gray wolf, Sierra Nevada red fox, Shasta salamander, and Shasta crayfish. Additionally, 29 species designated as state SSC or watch list species have at least some potential to occur in the Project Area including 13 birds, nine mammals, five amphibians, one reptile and one fish. No state and/or federal listed or candidate plants species are known to occur within the Project or Evaluation Areas; however, one listed plant species (slender Orcutt grass) is known to occur within 10 miles of the Project Area. Four CNPS-designated sensitive plant species are known to occur within the Project Area and several others have the potential to occur.

Seventeen raptor species have the potential to occur as residents and/or migrants in the Project Area. In addition, 11 species of owl and one species of vulture may also occur in the Project Area. Nesting habitat for forest-dependent raptor species is present throughout the Project and Evaluation Areas.

While not currently an issue for the Project, it is anticipated that California condors could be reintroduced to northern coastal California in the next several years. If reintroduction efforts are successful, there is a possibility that condors could inhabit more inland portions of northern California, including the Project Area, at some point in the future. However, the likelihood of this is currently unknown.

The Project Area is located within the Pacific Flyway and numerous birds likely migrate through the region. The Project Area is characterized by rolling mountain terrain that generally would not be expected to concentrate or funnel raptors during migration. Potential exists for migrating raptors to use updrafts and thermals created by topography and to be attracted to riparian areas within the Project and Evaluation Areas. The Project Area also contains stopover habitat for songbirds, waterfowl, and shorebirds in the form of conifer forest, scrub-shrub, and riparian and wetland habitats.

Relatively high bat mortality at other wind energy facilities in North America is a concern, and some species that appear to be at greatest risk, such as hoary and silver-haired bats, are likely to occur in the Project Area, particularly during migration, and 15 additional bat species have the potential to occur within the Project. The Project Area has ample forest that could provide

roosting habitat for bats and sufficient wetland and riparian habitat that may be important foraging or drinking habitat.

Table 12. Summary of the potential for wildlife and plant conflicts in the proposed Fountain Wind Project[1]; VH = Very High, H = High, M = Moderate, and L = Low

Issue	VH	H	M	L	Notes
Raptor nest sites			X		Dense early- to mid-seral forest with some larger individual trees likely provides some raptor nesting habitat.
Concentrated raptor flight areas			X		A number of raptors are likely to use the Project Area but site characteristics not expected to concentrate raptor flight activity or migratory activity.
Avian migratory pathways			X		Project Area located along the Pacific Flyway and suitable stopover habitat present; extensive riparian/wetland habitat absent. Potential use by migrating passerines, but not likely used as concentrated migration pathway or stopover area.
Raptor prey species			X		Potential for rodents, lagomorphs, and prey bird species to occur within Project Area, but not likely in high concentrations.
Federal protected species			X		Two federal listed, candidate, or under review species have at least a moderate potential to occur; five additional species have a low likelihood of occurrence.
State protected species		X			Eight state-listed, candidate, or fully-protected species have at least a moderate potential to occur, and five others have a low likelihood of occurrence. Twenty-nine state species of special concern (SSC) or watch list species also have potential to occur.
Uniqueness of habitat				X	Habitat and land use within the Project Area is similar to the surrounding area. Three sensitive habitats and one sensitive river drainage are found in the vicinity. Two IBAs are within 30 miles (48 km).
Rare plants			X		One federal and/or state listed plant known to occur within 10 miles of the Project Area; four CNPS sensitive species are known to occur in Project Area and several others have potential to occur.
Bats		X			Seventeen bat species have at least some potential to occur within the Project Area, five of which are state SSC. Bat species that have shown relatively high levels of fatalities at wind energy facilities are likely to be present.

[1]Summarized for the Project as a whole but the habitats within the Project Area vary in their ability to support species of concern.

USFWS Land-Based Wind Energy Guidelines Tier 2 Questions

Chapter 3 of the USFWS WEG (2012a) includes seven Tier 2 questions which should be addressed during site characterization efforts. A contextual review of these questions after synthesis of a SCS report may help identify areas where existing data do not sufficiently address potential impacts to biological resources which may occur through development of a wind energy facility, and should serve to guide formulation of project-specific Tier 3 study plans intended to fill data gaps. This SCS report has attempted to answer the Tier 2 questions through a desktop review of publicly available information. However, some data gaps remain; recommended field studies intended to fill data gaps are included in the following section (Conclusion and Next Steps). It is also useful to consider the seven Tier 2 questions individually in the context of this SCS; although the previous Summary section includes much pertinent information, it does not specifically relate SCS report findings to Tier 2 questions. The following list describes how this report has addressed specific Tier 2 questions, where information related to these questions can be found in this report, and what if any data gaps remain:

1. Are known species of concern present on the proposed site, or is habitat (including designated critical habitat) present for these species?

   There are three federal-listed species with at least a moderate potential to occur in the Project (see Federal Listed Species section), 13 state listed species or species with full protection with at least moderate potential to occur (see State Listed Species section), and 26 state SSC or watch list species (see State Species of Concern and Watch List Species section) with potential to occur. No federal or state listed plant species are known to occur in the Project or Evaluation Areas; however four CNPS sensitive plants have been documented within the Project Area and several other have the potential to occur (see Special Status Plant Species section). There is no designated critical habitat for any wildlife or plant species in the Project. Tier 3 field studies will help confirm presence or absence of many of these species (see Conclusion and Next Steps section).

2. Does the landscape contain areas where development is precluded by law or designated as sensitive according to scientifically credible information?

   A desktop review of publicly available information did not reveal any areas on the landscape where development is precluded by law, although 2.0 % of the Project Area is classified as wetlands (see Wetlands and Riparian Areas section). Two categorized sensitive habitats have the potential to occur in Project Area including alkali seep and northern interior cypress forest (see Sensitive Habitats section). Tier 3 field studies will help determine the presence or absence of any sensitive areas in the Project (see Conclusion and Next Steps section).

3. Are there plant communities of concern present or likely to be present at the site?

No federal or state listed plant species are known to occur in the Project or Evaluation Areas; however one listed species (see Slender Orcutt Grass section) in known to occur within 10 miles of the Project. Numerous CNPS-designated sensitive plant species have potential to occur in the Project Area and four have been documented as occurring in the Project Area (see Special Status Plant Species section). Tier 3 field studies will help determine the occurrence of plant communities of concern at the Project (see Conclusion and Next Steps section).

4. Are there known critical areas of congregation of species of concern, including, but not limited to: maternity roosts, hibernacula, staging areas, winter ranges, nesting sites, migration stopover or corridors, leks, or other areas of seasonal importance?

   There are not any known critical areas of congregation of species of concern within the Project Area, although numerous scattered clearcuts throughout the Project might concentrate prey for raptors (see Areas of Potentially High Prey Density). It is likely that there are other areas (e.g., pooled water, large trees) within the Project and Evaluation Areas which may serve as congregation points for birds and bats, and possibly bird and bat species of concern (see Wetlands and Riparian Areas and Potential Raptor Nesting Habitat sections). Tier 3 field studies will help determine the presence or absence of critical congregation areas in the Project (see Conclusion and Next Steps section).

5. Using best available scientific information has the developer or relevant federal, state, tribal, and/or local agency identified the potential presence of a population of a species of habitat fragmentation concern?

   The Project Area consists exclusively of private lands managed for timber production. As such, modern land use of the Project has already led to a fragmented landscape (see Table 1), and it is unlikely that populations of species with high fragmentation concern are present. However, Tier 3 field studies will help determine whether any species prone to impacts from habitat fragmentation are present (see Conclusion and Next Steps section).

6. Which species of birds and bats, especially those known to be at risk by wind energy facilities, are likely to use the proposed site based on an assessment of site attributes?

   Many species of birds and bats are likely to use the Project Area at some point during the year (see Raptors, Bird Migration, Breeding Birds and Bats sections); individual species accounts for listed birds are also included (see Federal Listed Species and State Listed Species sections). There are 17 diurnal raptor species, 11 owls, and one vulture which have the potential to occur within the Project. Of these, seven raptors, nine owls, and one vulture may breed within the Project or Evaluation Areas, including state-listed bald eagles and Swainson's hawks, as well as other sensitive bird species (see Raptors

section). Diurnal raptors, some owls, and vultures are known to be at risk by wind energy facilities. There are 17 species of bats with the potential to occur in the Project (see Bats section), including both hoary and silver-haired bats, which are known to be at risk by wind energy facilities; an additional seven of 19 species recorded as fatalities at wind facilities may occur at the Project. Tier 3 field studies will help refine the species present.

7. Is there a potential for significant adverse impacts to species of concern based on the answers to the questions above, and considering the design of the proposed project?

   Based on the design of the proposed Project and following a desktop review of publicly available information on the Project and Evaluation Areas, there does not appear to be a potential for significant adverse impacts to species of concern that could occur through development of the Fountain Wind Project (see Conclusion and Next Steps section). However, a number of pre-construction baseline biological studies are recommended in order to properly characterize wildlife use and evaluate the biotic resources within the Project Area (see Conclusion and Next Steps section).

CONCLUSION AND NEXT STEPS

Based on this SCS, the Project does not appear to have a high potential for conflict with the majority of wildlife and plant issues listed in Table 12. Regardless, a number of pre-construction baseline wildlife and botanical studies are recommended for the Project with the purpose of characterizing wildlife use (particularly avian and bat use) within the Project Area, estimating impacts of the proposed facility on sensitive wildlife and botanical resources, and to assist with siting project facilities to minimize impacts to the extent practicable. Baseline studies recommended at this time are presented in Table 13 and include the following:

- Year round large bird/eagle use surveys consistent with recommendations presented in the USFWS Eagle Conservation Plan Guidance (ECPG; USFWS 2013), designed to characterize bald and golden eagle use of the Project Area. Eagle surveys will include collection of use data for other raptor and large bird species.
- Small bird use surveys, consistent with recommendations presented in the WEG (USFWS 2012a) and the California Wind Energy Guidelines (CEC and CDFG 2007), designed to evaluate small bird use of the Project Area.
- Nesting raptor surveys with an emphasis on bald and golden eagles and other sensitive raptor species as recommended in the WEG (USFWS 2012a) and the ECPG (USFWS 2013).
- Bat acoustic monitoring during the spring, summer, and fall using methods recommended in the WEG (USFWS 2012a) and the California Wind Energy Guidelines (CEC and CDFG 2007).

- A habitat assessment and rare plant survey, following methods consistent with CDFW protocols for surveying and evaluating impacts to special status plants and natural communities (CDFG 2009).

The large bird/eagle and small bird use surveys listed above should be sufficient to provide a baseline assessment of species composition, spatial and temporal use, and risk assessment for bird species occurring within the Project Area and the need for additional studies or more detailed spatial distribution mapping. Early and regular consultation with the USFWS and CDFW is recommended, as it is possible that additional species-specific surveys for sensitive bird, mammal, and amphibian species may be encouraged by these agencies. The following Table (13) includes a column for Tier 2 questions. This is intended to highlight how recommended Tier 3 field studies will address information gaps identified during Tier 2 site characterization, and ties directly to information presented in the preceding USFWS Land-Based Wind Energy Guidelines Tier 2 section.

Table 13. Recommended Pre-construction Wildlife and Botanical Studies for the Fountain Wind Project.

Study	Purpose	Information Gaps Addressed from USFWS Tier 2 Question(s)	Timing
Large bird / Eagle use surveys	To assess spatial and temporal use of the Project Area by bald and golden eagles and other raptor species	Question 1, Question 4, Question 6, Question 7	Year-round
Small bird use surveys	To assess spatial and temporal avian use of the Project Area, with a focus of small bird use	Question 1, Question 4, Question 5, Question 6	Year-round
Nesting raptor surveys	To locate nests that may be subject to disturbance and/or displacement effects from Project construction and/or operation, particularly nests of bald or golden eagles or other sensitive raptor species	Question 1, Question 4, Question 5, Question 6, Question 7	Twice during late winter through early summer breeding season
Bat acoustic surveys	To estimate the level of, and seasonal and spatial patterns of, bat activity within the Project Area	Question 1, Question 5, Question 6, Question 7	A continuous spring, summer, and fall survey period
Habitat assessment and rare plant survey	To determine the presence, as well as the spatial distribution, of state and federal threatened and endangered species, CNPS rare species, species of concern, and other special-status plant species within the Project Area	Question 1, Question 2, Question 3, Question 5, Question 7	Spring and early summer when target sensitive species are in flower

LITERATURE CITED

AECOM. 2013. Annual Monitoring Report: July 2012 - June 2013. Solano Wind Project - Phase 3. Prepared for SMUD - Environmental Management, Sacramento, California. Prepared by AECOM, Sacramento, California. September 2013.

Anderson, R., N. Neuman, J. Tom, W.P. Erickson, M.D. Strickland, M. Bourassa, K.J. Bay, and K.J. Sernka. 2004. Avian Monitoring and Risk Assessment at the Tehachapi Pass Wind Resource Area, California. Period of Performance: October 2, 1996 - May 27, 1998. NREL/SR-500-36416. National Renewable Energy Laboratory, Golden, Colorado. September 2004. http://www.nrel.gov/docs/fy04osti/36416.pdf

ARCADIS U.S., Inc. 2013. Fall 2012 and Spring 2013 Avian and Bat Post-Construction Mortality Monitoring Report: Pioneer Trail Wind Farm. Prepared for E.On Climate & Renewables, North America. Prepared by ARCADIS U.S., Inc., Milwaukee, Wisconsin. August 2013.

Arnett, E. 2007. Report from the Bats and Wind Energy Cooperative (Bwec) on Collaborative Work and Plans. Presentation at the National Wind Coordinating Collaborative (NWCC) Wildlife Workgroup Meeting, Boulder Colorado. Conservation International. November 14th, 2007. Information available at www.nationalwind.org

Arnett, E.B., K. Brown, W.P. Erickson, J. Fiedler, B.L. Hamilton, T.H. Henry, A. Jain, G.D. Johnson, J. Kerns, R.R. Koford, C.P. Nicholson, T. O'Connell, M. Piorkowski, and R. Tankersley, Jr. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. Journal of Wildlife Management 72(1): 61-78.

Arnett, E.B., W.P. Erickson, J. Kerns, and J. Horn. 2005a. Relationships between Bats and Wind Turbines in Pennsylvania and West Virginia: An Assessment of Fatality Search Protocols, Patterns of Fatality, and Behavioral Interactions with Wind Turbines. Prepared for the Bats and Wind Energy Cooperative. March 2005.

Arnett, E.B., W.P. Erickson, J. Kerns, and J. Horn. 2005b. Relationships between Bats and Wind Turbines in Pennsylvania and West Virginia: An Assessment of Fatality Search Protocols, Patterns of Fatality, and Behavioral Interactions with Wind Turbines. Final Report. Prepared for Bats and Wind Energy Cooperative, Bat Conservation International, Austin, Texas. June 2005. Available online at: http://www.batsandwind.org/pdf/ar2004.pdf

Arnett, E.B., M.R. Schirmacher, C.D. Hein, and M.M.P. Huso. 2011. Patterns of Bird and Bat Fatality at the Locust Ridge Ii Wind Project, Pennsylvania. 2009-2010 Final Report. Prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission (PGC). Prepared by Bat Conservation International (BCI), Austin, Texas. January 2011.

Arnett, E.B., M.R. Schirmacher, M.M.P. Huso, and J.P. Hayes. 2009. Effectiveness of Changing Wind Turbine Cut-in Speed to Reduce Bat Fatalities at Wind Facilities: 2008 Annual Report. Prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission. Bat Conservation International (BCI), Austin, Texas. April 2009. http://www.batsandwind.org/pdf/Curtailment_2008_Final_Report.pdf

Arnett, E.B., M.R. Schirmacher, M.M.P. Huso, and J.P. Hayes. 2010. Patterns of Bat Fatality at the Casselman Wind Project in South-Central Pennsylvania. 2009 Annual Report. Annual report prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission. Bat Conservation International (BCI), Austin, Texas. January 2010.

Audubon Society (Audubon). 2017. The Important Bird Areas. Available online at: http://www.audubon.org/bird/iba; Fall River Valley IBA, http://iba.audubon.org/iba/profileReport.do?siteId=109&navSite=search&pagerOffset=35&page=2; Upper McCloud River IBA, http://iba.audubon.org/iba/profileReport.do?siteId=113&navSite=search&pager Offset=70&page=3

Baerwald, E.F. 2008. Variation in the Activity and Fatality of Migratory Bats at Wind Energy Facilities in Southern Alberta: Causes and Consequences. Thesis. University of Calgary, Calgary, Alberta, Canada.

Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code (USC) § 668-668d. Bald Eagle Protection Act of 1940, June 8, 1940, Chapter 278, Section (§) 2, 54 Statute (Stat.) 251; Expanded to include the related species of the golden eagle October 24, 1962, Public Law (PL) 87-884, 76 Stat. 1246. As amended: October 23, 1972, PL 92-535, § 2, 86 Stat. 1065; November 8, 1978, PL 95-616, § 9, 92 Stat. 3114.

Bat Conservation International, Inc. (BCI). 2015a. Species Profiles: *Parastrellus Hesperus*. Canyon bat, formerly western pipistrelle (*Pipistrellus hesperus*). Updated March 2015. Bat Conservation International, Inc. Austin, Texas. Available online at: http://www.batcon.org/resources/media-education/species-profiles/detail/1937

Bat Conservation International, Inc. (BCI). 2015b. Species Profiles: *Perimyotis Subflavus*. Tri-colored bat, formerly eastern pipistrelle (*Pipistrellus subflavus*). Updated March 2015. Bat Conservation International, Inc. Austin, Texas. Available online at: http://www.batcon.org/resources/media-education/species-profiles/detail/2345

Bat Conservation International (BCI). 2016. Bat Species: Us Bats. BCI, Inc., Austin, Texas. Accessed October 2016. Homepage: http://www.batcon.org; Species profiles available online at: http://www.batcon.org/resources/media-education/species-profiles, species ranges from 2003-2016 data.

BHE Environmental, Inc. (BHE). 2010. Post-Construction Bird and Bat Mortality Study: Cedar Ridge Wind Farm, Fond Du Lac County, Wisconsin. Interim Report prepared for Wisconsin Power and Light, Madison, Wisconsin. Prepared by BHE Environmental, Inc. Cincinnati, Ohio. February 2010.

BHE Environmental, Inc. (BHE). 2011. Post-Construction Bird and Bat Mortality Study: Cedar Ridge Wind Farm, Fond Du Lac County, Wisconsin. Final Report. Prepared for Wisconsin Power and Light, Madison, Wisconsin. Prepared by BHE Environmental, Inc. Cincinnati, Ohio. February 2011.

BioResource Consultants, Inc. (BRC). 2010. 2009/2010 Annual Report: Bird and Bat Mortality Monitoring, Pine Tree Wind Farm, Kern County, California. To the Los Angeles Department of Water and Power, from AECOM, Irvine, California. Report prepared by BioResource Consultants, Inc., Ojai, California. October 14, 2010.

Brown, K., K.S. Smallwood, and B. Karas. 2013. Final 2012-2013 Annual Report, Avian and Bat Monitoring Project, Vasco Winds, Llc. Prepared for NextEra Energy Resources, Livermore, California. Prepared by Ventus Environmental Solutions, Portland, Oregon. September 2013.

Brown, W.K. and B.L. Hamilton. 2004. Bird and Bat Monitoring at the Mcbride Lake Wind Farm, Alberta, 2003-2004. Report for Vision Quest Windelectric, Inc., Calgary, Alberta, Canada. September 2004.

Brown, W.K. and B.L. Hamilton. 2006a. Bird and Bat Interactions with Wind Turbines Castle River Wind Facility, Alberta, 2001-2002. Report for Vision Quest Windelectric, Inc., Calgary, Alberta, Canada.

Brown, W.K. and B.L. Hamilton. 2006b. Monitoring of Bird and Bat Collisions with Wind Turbines at the Summerview Wind Power Project, Alberta: 2005-2006. Prepared for Vision Quest Windelectric, Calgary, Alberta by TAEM Ltd., Calgary, Alberta, and BLH Environmental Services, Pincher Creek, Alberta. September 2006. http://www.batsandwind.org/pdf/Brown2006.pdf

CalFire. 2015. Fire Perimeters (fire15_1). Edition 2014 version 2. Available online at: http://frap.cdf.ca.gov/data/frapgisdata/select.asp

Calflora. 2017. Information on California Plants for Education, Research and Conservation, Based on Data Contributed by Dozens of Public and Private Institutions and Individuals, Including the Consortium of California Herbaria. [Web application.] The Calflora Database [a non-profit organization], Berkeley, California. Accessed January 2017. Available online at: http://www.calflora.org/

California Department of Fish and Game (CDFG). 2009. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities. http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp

California Department of Fish and Wildlife (CDFW). 2017. Special Animals List. CDFW California Natural Diversity Database. Periodic publication. January 2017. 51 pp. Available online at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline

California Endangered Species Act (CESA). 1984. Fish and Game Code §§ 2050 - 2115.5.

California Energy Commission (CEC) and California Department of Fish and Game (CDFG). 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. CEC, Renewables Committee, and Energy Facilities Siting Division, and CDFG, Resources Management and Policy Division. CEC-700-2007-008-CMF.

California Native Plant Society (CNPS). 2001. Inventory of Rare and Endangered Plants in California. Sixth Edition. Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. CNPS, Sacramento, California.

California Native Plant Society (CNPS). 2017. Inventory of Rare and Endangered Plants. (online edition, v8-02). Accessed January 2017. California Native Plant Society. Sacramento, California. Online at: http://www.rareplants.cnps.org

California Natural Diversity Database (CNDDB). 2017. Inventory of the Status and Location of Rare Plants and Animals in California. State of California, Natural Resources Agency, Department of Fish and Wildlife (CDFW), Biogeographic Data Branch, CNDDB. Accessed January 2017. Available online at: https://www.wildlife.ca.gov/Data/CNDDB

California Wildlife Habitat Relationships (CWHR). 2017. California Wildlife Habitat Relationships (CWHR) Life History Accounts and Range Maps. CWHR System. California Department of Fish and Game, Sacramento, California. Accessed January 2017. Available online at: http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx

Chatfield, A. and K. Bay. 2014. Post-Construction Studies for the Mustang Hills and Alta VIII Wind Energy Facilities, Kern County, California. Final Report for the First Year of Operation: July 2012 - October 2013. Prepared for EverPower Wind Holdings, Inc. and Brookfield Renewable Energy Group. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 28, 2014.

Chatfield, A., W. Erickson, and K. Bay. 2009. Avian and Bat Fatality Study, Dillon Wind-Energy Facility, Riverside County, California. Final Report: March 26, 2008 - March 26, 2009. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 3, 2009.

Chatfield, A., W.P. Erickson, and K. Bay. 2010. Final Report: Avian and Bat Fatality Study at the Alite Wind-Energy Facility, Kern County, California. Final Report: June 15, 2009 – June 15, 2010. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Chatfield, A., D. Riser-Espinoza, and K. Bay. 2014. Bird and Bat Mortality Monitoring at the Alta Wind Energy Center, Phases I - V, Kern County, California. Final Report for the Second Year of Operation: March 4, 2013 - March 6, 2014. Prepared for Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 22, 2014.

Chatfield, A. and D. Russo. 2014. Post-Construction Avian and Bat Fatality Monitoring for the Pinyon Pines I & Ii Wind Energy Project, Kern County, California. Final Report for the First Year of Operation: March 2013 - March 2014. Prepared for MidAmerican Renewables, LLC, Des Moines, Iowa, and Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 28, 2014.

Chatfield, A., M. Sonnenberg, and K. Bay. 2012. Avian and Bat Mortality Monitoring at the Alta-Oak Creek Mojave Project, Kern County, California. Final Report for the First Year of Operation March 22, 2011 – June 15, 2012. Prepared for Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 12, 2012.

Chodachek, K., K. Adachi, and G. DiDonato. 2015. Post Construction Fatality Surveys for the Prairie Rose Wind Energy Facility, Rock County, Minnesota. Final Report: April 15 to June 13, 2014, and August 15 to October 29, 2014. Prepared for Enel Green Power, North America, San Diego, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. January 23, 2015.

Chodachek, K., C. Derby, K. Adachi, and T. Thorn. 2014. Post-Construction Fatality Surveys for the Pioneer Prairie Ii Wind Energy Facility, Mitchell County, Iowa. Final Report: July 1 – October 18, 2013. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology Inc. (WEST), Bismarck, North Dakota. April 2014.

Chodachek, K., C. Derby, M. Sonnenberg, and T. Thorn. 2012. Post-Construction Fatality Surveys for the Pioneer Prairie Wind Farm I Llc Phase Ii, Mitchell County, Iowa: April 4, 2011 – March 31, 2012. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 27, 2012.

Cryan, P.M. and J.P. Veilleux. 2007. Migration and the Use of Autumn, Winter, and Spring Roosts by Tree Bats. *In*: Bats and Forests. M. J. Lacki, J. P. Hayes, and A. Kurta, eds. The Johns Hopkins University Press, Baltimore, Maryland. Pp. 153-175.

Derby, C., K. Chodachek, and K. Bay. 2010a. Post-Construction Bat and Bird Fatality Study Crystal Lake II Wind Energy Center, Hancock and Winnebago Counties, Iowa. Final Report: April 2009-October 2009. Prepared for NextEra Energy Resources, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. June 2, 2010.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010b. Post-Construction Fatality Survey for the Buffalo Ridge I Wind Project. May 2009 - May 2010. Prepared for Iberdrola Renewables, Inc., Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010c. Post-Construction Fatality Surveys for the Elm Creek Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010d. Post-Construction Fatality Surveys for the Moraine II Wind Project: March - December 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010e. Post-Construction Fatality Surveys for the Winnebago Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and S. Nomani. 2011a. Post-Construction Fatality Surveys for the Barton I and Ii Wind Project: Iri. March 2010 - February 2011. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Version: September 28, 2011.

Derby, C., K. Chodachek, K. Bay, and S. Nomani. 2011b. Post-Construction Fatality Surveys for the Rugby Wind Project: Iberdrola Renewables, Inc. March 2010 - March 2011. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Version: October 14, 2011.

Derby, C., K. Chodachek, and M. Sonnenberg. 2012a. Post-Construction Casualty Surveys for the Buffalo Ridge II Wind Project. Iberdrola Renewables: March 2011- February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 31, 2012.

Derby, C., K. Chodachek, and M. Sonnenberg. 2012b. Post-Construction Fatality Surveys for the Elm Creek II Wind Project. Iberdrola Renewables: March 2011-February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. October 8, 2012.

Derby, C., K. Chodachek, T. Thorn, K. Bay, and S. Nomani. 2011c. Post-Construction Fatality Surveys for the Prairiewinds ND1 Wind Facility, Basin Electric Power Cooperative, March - November 2010. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 2, 2011.

Derby, C., K. Chodachek, T. Thorn, and A. Merrill. 2012c. Post-Construction Surveys for the Prairiewinds ND1 (2011) Wind Facility Basin Electric Power Cooperative: March - October 2011. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western Ecosystems Technology, Inc. (WEST), Bismarck, North Dakota. August 31, 2012.

Derby, C., A. Dahl, K. Bay, and L. McManus. 2011d. 2010 Post-Construction Monitoring Results for the Wessington Springs Wind Energy Facility, South Dakota. Final Report: March 9 – November 16, 2010. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 22, 2011.

Derby, C., A. Dahl, and G. DiDonato. 2014. Post-Construction Fatality Monitoring Studies for the Prairiewinds SD1 Wind Energy Facility, South Dakota. Final Report: March 2013 - February 2014. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., A. Dahl, W. Erickson, K. Bay, and J. Hoban. 2007. Post-Construction Monitoring Report for Avian and Bat Mortality at the Nppd Ainsworth Wind Farm. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, for the Nebraska Public Power District.

Derby, C., A. Dahl, and D. Fox. 2013a. Post-Construction Fatality Monitoring Studies for the Prairiewinds Sd1 Wind Energy Facility, South Dakota. Final Report: March 2012 - February 2013. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 13, 2013.

Derby, C., A. Dahl, and A. Merrill. 2012d. Post-Construction Monitoring Results for the Prairiewinds SD1 Wind Energy Facility, South Dakota. Final Report: March 2011 - February 2012. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. September 27, 2012.

Derby, C., A. Dahl, A. Merrill, and K. Bay. 2010f. 2009 Post-Construction Monitoring Results for the Wessington Springs Wind-Energy Facility, South Dakota. Final Report. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 19, 2010.

Derby, C., G. Iskali, S. Howlin, T. Thorn, T. Lyon, and A. Dahl. 2013b. Post-Construction Monitoring Results for the Big Smile Wind Farm, Roger Mills County, Oklahoma. Final Report: March 2012 to February 2013. Prepared for Acciona Wind Energy, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. June 12, 2013.

Derby, C., G. Iskali, M. Kauffman, T. Thorn, T. Lyon, and A. Dahl. 2013c. Post-Construction Monitoring Results, Red Hills Wind Farm, Roger Mills and Custer Counties, Oklahoma. Final Report: March 2012 to March 2013. Prepared for Acciona Wind Energy, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. June 12, 2013.

Derby, C., J. Ritzert, and K. Bay. 2010g. Bird and Bat Fatality Study, Grand Ridge Wind Resource Area, Lasalle County, Illinois. January 2009 - January 2010. Prepared for Grand Ridge Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. July 13, 2010. Revised January 2011.

Downes, S. and R. Gritski. 2012a. Harvest Wind Project Wildlife Monitoring Report: January 2010 – January 2012. Prepared for Harvest Wind Project, Roosevelt, Washington. Prepared by Northwest Wildlife Consultants, Inc., Pendleton, Oregon May 1, 2012.

Downes, S. and R. Gritski. 2012b. White Creek Wind I Wildlife Monitoring Report: November 2007 - November 2011. Prepared for White Creek Wind I, LLC, Roosevelt, Washington. Prepared by Northwest Wildlife Consultants, Inc., Pendleton, Oregon May 1, 2012.

Endangered Species Act (ESA). 1973. 16 United States Code (USC) §§ 1531-1544, Public Law (PL) 93-205, December 28, 1973, as amended, PL 100-478 [16 USC 1531 *et seq.*]; 50 Code of Federal Regulations (CFR) 402.

Enk, T., K. Bay, M. Sonnenberg, J. Baker, M. Kesterke, J.R. Boehrs, and A. Palochak. 2010. Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring Second Annual Report, Sherman County, Oregon. January 26, 2009 - December 11, 2009. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc.(WEST) Cheyenne, Wyoming, and Walla Walla, Washington. April 2010.

Enk, T., K. Bay, M. Sonnenberg, and J.R. Boehrs. 2012a. Year 1 Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase III, Sherman County, Oregon. September 13, 2010 - September 9, 2011. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. April 24, 2012.

Enk, T., K. Bay, M. Sonnenberg, and J.R. Boehrs. 2012b. Year 2 Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase II, Sherman County, Oregon. September 13, 2010 - September 15, 2011. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. April 23, 2012.

Enk, T., K. Bay, M. Sonnenberg, J. Flaig, J.R. Boehrs, and A. Palochak. 2011a. Year 1 Post-Construction Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase II, Sherman County, Oregon. September 10, 2009 - September 12, 2010. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. January 7, 2011.

Enk, T., C. Derby, K. Bay, and M. Sonnenberg. 2011b. 2010 Post-Construction Fatality Monitoring Report, Elkhorn Valley Wind Farm, Union County, Oregon. January – December 2010. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Walla Walla, Washington, and Cheyenne, Wyoming. December 8, 2011.

Enz, T. and K. Bay. 2010. Post-Construction Avian and Bat Fatality Monitoring Study, Tuolumne Wind Project, Klickitat County, Washington. Final Report: April 20, 2009 - April 7, 2010. Prepared for Turlock Irrigation District, Turlock, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 6, 2010.

Enz, T. and K. Bay. 2011. Post-Construction Monitoring at the Linden Ranch Wind Farm, Klickitat County, Washington. Final Report: June 30, 2010 - July 17, 2011. Prepared for EnXco. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. November 10, 2011.

Enz, T., K. Bay, S. Nomani, and M. Kesterke. 2011. Bird and Bat Fatality Monitoring Study, Windy Flats and Windy Point II Wind Energy Projects, Klickitat County, Washington. Final Report: February 1, 2010 - January 14, 2011. Prepared for Windy Flats Partners, LLC, Goldendale, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 19, 2011.

Enz, T., K. Bay, M. Sonnenberg, and A. Palochak. 2012. Post-Construction Monitoring Studies for the Combine Hills Turbine Ranch, Umatilla County, Oregon. Final Report: January 7 - December 2, 2011. Prepared for Eurus Energy America Corporation, San Diego, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Walla Walla, Washington.

Erickson, W.P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Annual Report. July 2001 - December 2003. Technical report peer-reviewed by and submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee. Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 2004. Available online at: http://www.west-inc.com/reports/swp_final_dec04.pdf

Erickson, W.P., J.D. Jeffrey, and V.K. Poulton. 2008. Puget Sound Energy Wild Horse Wind Facility Avian and Bat Monitoring: First Annual Report: January–December, 2007. Prepared for Puget Sound Energy, Ellensburg, Washington. Prepared by by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 2008.

Erickson, W.P., G.D. Johnson, M.D. Strickland, and K. Kronner. 2000. Avian and Bat Mortality Associated with the Vansycle Wind Project, Umatilla County, Oregon. Technical Report prepared by WEST, Inc., for Umatilla County Department of Resource Services and Development, Pendleton, Oregon. 21 pp.

Erickson, W.P., K. Kronner, and K.J. Bay. 2007. Stateline 2 Wind Project Wildlife Monitoring Report, January - December 2006. Technical report submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee.

Erickson, W.P., K. Kronner, and R. Gritski. 2003. Nine Canyon Wind Power Project Avian and Bat Monitoring Report. September 2002 – August 2003. Prepared for the Nine Canyon Technical Advisory Committee and Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants (NWC), Pendleton, Oregon. October 2003. http://www.west-inc.com/reports/nine_canyon_monitoring_final.pdf

Erickson, W.P., K. Kronner, and R. Gritski. 2005. Nine Canyon Wind Project Phase II, Fall 2004 Avian and Bat Monitoring Report: July 25 – November 2, 2004. Prepared for the Nine Canyon Technical Advisory Committee, Energy Northwest, by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. March 2005.

Erickson, W.P. and L. Sharp. 2005. Phase 1 and Phase 1a Avian Mortality Monitoring Report for 2004-2005 for the Smud Solano Wind Project. Prepared for Sacramento Municipal Utility District (SMUD), Sacramento, California. Prepared by URS Sacramento, California and Western EcoSystems Technology, Inc. (WEST). August 2005.

Fagen Engineering, LLC. 2014. 2013 Avian and Bat Monitoring Annual Report: Big Blue Wind Farm, Blue Earth, Minnesota. Prepared for Big Blue Wind Farm. Prepared by Fagen Engineering, LLC. May 2014.

Fagen Engineering, LLC. 2015. 2014 Avian and Bat Monitoring Annual Report: Big Blue Wind Farm, Blue Earth, Minnesota. Prepared for Big Blue Wind Farm. Prepared by Fagen Engineering, LLC.

Fiedler, J.K. 2004. Assessment of Bat Mortality and Activity at Buffalo Mountain Windfarm, Eastern Tennessee. Thesis. University of Tennessee, Knoxville, Tennessee. Available online at: http://www.tva.gov/environment/bmw_report/bat_mortality_bmw.pdf

Fiedler, J.K., T.H. Henry, R.D. Tankersley, and C.P. Nicholson. 2007. Results of Bat and Bird Mortality Monitoring at the Expanded Buffalo Mountain Windfarm, 2005. Tennessee Valley Authority. June 28, 2007.

Fishman Ecological Services LLC. 2003. Carcass Survey Results for Seawest Windpower, Inc., Condon Site 2002-2003. Prepared for SeaWest WindPower Inc.

Gauthreaux, S.A. Jr., C.G. Belser, and D. van Blaricom. 2003. Using a Network of Wsr 88-D Weather Surveillance Radars to Define Patterns of Bird Migration at Large Spatial Scales. *In*: Avian Migration. P. Berthold, E. Gwinner, and E. Sonnenschein, eds. Berlin: Springer. Pp. 335-346.

Golder Associates. 2010. Report on Fall Post-Construction Monitoring, Ripley Wind Power Project, Acciona Wind. Report Number 09-1126-0029. Submitted to Suncor Energy Products Inc., Calgary, Alberta, and Acciona Wind Energy Canada, Toronto, Ontario. February 2010.

Good, R.E., W.P. Erickson, A. Merrill, S. Simon, K. Murray, K. Bay, and C. Fritchman. 2011. Bat Monitoring Studies at the Fowler Ridge Wind Energy Facility, Benton County, Indiana: April 13 - October 15, 2010. Prepared for Fowler Ridge Wind Farm. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 28, 2011.

Good, R.E., A. Merrill, S. Simon, K. Murray, and K. Bay. 2012. Bat Monitoring Studies at the Fowler Ridge Wind Farm, Benton County, Indiana: April 1 - October 31, 2011. Prepared for the Fowler Ridge Wind Farm. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. January 31, 2012.

Good, R.E., J.P. Ritzert, and K. Adachi. 2013a. Post-Construction Monitoring at the Top Crop Wind Farm, Gundy and Lasalle Counties, Illinois. Final Report: May 2012 - May 2013. Prepared for EDP Renewables, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. October 22, 2013.

Good, R.E., M.L. Ritzert, and K. Adachi. 2013b. Post-Construction Monitoring at the Rail Splitter Wind Farm, Tazwell and Logan Counties, Illinois. Final Report: May 2012 - May 2013. Prepared for EDP Renewables, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. October 22, 2013.

Good, R.E., M. Sonnenburg, and S. Simon. 2013c. Bat Evaluation Monitoring Studies at the Fowler Ridge Wind Farm, Benton County, Indiana: August 1 - October 15, 2012. Prepared for the Fowler Ridge Wind Farm. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. January 31, 2013.

Grehan, J.R. 2008. Steel Winds Bird Mortality Study, Final Report, Lackawanna, New York. Prepared for Steel Winds LLC. April 2008.

Griffith, G. E., J. M. Omernick, D. W. Smith, T. D. Cook, E. Tallyn, K. Moseley, and C. B. Johnson. 2016. Ecoregions of California. U.S. Geological Survey. Available online at: http://dx.doi.org/10.3133/ofr20161021

Grinnell, J., J.S. Dixon, and J.M. Linsdale. 1937. Fur-Bearing Mammals of California. 2 Vols. University of California Press, Berkeley, California. 777pp.

Gritski, R., S. Downes, and K. Kronner. 2010. Klondike III (Phase 1) Wind Power Project Wildlife Monitoring: October 2007-October 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon, for Klondike Wind Power III LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 21, 2010 (Updated September 2010). Available online at: http://www.oregon.gov/energy/Siting/docs/KWP/KWPWildlifeReport091210.pdf

Gritski, R., S. Downes, and K. Kronner. 2011. Klondike Iiia (Phase 2) Wind Power Project Wildlife Monitoring: August 2008 - August 2010. Updated Final. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon, for Klondike Wind Power III LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. Updated April 2011. Available online at: http://www.oregon.gov/energy/Siting/docs/KWP/KWPWildlifeReport042711.pdf

Gritski, R. and K. Kronner. 2010a. Hay Canyon Wind Power Project Wildlife Monitoring Study: May 2009 - May 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Hay Canyon Wind Power Project LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. September 20, 2010.

Gritski, R. and K. Kronner. 2010b. Pebble Springs Wind Power Project Wildlife Monitoring Study: January 2009 - January 2010. Prepared for Iberdrola Renewables, Inc. (IRI), and the Pebble Springs Advisory Committee. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 20, 2010.

Gritski, R., K. Kronner, and S. Downes. 2008. Leaning Juniper Wind Power Project, 2006 − 2008. Wildlife Monitoring Final Report. Prepared for PacifiCorp Energy, Portland, Oregon. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 30, 2008.

Grodsky, S.M. and D. Drake. 2011. Assessing Bird and Bat Mortality at the Forward Energy Center. Final Report. Public Service Commission (PSC) of Wisconsin. PSC REF#:152052. Prepared for Forward Energy LLC. Prepared by Department of Forest and Wildlife Ecology, University of Wisconsin-Madison, Madison, Wisconsin. August 2011.

Gruver, J. 2002. Assessment of Bat Community Structure and Roosting Habitat Preferences for the Hoary Bat (*Lasiurus Cinereus*) near Foote Creek Rim, Wyoming. Thesis. University of Wyoming, Laramie, Wyoming. 149 pp.

Gruver, J., M. Sonnenberg, K. Bay, and W. Erickson. 2009. Post-Construction Bat and Bird Fatality Study at the Blue Sky Green Field Wind Energy Center, Fond Du Lac County, Wisconsin July 21 - October 31, 2008 and March 15 - June 4, 2009. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. December 17, 2009.

Hale, A.M. and K.B. Karsten. 2010. Estimating Bird and Bat Mortality at a Wind Energy Facility in North-Central Texas. Presented at the National Wind Coordinating Collaborative (NWCC) Research Meeting VIII, October 19-21, 2010, Lakewood, Colorado. Available online at: http://nationalwind.org/wpcontent/uploads/assets/research_meetings/Research_Meeting_VIII_Hale.pdf

Harvey & Associates. 2013. Montezuma II Wind Energy Center: Post Construction Monitoring Report, Year-1. Prepared by NextEra Montezuma II Wind, LLC, Juno Beach, Florida. Prepared by H.T. Harvey & Associates, Los Gatos, California. September 3, 2013.

Harvey, M.J., J.S. Altenbach, and T.L. Best. 1999. Bats of the United States. Arkansas Game and Fish Commission and US Fish and Wildlife Service, Arkansas.

Hein, C.D., A. Prichard, T. Mabee, and M.R. Schirmacher. 2013a. Avian and Bat Post-Construction Monitoring at the Pinnacle Wind Farm, Mineral County, West Virginia, 2012. Final Report. Bat Conservation International, Austin, Texas, and ABR, Inc., Forest Grove, Oregon. April 2013.

Hein, C.D., A. Prichard, T. Mabee, and M.R. Schirmacher. 2013b. Effectiveness of an Operational Mitigation Experiment to Reduce Bat Fatalities at the Pinnacle Wind Farm, Mineral County, West Virginia, 2012. Bat Conservation International, Austin, Texas, and ABR, Inc., Forest Grove, Oregon. April 2013.

Howe, R.W., W. Evans, and A.T. Wolf. 2002. Effects of Wind Turbines on Birds and Bats in Northeastern Wisconsin. Prepared by University of Wisconsin-Green Bay, for Wisconsin Public Service Corporation and Madison Gas and Electric Company, Madison, Wisconsin. November 21, 2002. 104 pp.

ICF International. 2012. Montezuma Wind LLC (Montezuma I) 2011 Avian and Bat Fatality Monitoring Report. Prepared for NextEra Energy Resources. Prepared by ICF International, Sacramento, California. May 17, 2012.

ICF International. 2013. Montezuma Wind Llc (Montezuma I) 2012 Avian and Bat Fatality Monitoring Report. Prepared for NextEra Energy Resources. Prepared by ICF International, Sacramento, California. May 2013.

Insignia Environmental. 2009. 2008/2009 Annual Report for the Buena Vista Avian and Bat Monitoring Project. Prepared for Contra Costa County, Martinez, California. Prepared by Insignia Environmental, Palo Alto, California. September 4, 2009.

Jacques Whitford Stantec Limited (Jacques Whitford). 2009. Ripley Wind Power Project Postconstruction Monitoring Report. Project No. 1037529.01. Report to Suncor Energy Products Inc., Calgary, Alberta, and Acciona Energy Products Inc., Calgary, Alberta. Prepared for the Ripley Wind Power Project Post-Construction Monitoring Program. Prepared by Jacques Whitford, Markham, Ontario. April 30, 2009.

Jain, A. 2005. Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm. M.S. Thesis. Iowa State University, Ames, Iowa.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2007. Annual Report for the Maple Ridge Wind Power Project: Post-Construction Bird and Bat Fatality Study – 2006. Final Report. Prepared for PPM Energy and Horizon Energy and Technical Advisory Committee (TAC) for the Maple Ridge Project Study.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2009a. Annual Report for the Maple Ridge Wind Power Project: Post-Construction Bird and Bat Fatality Study - 2007. Final report prepared for PPM Energy and Horizon Energy and Technical Advisory Committee (TAC) for the Maple Ridge Project Study. May 6, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, A. Fuerst, and C. Hansen. 2009b. Annual Report for the Noble Ellenburg Windpark, LLC, Postconstruction Bird and Bat Fatality Study - 2008. Prepared for Noble Environmental Power, LLC by Curry and Kerlinger, LLC. April 13, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Histed, and J. Meacham. 2009c. Annual Report for the Noble Clinton Windpark, Llc, Postconstruction Bird and Bat Fatality Study - 2008. Prepared for Noble Environmental Power, LLC by Curry and Kerlinger, LLC. April 13, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, and M. Lehman. 2009d. Maple Ridge Wind Power Avian and Bat Fatality Study Report - 2008. Annual Report for the Maple Ridge Wind Power Project, Post-construction Bird and Bat Fatality Study - 2008. Prepared for Iberdrola Renewables, Inc, Horizon Energy, and the Technical Advisory Committee (TAC) for the Maple Ridge Project Study. Prepared by Curry and Kerlinger, LLC. May 14, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Quant, and D. Pursell. 2009e. Annual Report for the Noble Bliss Windpark, LLC, Postconstruction Bird and Bat Fatality Study - 2008. Prepared for Noble Environmental Power, LLC by Curry and Kerlinger, LLC. April 13, 2009.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, A. Fuerst, and A. Harte. 2010a. Annual Report for the Noble Bliss Windpark, LLC: Postconstruction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. March 9, 2010.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and A. Harte. 2011a. Annual Report for the Noble Wethersfield Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. January 22, 2011.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2010b. Annual Report for the Noble Clinton Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. March 9, 2010.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2010c. Annual Report for the Noble Ellenburg Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. March 14, 2010.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2011b. Annual Report for the Noble Altona Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. January 22, 2011.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2011c. Annual Report for the Noble Chateaugay Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. January 22, 2011.

Jeffrey, J.D., K. Bay, W.P. Erickson, M. Sonneberg, J. Baker, M. Kesterke, J.R. Boehrs, and A. Palochak. 2009a. Portland General Electric Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring First Annual Report, Sherman County, Oregon. January 2008 - December 2008. Technical report prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology (WEST) Inc., Cheyenne, Wyoming, and Walla Walla, Washington. April 29, 2009.

Jeffrey, J.D., W.P. Erickson, K. Bay, M. Sonneberg, J. Baker, J.R. Boehrs, and A. Palochak. 2009b. Horizon Wind Energy, Elkhorn Valley Wind Project, Post-Construction Avian and Bat Monitoring, First Annual Report, January-December 2008. Technical report prepared for Telocaset Wind Power Partners, a subsidiary of Horizon Wind Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming, and Walla Walla, Washington. May 4, 2009.

Johnson, G., W. Erickson, and J. White. 2003a. Avian and Bat Mortality During the First Year of Operation at the Klondike Phase I Wind Project, Sherman County, Oregon. Technical report prepared for Northwestern Wind Power, Goldendale, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 2003. http://www.west-inc.com

Johnson, G.D. 2005. A Review of Bat Mortality at Wind-Energy Developments in the United States. Bat Research News 46(2): 45-49.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, and D.A. Shepherd. 2000. Final Report: Avian Monitoring Studies at the Buffalo Ridge Wind Resource Area, Minnesota: Results of a 4-Year Study. Final report prepared for Northern States Power Company, Minneapolis, Minnesota, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 22, 2000. 212 pp. http://www.west-inc.com

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.A. Sarappo. 2003b. Mortality of Bats at a Large-Scale Wind Power Development at Buffalo Ridge, Minnesota. The American Midland Naturalist 150: 332-342.

Johnson, G.D., M.K. Perlik, W.P. Erickson, and M.D. Strickland. 2004. Bat Activity, Composition and Collision Mortality at a Large Wind Plant in Minnesota. Wildlife Society Bulletin 32(4): 1278-1288.

Johnson, G.D., M. Ritzert, S. Nomani, and K. Bay. 2010a. Bird and Bat Fatality Studies, Fowler Ridge I Wind-Energy Facility Benton County, Indiana. Unpublished report prepared for British Petroleum Wind Energy North America Inc. (BPWENA) by Western EcoSystems Technology, Inc. (WEST).

Johnson, G.D., M. Ritzert, S. Nomani, and K. Bay. 2010b. Bird and Bat Fatality Studies, Fowler Ridge III Wind-Energy Facility, Benton County, Indiana. April 2 - June 10, 2009. Prepared for BP Wind Energy North America. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Kelly, T.A., J. Lewis, T. West, K. Voltura, and J. Davenport. Advances in Avian Radars for Assessing Bird Activity at Offshore Wind Energy Sites. DeTect, Inc. Panama City, Florida. Handout at the 2012 American Wind Energy Association (AWEA) Offshore Windpower Conference and Exhibition, October 9-11, 2012. Virginia Beach, Virginia.

Kerlinger, P. 2002a. An Assessment of the Impacts of Green Mountain Power Corporation's Wind Power Facility on Breeding and Migrating Birds in Searsburg, Vermont: July 1996-July 1998. NREL/SR-500-28591. Prepared for Vermont Public Service, Montpelier, Vermont. US Department of Energy, National Renewable Energy Laboratory, Golden, Colorado. March 2002. 95 pp. http://www.nrel.gov/docs/fy02osti/28591.pdf

Kerlinger, P. 2002b. Avian Fatality Study at the Madison Wind Power Project, Madison, New York. Report to PG&E Generating.

Kerlinger, P., R. Curry, L. Culp, A. Hasch, and A. Jain. 2009. Revised Post-Construction Avian Monitoring Study for the Shiloh I Wind Power Project, Solano County, California. Final Report: October 2009. Third Year Report (Revised 2010). Prepared for Iberdrola Renewables, Inc. (IRI). Prepared by Curry and Kerlinger, LLC., McLean, Virginia. Available online at: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=8914

Kerlinger, P., R. Curry, L. Culp, A. Hasch, and A. Jain. 2010. Post-Construction Avian Monitoring Study for the Shiloh II Wind Power Project, Solano County, California. Year One Report. Prepared for enXco Development Inc. Prepared by Curry and Kerlinger, LLC, McLean, Virginia. September 2010. Available online at: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=12118

Kerlinger, P., R. Curry, L. Culp, A. Jain, C. Wilkerson, B. Fischer, and A. Hasch. 2006. Post-Construction Avian and Bat Fatality Monitoring Study for the High Winds Wind Power Project, Solano County, California: Two Year Report. Prepared for High Winds LLC, FPL Energy. Prepared by Curry and Kerlinger, LLC, MacLean, Virginia. April 2006. Available online at: http://www.co.solano.ca.us/civicax/filebank/blobdload.aspx?blobid=8915

Kerlinger, P., R. Curry, A. Hasch, and J. Guarnaccia. 2007. Migratory Bird and Bat Monitoring Study at the Crescent Ridge Wind Power Project, Bureau County, Illinois: September 2005 - August 2006. Final draft prepared for Orrick Herrington and Sutcliffe, LLP. May 2007.

Kerlinger, P., R. Curry, A. Hasch, J. Guarnaccia, and D. Riser-Espinoza. 2013a. Post-Construction Bird and Bat Studies at the Shiloh II Wind Project, LLC, Solano County, California. Final Report. Prepared for EDF Renewable Energy (formerly known as enXco). Prepared by Curry and Kerlinger, LLC, McLean, Virginia. December 2012 (Revised June 2013).

Kerlinger, P., R. Curry, A. Hasch, J. Guarnaccia, and D. Riser-Espinoza. 2013b. Post-Construction Bird and Bat Studies at the Shiloh III Wind Project, LLC, Solano County, California. Report on Year 1 Results. Prepared for EDF Renewable Energy (formerly known as enXco). Prepared by Curry and Kerlinger, LLC, McLean, Virginia. August 2013.

Kerlinger, P., J. Guarnaccia, R. Curry, and C.J. Vogel. 2014. Bird and Bat Fatality Study, Heritage Garden I Wind Farm, Delta County, Michigan: 2012-2014. Prepared for Heritage Sustainable Energy, LLC. Prepared by Curry and Kerlinger, LLC, McLean, Virginia. November 2014.

Kerlinger, P., J. Guarnaccia, L. Slobodnik, and R. Curry. 2011a. A Comparison of Bat Mortality in Farmland and Forested Habitats at the Noble Bliss and Wethersfield Windparks, Wyoming County, New York. Report Prepared for Noble Environmental Power. Report prepared by Curry & Kerlinger, LLC, Cape May Point, New Jersey. November 2011.

Kerlinger, P., D.S. Reynolds, J. Guarnaccia, L. Slobodnik, and R. Curry. 2011b. An Examination of the Relationship between Bat Abundance and Fatalities at the Noble Altona Windpark, Clinton County, New York. Report prepared for Noble Environmental Power. Report prepared by Curry & Kerlinger, LLC, Cape May Point, New Jersey, and North East Ecological Services. December 2011.

Kerns, J. and P. Kerlinger. 2004. A Study of Bird and Bat Collision Fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: Annual Report for 2003. Prepared for FPL Energy and the Mountaineer Wind Energy Center Technical Review Committee. February 14, 2004. 39 pp. http://www.wvhighlands.org/Birds/MountaineerFinalAvianRpt-%203-15-04PKJK.pdf

Kovacs, K.E., K.E. Converse, M.C. Stopher, J.H. Hobbs, M.L. Sommer, P.J. Figura, D.A. Applebee, D.L. Clifford, and D.J. Michaels. 2016. Conservation Plan for Gray Wolves. California Department of Fish and Wildlife, Sacramento, California. 329 pp.

Krenz, J.D. and B.R. McMillan. 2000. Final Report: Wind-Turbine Related Bat Mortality in Southwestern Minnesota. Minnesota Department of Natural Resources, St. Paul, Minnesota.

Kronner, K., B. Gritski, and S. Downes. 2008. Big Horn Wind Power Project Wildlife Fatality Monitoring Study: 2006−2007. Final report prepared for PPM Energy and the Big Horn Wind Project Technical Advisory Committee by Northwest Wildlife Consultants, Inc. (NWC), Mid-Columbia Field Office, Goldendale, Washington. June 1, 2008.

Liguori, J. 2005. Hawks from Every Angle: How to Identify Raptors in Flight. Princeton University Press, Princeton, New Jersey.

Martin, C., E. Arnett, and M. Wallace. 2013. Evaluating Bird and Bat Post-Construction Impacts at the Sheffield Wind Facility, Vermont: 2012 Annual Report. Prepared for Bat Conservation International and First Wind. Prepared by Department of Natural Resources Management, Texas Tech University, Lubbock, Texas. March 25, 2013.

Migratory Bird Treaty Act (MBTA). 1918. 16 United States Code (USC) §§ 703-712. July 13, 1918.

Miller, A. 2008. Patterns of Avian and Bat Mortality at a Utility-Scaled Wind Farm on the Southern High Plains. Thesis. Texas Tech University, August 2008.

Minnesota Public Utilities Commission (MPUC). 2012. Lakefield Wind Project Avian and Bat Fatality Monitoring. MPUC Site Permit Quarterly Report and USFWS Special Purpose – Utility (Avian Take Monitoring) 30-Day Report: April 1 – September 30, 2012. USFWS Permit No: MB70161A-0; MDNR Permit No: 17930; MPUC Permit No: IP-6829/WS-09-1239, Permit Special Condition VII.B. October 15, 2012.

National Research Council (NRC). 2007. Environmental Impacts of Wind-Energy Projects. National Academies Press. Washington, D.C. www.nap.edu

National Wind Coordinating Collaborative (NWCC). 2004. Wind Turbine Interactions with Birds and Bats: A Summary of Research Results and Remaining Questions. Fact Sheet. 2nd Edition. November 2004. Available online at: http://nationalwind.org/wpcontent/uploads/assets/archive/Wind_Turbine_Interactions_with_Birds_and_Bats_-_A_Summary_of_Research_Results_and_Remaining_Questions__2004_.pdf

Natural Resource Solutions Inc. (NRSI). 2011. Harrow Wind Farm 2010 Post-Construction Monitoring Report. Project No. 0953. Prepared for International Power Canada, Inc., Markham, Ontario. Prepared by NRSI. August 2011.

Natural Resources Conservation Service. 2017. Web Soil Survey. US Department of Agriculture. Available online at: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

New Jersey Audubon Society (NJAS). 2008a. Post-Construction Wildlife Monitoring at the Atlantic City Utilities Authority - Jersey Atlantic Wind Power Facility: Periodic Report Covering Work Conducted between 1 August and 30 September 2008. Submitted to New Jersey Board of Public Utilities, New Jersey Clean Energy Program, Newark, New Jersey. Submitted by New Jersey Audubon Society, Center for Research and Education, Cape May Court House, New Jersey. Available online at: http://www.njcleanenergy.com/files/file/Renewable_Programs/Wind/ACUA_Interim%20Report_Jan-Sep08_all.pdf

New Jersey Audubon Society (NJAS). 2008b. Post-Construction Wildlife Monitoring at the Atlantic City Utilities Authority - Jersey Atlantic Wind Power Facility: Periodic Report Covering Work Conducted between 20 July and 31 December 2007. Submitted to New Jersey Board of Public Utilities, New Jersey Clean Energy Program, Newark, New Jersey. Submitted by New Jersey Audubon Society, Center for Research and Education, Cape May Court House, New Jersey. Available online at: http://www.njcleanenergy.com/files/file/Renewable_Programs/CORE/ACUAReportwithimages123107LowRes.pdf

New Jersey Audubon Society (NJAS). 2009. Post-Construction Wildlife Monitoring at the Atlantic City Utilities Authority - Jersey Atlantic Wind Power Facility: Project Status Report Iv. Available online at: http://www.njcleanenergy.com/files/file/Renewable_Programs/Wind/ACUA_Quarterly%20report_to-date_Jan-Aug09_1c.pdf

Nicholson, C.P., J. R.D. Tankersley, J.K. Fiedler, and N.S. Nicholas. 2005. Assessment and Prediction of Bird and Bat Mortality at Wind Energy Facilities in the Southeastern United States. Final Report. Tennessee Valley Authority, Knoxville, Tennessee.

Normandeau Associates, Inc. 2010. Stetson Mountain II Wind Project Year 1 Post-Construction Avian and Bat Mortality Monitoring Study, T8 R4 Nbpp, Maine. Prepared for First Wind, LLC, Portland, Maine. Prepared by Normandeau Associates, Inc., Falmouth, Maine. December 2, 2010.

Normandeau Associates, Inc. 2011. Year 3 Post- Construction Avian and Bat Casualty Monitoring at the Stetson I Wind Farm, T8 R4 Nbpp, Maine. Prepared for First Wind Energy, LLC, Portland, Maine. Prepared by Normandeau Associates, Inc., Falmouth, Maine. December 2011.

North American Datum (NAD). 1983. Nad83 Geodetic Datum.

Northwest Wildlife Consultants, Inc. (NWC) and Western EcoSystems Technology, Inc. (WEST). 2007. Avian and Bat Monitoring Report for the Klondike II Wind Power Project. Sherman County, Oregon. Prepared for PPM Energy, Portland, Oregon. Managed and conducted by NWC, Pendleton, Oregon. Analysis conducted by WEST, Cheyenne, Wyoming. July 17, 2007.

Orloff, S. and A. Flannery. 1992. Wind Turbine Effects on Avian Activity, Habitat Use, and Mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final Report P700-92-001 to Alameda, Contra Costa, and Solano Counties, and the California Energy Commission, Sacramento, California, by Biosystems Analysis, Inc., Tiburon, California. March 1992.

Osborn, R.G., K.F. Higgins, C.D. Dieter, and R.E. Usgaard. 1996. Bat Collisions with Wind Turbines in Southwestern Minnesota. Bat Research News 37: 105-108.

Osborn, R.G., K.F. Higgins, R.E. Usgaard, C.D. Dieter, and R.G. Neiger. 2000. Bird Mortality Associated with Wind Turbines at the Buffalo Ridge Wind Resource Area, Minnesota. American Midland Naturalist 143: 41-52.

Peurach, S.C. 2003. High-Altitude Collision between an Airplane and a Hoary Bat, *Lasiurus Cinereus*. Bat Research News 44(1): 2-3.

Piorkowski, M.D. and T.J. O'Connell. 2010. Spatial Pattern of Summer Bat Mortality from Collisions with Wind Turbines in Mixed-Grass Prairie. American Midland Naturalist 164: 260-269.

Poulton, V. and W.P. Erickson. 2010. Post-Construction Bat and Bird Fatality Study, Judith Gap Wind Farm, Wheatland County, Montana. Final Report: Results from June–October 2009 Study and Comparison with 2006-2007 Study. Prepared for Judith Gap Energy, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 2010.

Pruitt, L. and J. Okajima. 2014. Indiana Bat Fatalities at Wind Energy Facilities. US Fish and Wildlife Service (USFWS) Bloomington Indiana Field Office. Update December 2014. Available online at: http://www.fws.gov/midwest/wind/wildlifeimpacts/pdf/IndianaBatFatalitiesUpdatedDec2014.pdf

Sapphos Environmental, Inc. (Sapphos). 2014. Pacific Wind Energy Project: Year I Avian and Bat Fatality Monitoring Report. Prepared for Pacific Wind, LLC, San Diego, California. Prepared by Sapphos, Pasadena, California. September 15, 2014.

Sauer, J.R., J.E. Hines, J.E. Fallon, K.L. Pardieck, D. J. Ziolkowski, Jr., and W.A. Link. 2014. The North American Breeding Bird Survey, Results and Analysis 1966 - 2012. Version 02.19.2014. US Geological Survey [USGS] Patuxent Wildlife Research Center. Laurel, Maryland. BBS Routes available online at: http://www.mbr-pwrc.usgs.gov/bbs/bbs.html

Schempf, P.F. and M. White. 1977. Status of Furbearer Population in the Mountains of Northern California. US Department of Agriculture (USDA) Forest Service, San Francisco, California. 51 pp.

Snyder, N.F.R. and N.J. Schmitt. 2002. California Condor (*Gymnogyps Californianus*). A. Poole, ed. The Birds of North America Online. Cornell Lab of Ornithology. Ithaca, New York. Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/610

Stantec Consulting, Inc. (Stantec). 2008. 2007 Spring, Summer, and Fall Post-Construction Bird and Bat Mortality Study at the Mars Hill Wind Farm, Maine. Prepared for UPC Wind Management, LLC, Cumberland, Maine. Prepared by Stantec (formerly Woodlot Alternatives, Inc.), Topsham, Maine. January 2008.

Stantec Consulting, Inc. (Stantec). 2009a. Post-Construction Monitoring at the Mars Hill Wind Farm, Maine - Year 2, 2008. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec Consulting, Topsham, Maine. January 2009.

Stantec Consulting, Inc. (Stantec). 2009b. Post-Construction Monitoring at the Munnsville Wind Farm, New York: 2008. Prepared for E.ON Climate and Renewables, Austin, Texas. Prepared by Stantec Consulting, Topsham, Maine. January 2009.

Stantec Consulting, Inc. (Stantec). 2009c. Stetson I Mountain Wind Project: Year 1 Post-Construction Monitoring Report, 2009 for the Stetson Mountain Wind Project in Penobscot and Washington Counties, Maine. Prepared for First Wind Management, LLC. Portland, Maine. Prepared by Stantec, Topsham, Maine. December 2009.

Stantec Consulting, Inc. (Stantec). 2010. Cohocton and Dutch Hill Wind Farms Year 1 Post-Construction Monitoring Report, 2009, for the Cohocton and Dutch Hill Wind Farms in Cohocton, New York. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. January 2010.

Stantec Consulting, Inc. (Stantec). 2011a. Cohocton and Dutch Hill Wind Farms Year 2 Post-Construction Monitoring Report, 2010, for the Cohocton and Dutch Hill Wind Farms in Cohocton, New York. Prepared for Canandaigua Power Partners, LLC, and Canandaigua Power Partners II, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. October 2011.

Stantec Consulting, Inc. (Stantec). 2011b. Post-Construction Monitoring 2010 Final Annual Report – Year 1, Milford Wind Corridor Phase I, Milford, Utah. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. August 2011.

Stantec Consulting, Inc. (Stantec). 2012a. 2011 Post-Construction Monitoring Report, Kibby Wind Power Project, Franklin County, Maine. Prepared for TransCanada Hydro Northeast, Inc., North Walpole, New Hampshire. Prepared by Stantec, Topsham, Maine. March 2012.

Stantec Consulting, Inc. (Stantec). 2012b. Post-Construction Monitoring 2011 - 2012, Milford Wind Corridor Phase I and II, Milford, Utah. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. May 2012.

Stantec Consulting, Inc. (Stantec). 2013a. Palouse Wind Post-Construction Wildlife Monitoring Report, 2012-2013. Prepared for Palouse Wind, Whitman County, Washington. Prepared by Stantec, Topsham, Maine. December 2013.

Stantec Consulting, Inc. (Stantec). 2013b. Record Hill Wind Project Post-Construction Monitoring Report, 2012. Prepared for Record Hill Wind LLC, Lyme, New Hampshire. Prepared by Stantec, Topsham, Maine. March 2013. Available online at: http://www.maine.gov/dep/ftp/WindPowerProjectFiles/PostConstructionMonitoring/RH%202012%20PCM%20Report_031313.pdf

Stantec Consulting, Inc. (Stantec). 2013c. Rollins Wind Project Post-Construction Monitoring Report, 2012. Prepared for First Wind, Portland, Maine. Prepared by Stantec, Topsham, Maine. March 2013.

Stantec Consulting, Inc. (Stantec). 2013d. Steel Winds I and II Post-Construction Monitoring Report, 2012, Lackwanna and Hamburg, New York. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. April 2013.

Stantec Consulting, Inc. (Stantec). 2013e. Stetson II Wind Project Post-Construction Monitoring Report, 2012. Prepared for First Wind, Portland, Maine. Prepared by Stantec, Topsham, Maine. March 2013.

Stantec Consulting, Inc. (Stantec). 2014. Stetson I Wind Project 2013 Post-Construction Wildlife Monitoring Report, Year 5. Stetson I Wind Project, Washington County, Maine. Prepared for First Wind, Portland, Maine. Prepared by Stantec, Topsham, Maine. February 2014.

Stantec Consulting, Inc. (Stantec). 2015. Record Hill Wind Project Year 2 Post-Construction Wildlife Monitoring Report, 2014. Prepared for Record Hill Wind LLC and Wagner Forest Management, Ltd., Lyme, New Hampshire. Prepared by Stantec Consulting, Topsham, Maine. March 2015.

Stantec Consulting Ltd. (Stantec Ltd.). 2008. Melancthon I Wind Plant Post-Construction Bird and Bat Monitoring Report: 2007. File No. 160960220. Prepared for Canadian Hydro Developers, Inc., Guelph, Ontario. Prepared by Stantec Ltd., Guelph, Ontario. June 2008.

Stantec Consulting Ltd. (Stantec Ltd.). 2010a. Wolfe Island Ecopower Centre Post-Construction Followup Plan. Bird and Bat Resources Monitoring Report No. 1: May - June 2009. File No. 160960494. Prepared for Canadian Hydro Developers, Inc.'s wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Ltd., Guelph, Ontario. February 2010.

Stantec Consulting Ltd. (Stantec Ltd.). 2010b. Wolfe Island Ecopower Centre Post-Construction Followup Plan. Bird and Bat Resources Monitoring Report No. 2: July - December 2009. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Ltd., Guelph, Ontario. May 2010.

Stantec Consulting Ltd. (Stantec Ltd.). 2011a. Wolfe Island Wind Plant Post-Construction Followup Plan. Bird and Bat Resources Monitoring Report No. 3: January - June 2010. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Consulting Ltd., Guelph, Ontario. January 2011.

Stantec Consulting Ltd. (Stantec Ltd.). 2011b. Wolfe Island Wind Plant Post-Construction Followup Plan. Bird and Bat Resources Monitoring Report No. 4: July - December 2010. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Consulting Ltd., Guelph, Ontario. July 2011.

Stantec Consulting Ltd. (Stantec Ltd.). 2011c. Wolfe Island Wind Plant Post-Construction Followup Plan. Bird and Bat Resources Monitoring Report No. 5: January - June 2011. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Consulting Ltd., Guelph, Ontario. December 2011.

Stantec Consulting Ltd. (Stantec Ltd.). 2012. Wolfe Island Wind Plant Post-Construction Follow-up Plan. Bird and Bat Resources Monitoring Report No. 6: July-December 2011. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Consulting Ltd., Guelph, Ontario. July 2012.

Stantec Consulting Ltd. (Stantec Ltd.). 2014. Wolfe Island Wind Plant Post-Construction Follow-up Plan. Bird and Bat Resources Monitoring Report No. 7: January - June 2012. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Consulting Ltd., Guelph, Ontario. April 2014. Available online at: http://www.transalta.com/sites/default/files/WolfeIsland_TransAlta_PostConstruction_BirdBat_Report_7.pdf

Stantec Consulting Services, Inc. (Stantec Consulting). 2012. Post-Construction Monitoring, Summer 2011 - Spring 2012. Year 1 Annual Report. Kittitas Valley Wind Power Project, Cle Elum, Washington. Prepared for Sagebrush Power Partners, LLC, Houston, Texas. Prepared by Stantec Consulting, Salt Lake City, Utah.

Stantec Consulting Services, Inc. (Stantec Consulting). 2013. Kittitas Valley Wind Power Project, Cle Elum, Washington. Post-Construction Monitoring: Summer 2012 - Spring 2013. Year 2 Annual Report. Prepared for Sagebrush Power Partners LLC, Houston Texas. Prepared by Stantec Consulting, Salt Lake City, Utah.

Tetra Tech. 2013a. Hatchet Ridge Wind Farm Post-Construction Mortality Monitoring: Year Two Annual Report. Prepared for Hatchet Ridge Wind, LLC. Prepared by Tetra Tech, Portland, Oregon. March 2013. Available online at: http://wintuaudubon.org/Documents/HatchetRidgeYear2FinalReport3-13.pdf

Tetra Tech. 2013b. Spruce Mountain Wind Project Post-Construction Bird and Bat Fatality and Raptor Monitoring: Year 1 Annual Report. Prepared for Patriot Renewables. Prepared by Tetra Tech, Portland, Maine. May 2013.

Thompson, J. and K. Bay. 2012. Post-Construction Fatality Surveys for the Dry Lake II Wind Project: February 2011 – February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 6, 2012.

Thompson, J., D. Solick, and K. Bay. 2011. Post-Construction Fatality Surveys for the Dry Lake Phase I Wind Project. Iberdrola Renewables: September 2009 - November 2010. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 10, 2011.

Tidhar, D., L. McManus, Z. Courage, and W.L. Tidhar. 2012a. 2010 Post-Construction Fatality Monitoring Study and Bat Acoustic Study for the High Sheldon Wind Farm, Wyoming County, New York. Final Report: April 15 - November 15, 2010. Prepared for High Sheldon Wind Farm, Sheldon Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Waterbury, Vermont. April 15, 2012.

Tidhar, D., L. McManus, D. Solick, Z. Courage, and K. Bay. 2012b. 2011 Post-Construction Fatality Monitoring Study and Bat Acoustic Study for the High Sheldon Wind Farm, Wyoming County, New York. Final Report: April 15 - November 15, 2011. Prepared for High Sheldon Wind Farm, Sheldon Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Waterbury, Vermont. April 25, 2012.

Tidhar, D., J. Ritzert, M. Sonnenberg, M. Lout, and K. Bay. 2013a. 2012 Post-Construction Fatality Monitoring Study for the Maple Ridge Wind Farm, Lewis County, New York. Final Report: July 12 - October 15, 2012. Prepared for EDP Renewables North, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), NE/Mid-Atlantic Branch, Waterbury, Vermont. February 12, 2013.

Tidhar, D., M. Sonnenberg, and D.P. Young, Jr. 2013b. 2012 Post-Construction Carcass Monitoring Study for the Beech Ridge Wind Farm, Greenbrier County, West Virginia. Final Report: April 1 - October 28, 2012. Prepared for Beech Ridge Wind Farm, Beech Ridge Energy, LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), NE/Mid-Atlantic Branch, Waterbury, Vermont. January 18, 2013.

Tidhar, D., W. Tidhar, and M. Sonnenberg. 2010. Post-Construction Fatality Surveys for Lempster Wind Project, Iberdrola Renewables. Prepared for Lempster Wind, Llc, Lempster Wind Technical Advisory Committee, and Iberdrola Renewables, Inc. Prepared by Western EcoSystems Technology Inc. (WEST), Waterbury, Vermont. September 30, 2010.

Tidhar, D., W.L. Tidhar, L. McManus, and Z. Courage. 2011. 2010 Post-Construction Fatality Surveys for the Lempster Wind Project, Lempster, New Hampshire. Prepared for Iberdrola Renewables, Inc. and the Lempster Wind Technical Committee. Prepared by Western EcoSystems Technology, Inc., Waterbury, Vermont. May 18, 2011.

Tierney, R. 2007. Buffalo Gap I Wind Farm Avian Mortality Study: February 2006-January 2007. Final Survey Report. Prepared for AES SeaWest, Inc. TRC, Albuquerque, New Mexico. TRC Report No. 110766-C-01. May 2007.

Tierney, R. 2009. Buffalo Gap 2 Wind Farm Avian Mortality Study: July 2007 - December 2008. Final Survey Report. Submitted by TRC, Albuquerque, New Mexico. TRC Report No. 151143-B-01. June 2009.

TRC Environmental Corporation. 2008. Post-Construction Avian and Bat Fatality Monitoring and Grassland Bird Displacement Surveys at the Judith Gap Wind Energy Project, Wheatland County, Montana. Prepared for Judith Gap Energy, LLC, Chicago, Illinois. TRC Environmental Corporation, Laramie, Wyoming. TRC Project 51883-01 (112416). January 2008. http://www.newwest.net/pdfs/AvianBatFatalityMonitoring.pdf

URS Corporation. 2010a. Final Goodnoe Hills Wind Project Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 16, 2010.

URS Corporation. 2010b. Final Marengo I Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

URS Corporation. 2010c. Final Marengo II Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

US Department of Agriculture (USDA). 2014. Imagery Programs - National Agriculture Imagery Program (Naip). USDA - Farm Service Agency (FSA). Aerial Photography Field Office (APFO), Salt Lake City, Utah. Last updated September 2014. Information available online at: http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/index

US Fish and Wildlife Service (USFWS). 1998. Recovery Plan for the Shasta Crayfish (*Pacifastacus Fortis*). USFWS, Portland, Oregon.

US Fish and Wildlife Service (USFWS). 2006. Valley Elderberry Longhorn Beetle (*Desmocerus Californicus Dimorphus*). 5-Year Review: Summary and Evaluation. USFWS, Sacramento, California.

US Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern 2008. December 2008. Division of Migratory Bird Management. Arlington, Virginia. Available online at: https://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf

US Fish and Wildlife Service (USFWS). 2011a. U.S. Fish and Wildlife Service Seeks Input on Developing Indiana Bat Habitat Conservation Plan for Wind Facility in Benton County. News release prepared by G. Parham, USFWS. May 25, 2011. Available online at: http://www.fws.gov/midwest/Endangered/permits/hcp/FowlerRidge/NR_FowlerNOI25May2011.html; Information on fatalities at: http://www.fws.gov/midwest/Endangered/permits/hcp/FowlerRidge/FowlerRidgeSummary.html

US Fish and Wildlife Service (USFWS). 2011b. U.S. Fish and Wildlife Service Statement on Indiana Bat Fatality at North Allegheny Wind Facility. Lowell Whitney, Northeast Regional HCP Coordinator, USFWS.

US Fish and Wildlife Service (USFWS). 2012a. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online at: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf

US Fish and Wildlife Service (USFWS). 2012b. Endangered Indiana Bat Found Dead at Ohio Wind Facility; Steps Underway to Reduce Future Mortalities. Newsroom, Midwest Region, USFWS. November 29, 2012. Available online at: http://www.fws.gov/midwest/news/604.html

US Fish and Wildlife Service (USFWS). 2012c. Indiana Bat Fatality at West Virginia Wind Facility. West Virginia Field Office, Northeast Region, USFWS. Last updated August 23, 2012. Available online at: http://www.fws.gov/westvirginiafieldoffice/ibatfatality.html

US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Executive Summary and frontmatter + 103 pp. Available online at: https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf

US Fish and Wildlife Service (USFWS). 2015. SPECIES REPORT: Sierra Nevada Red Fox (Vulpes vulpes necator). August 14, 2015. Available online at: http://www.fws.gov/sacramento/outreach/2015/10-07/docs/20150814_SNRF_SpeciesReport.pdf

US Fish and Wildlife Service (USFWS). 2017. Critical Habitat Portal. USFWS Critical Habitat for Threatened and Endangered Species: Online Mapper. Accessed April 2015. Online at: http://ecos.fws.gov/crithab/

US Fish and Wildlife Service (USFWS). 2016. California Condor Recovery Program Population Status v, California Condor Recovery Program. Filmore, California. Available online at: https://www.fws.gov/cno/es/CalCondor/Condor-population.html

US Fish and Wildlife Service (USFWS). 2017a. Species by County Report. Environmental Conservation Online System (ECOS), USFWS. Accessed January 2017. Shasta County report available online at: https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=06089

US Fish and Wildlife Service (USFWS). 2017b. Critical Habitat Portal. USFWS Critical Habitat for Threatened and Endangered Species: Online Mapper. Accessed February 2017. Online at: http://ecos.fws.gov/crithab/

US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). 2016. Seamless Wetlands Data by State. National Wetlands Inventory website. Last updated: October 13, 2016. U.S. Department of the Interior, Fish and Wildlife Service. Washington, D.C. Geodatabase and Shapefile data available online at: http://www.fws.gov/wetlands/data/State-Downloads.html

US Geological Survey (USGS). 1999. North American Breeding Bird Survey Route Locations for Lower 48 States, Patuxent Wildlife Research Center, USGS. Available online at: https://sagemap.wr.usgs.gov/FTP/unitedstates/NATLAS/birdm.htm

US Geological Survey (USGS). 2001. North American Breeding Bird Survey: About BBS. USGS Breeding Bird Surveys (BBS), Patuxent Wildlife Research Center. Laurel, Maryland. Homepage available online at: http://www.pwrc.usgs.gov/bbs/about/

US Geological Survey (USGS). 2015. USGS Topographic Maps. Last updated August 2015. Homepage available at: http://topomaps.usgs.gov/

US Geological Survey (USGS). 1999. North American Breeding Bird Survey Route Locations for Lower 48 States, Patuxent Wildlife Research Center, USGS. Available online at: https://sagemap.wr.usgs.gov/FTP/unitedstates/NATLAS/birdm.htm

US Geological Survey (USGS) Digital Elevation Model (DEM). 2016. Digital Elevation Model (DEM) Imagery.

US Geological Survey (USGS) National Land Cover Database (NLCD). 2011. Multi-Resolution Land Characteristics Consortium (MRLC), National Land Cover Database (NLCD). USGS Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota. Information available online at: http://www.mrlc.gov/nlcd2011.php; Legend information available at: http://www.mrlc.gov/nlcd11_leg.php

Ventus Environmental Solutions (Ventus). 2012. Vantage Wind Energy Center Avian and Bat Monitoring Study: March 2011- March 2012. Prepared for Vantage Wind Energy, LLC, Chicago, Illinois. Prepared by Ventus, Portland, Oregon. May 16, 2012.

Western EcoSystems Technology, Inc. (WEST). 2006. Diablo Winds Wildlife Monitoring Progress Report, March 2005 - February 2006. Technical report submitted to FPL Energy and Alameda County California. WEST. Cheyenne, Wyoming.

Western EcoSystems Technology, Inc. (WEST). 2008. Diablo Winds Wildlife Monitoring Progress Report: March 2005 – February 2007. Prepared by WEST, Cheyenne, Wyoming. August 2008.

Western EcoSystems Technology, Inc. (WEST). 2011. Post-Construction Fatality Surveys for the Barton Chapel Wind Project: Iberdrola Renewables. Version: July 2011. Iberdrola Renewables, Portland, Oregon.

Young, D.P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2009a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: March - June 2009. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. August 17, 2009.

Young, D.P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2010a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: April - July 2010. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 27, 2010.

Young, D.P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2010b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2009. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 12, 2010.

Young, D.P., Jr., W.P. Erickson, K. Bay, S. Nomani, and W. Tidhar. 2009b. Mount Storm Wind Energy Facility, Phase 1 Post-Construction Avian and Bat Monitoring, July - October 2008. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 17, 2009.

Young, D.P., Jr., W.P. Erickson, R.E. Good, M.D. Strickland, and G.D. Johnson. 2003. Avian and Bat Mortality Associated with the Initial Phase of the Foote Creek Rim Windpower Project, Carbon County, Wyoming, Final Report, November 1998 - June 2002. Prepared for Pacificorp, Inc. Portland, Oregon, SeaWest Windpower Inc. San Diego, California, and Bureau of Land Management, Rawlins District Office, Rawlins, Wyoming. January 10, 2003. Available online at: http://west-inc.com/reports/fcr_final_mortality.pdf

Young, D.P., Jr., W.P. Erickson, J. Jeffrey, and V.K. Poulton. 2007. Puget Sound Energy Hopkins Ridge Wind Project Phase 1 Post-Construction Avian and Bat Monitoring First Annual Report, January - December 2006. Technical report for Puget Sound Energy, Dayton, Washington and Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Western EcoSystems Technology, Inc. (WEST) Cheyenne, Wyoming, and Walla Walla, Washington. 25 pp.

Young, D.P., Jr., J. Jeffrey, W.P. Erickson, K. Bay, V.K. Poulton, K. Kronner, R. Gritski, and J. Baker. 2006. Eurus Combine Hills Turbine Ranch. Phase 1 Post Construction Wildlife Monitoring First Annual Report: February 2004 - February 2005. Technical report prepared for Eurus Energy America Corporation, San Diego, California, and the Combine Hills Technical Advisory Committee, Umatilla County, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla Washington, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. February 21, 2006. Available online at: http://wind.nrel.gov/public/library/young7.pdf

Young, D.P., Jr., J.D. Jeffrey, K. Bay, and W.P. Erickson. 2009c. Puget Sound Energy Hopkins Ridge Wind Project, Phase 1, Columbia County, Washington. Post-Construction Avian and Bat Monitoring, Second Annual Report: January - December, 2008. Prepared for Puget Sound Energy, Dayton, Washington, and the Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. May 20, 2009.

Young, D.P., Jr., M. Kauffman, M. Lout, and K. Bay. 2014a. 2013 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland. April - November 2013. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. February 18, 2014.

Young, D.P., Jr., M. Lout, Z. Courage, S. Nomani, and K. Bay. 2012a. 2011 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland: April - November 2011. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. April 20, 2012. Revised November 25, 2013.

Young, D.P., Jr., M. Lout, L. McManus, and K. Bay. 2014b. 2013 Post-Construction Monitoring Study, Beech Ridge Wind Energy Project, Greenbrier and Nicholas Counties, West Virginia. Final Report: April 1 - November 15, 2013. Prepared for Beech Ridge Energy, LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Burlington, Vermont. January 28, 2014.

Young, D.P., Jr., C. Nations, M. Lout, and K. Bay. 2013. 2012 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland. April - November 2012. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. January 15, 2013.

Young, D.P., Jr., S. Nomani, Z. Courage, and K. Bay. 2011a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: April - July 2011. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. August 29, 2011.

Young, D.P., Jr., S. Nomani, Z. Courage, and K. Bay. 2012b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2011. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 27, 2012.

Young, D.P., Jr., S. Nomani, W. Tidhar, and K. Bay. 2011b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2010. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 10, 2011.

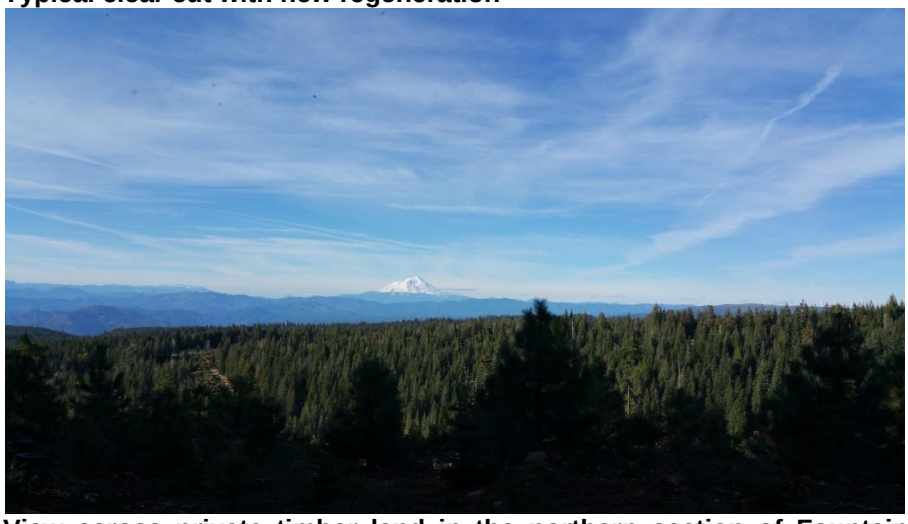
Zhang, J., J. Webster, R. F. Powers, and J. Mills. 2008. Reforestation after the Fountain Fire in Northern California: an Untold Success Story. Journal of Forestry 106:425–430.

Appendix A. Photographs Taken During the Preliminary Site Visit to the Fountain Wind Project in October 2016

Variable-aged stand structure found throughout the Fountain Wind Project

Regenerating stand with shrub cover and residual leave trees

Typical clear cut with new regeneration



View across private timber land in the northern section of Fountain Wind Project

Landscape view of uneven-aged stands within the Fountain Wind Project

Brushy riparian area within early- to mid-seral conifer stand

Appendix B. Citations for Table 8 for Publicly Available Fatality Reports from Wind Energy Facilities in North America that have Reported Bat Fatalities

Appendix B. Summary of publicly available studies at modern North American wind energy facilities that report fatality and species data for bats.

Data from the following sources:

Project, Location	Reference	Project, Location	Reference
Alite, CA (09-10)	Chatfield et al. 2010	Maple Ridge, NY (07-08)	Jain et al. 2009d
Alta Wind I, CA (11-12)	Chatfield et al. 2012	Maple Ridge, NY (12)	Tidhar et al. 2013a
Alta Wind I-V, CA (13-14)	Chatfield et al. 2014	Marengo I, WA (09-10)	URS Corporation 2010b
Alta Wind II-V, CA (11-12)	Chatfieldet al. 2012	Marengo II, WA (09-10)	URS Corporation 2010c
Alta VIII, CA (12-13)	Chatfield and Bay 2014	Mars Hill, ME (07)	Stantec 2008
Barton I & II, IA (10-11)	Derby et al. 2011a	Mars Hill, ME (08)	Stantec 2009a
Barton Chapel, TX (09-10)	WEST 2011	McBride, Alb (04)	Brown and Hamilton 2004
Beech Ridge, WV (12)	Tidhar et al. 2013b	Melancthon, Ont (Phase I; 07)	Stantec Ltd. 2008
Beech Ridge, WV (13)	Young et al. 2014b	Meyersdale, PA (04)	Arnett et al. 2005a
Big Blue, MN (13)	Fagen Engineering 2014	Milford I, UT (10-11)	Stantec 2011b
Big Blue, MN (14)	Fagen Engineering 2015	Milford I & II, UT (11-12)	Stantec 2012b
Big Horn, WA (06-07)	Kronner et al. 2008	Montezuma I, CA (11)	ICF International 2012
Big Smile, OK (12-13)	Derby et al. 2013b	Montezuma I, CA (12)	ICF International 2013
Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a	Montezuma II, CA (12-13)	Harvey & Associates 2013
Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Moraine II, MN (09)	Derby et al. 2010d
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011a	Mount Storm, WV (Fall 08)	Young et al. 2009b
Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012b	Mount Storm, WV (09)	Young et al. 2009a, 2010b
Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012a	Mount Storm, WV (10)	Young et al. 2010a, 2011b
Blue Sky Green Field, WI (08; 09)	Gruver et al. 2009	Mount Storm, WV (11)	Young et al. 2011a, 2012b
Buena Vista, CA (08-09)	Insignia Environmental 2009	Mountaineer, WV (03)	Kerns and Kerlinger 2004
Buffalo Gap I, TX (06)	Tierney 2007	Mountaineer, WV (04)	Arnett et al. 2005a
Buffalo Gap II, TX (07-08)	Tierney 2009	Munnsville, NY (08)	Stantec 2009b
Buffalo Mountain, TN (00-03)	Nicholson et al. 2005	Mustang Hills, CA (12-13)	Chatfield and Bay 2014
Buffalo Mountain, TN (05)	Fiedler et al. 2007	Nine Canyon, WA (02-03)	Erickson et al. 2003
Buffalo Ridge, MN (94-95)	Osborn et al. 1996, 2000	Nine Canyon II, WA (04)	Erickson et al. 2005
Buffalo Ridge, MN (00)	Krenz and McMillan 2000	Noble Altona, NY (10)	Jain et al. 2011b
Buffalo Ridge, MN (Phase I; 96)	Johnson et al. 2000	Noble Altona, NY (11)	Kerlinger et al. 2011b
Buffalo Ridge, MN (Phase I; 97)	Johnson et al. 2000	Noble Bliss, NY (08)	Jain et al.2009e
Buffalo Ridge, MN (Phase I; 98)	Johnson et al. 2000	Noble Bliss, NY (09)	Jain et al. 2010a
Buffalo Ridge, MN (Phase I; 99)	Johnson et al. 2000	Noble Bliss/Wethersfield, NY (11)	Kerlinger et al. 2011a
Buffalo Ridge, MN (Phase II; 98)	Johnson et al. 2000	Noble Chateaugay, NY (10)	Jain et al. 2011c
Buffalo Ridge, MN (Phase II; 99)	Johnson et al. 2000	Noble Clinton, NY (08)	Jain et al. 2009c
Buffalo Ridge, MN (Phase II; 01/Lake Benton I)	Johnson et al. 2004	Noble Clinton, NY (09)	Jain et al. 2010b
Buffalo Ridge, MN (Phase II; 02/Lake Benton I)	Johnson et al. 2004	Noble Ellenburg, NY (08)	Jain et al. 2009b
Buffalo Ridge, MN (Phase III; 99)	Johnson et al. 2000	Noble Ellenburg, NY (09)	Jain et al. 2010c
Buffalo Ridge, MN (Phase III; 01/Lake Benton II)	Johnson et al. 2004	Noble Wethersfield, NY (10)	Jain et al. 2011a
Buffalo Ridge, MN (Phase III; 02/Lake Benton II)	Johnson et al. 2004	NPPD Ainsworth, NE (06)	Derby et al. 2007
Buffalo Ridge I, SD (09-10)	Derby et al. 2010b	Oklahoma Wind Energy Center, OK (04; 05)	Piorkowski and O'Connell 2010
Buffalo Ridge II, SD (11-12)	Derby et al. 2012a	Pacific, CA (12-13)	Sapphos 2014
Casselman, PA (08)	Arnett et al. 2009	Palouse Wind, WA (12-13)	Stantec 2013a
Casselman, PA (09)	Arnett et al. 2010	Pebble Springs, OR (09-10)	Gritski and Kronner 2010b
Castle River, Alb. (01)	Brown and Hamilton 2006a	Pine Tree, CA (09-10)	BioResource Consultants 2010
Castle River, Alb. (02)	Brown and Hamilton 2006a	Pinnacle, WV (12)	Hein et al. 2013a
Cedar Ridge, WI (09)	BHE Environmental 2010	Pinnacle Operational Mitigation Study (12)	Hein et al. 2013b
Cedar Ridge, WI (10)	BHE Environmental 2011	Pinyon Pines I & II, CA (13-14)	Chatfield and Russo 2014
Cohocton/Dutch Hill, NY (09)	Stantec 2010	Pioneer Prairie I, IA (Phase II; 11-12)	Chodachek et al. 2012
Cohocton/Dutch Hills, NY (10)	Stantec 2011a	Pioneer Prairie II, IA (13)	Chodachek et al. 2014
Combine Hills, OR (Phase I; 04-05)	Young et al. 2006	Pioneer Trail, IL (12-13)	ARCADIS U.S. 2013
Combine Hills, OR (11)	Enz et al. 2012	Prairie Rose, MN (14)	Chodachek et al. 2015
Condon, OR	Fishman Ecological Services 2003	PrairieWinds ND1 (Minot), ND (10)	Derby et al. 2011c
Crescent Ridge, IL (05-06)	Kerlinger et al. 2007	PrairieWinds ND1 (Minot), ND (11)	Derby et al. 2012c
Criterion, MD (11)	Young et al. 2012a	PrairieWinds SD1 (Crow Lake), SD (11-12)	Derby et al. 2012d
Criterion, MD (12)	Young et al. 2013	PrairieWinds SD1 (Crow Lake), SD (12-13)	Derby et al. 2013a
Criterion, MD (13)	Young et al. 2014a	PrairieWinds SD1 (Crow Lake), SD (13-14)	Derby et al. 2014
Crystal Lake II, IA (09)	Derby et al. 2010a	Rail Splitter, IL (12-13)	Good et al. 2013b
Diablo Winds, CA (05-07)	WEST 2006, 2008	Record Hill, ME (12)	Stantec 2013b
Dillon, CA (08-09)	Chatfield et al. 2009	Record Hill, ME (14)	Stantec 2015
Dry Lake I, AZ (09-10)	Thompson et al. 2011	Red Canyon, TX (06-07)	Miller 2008
Dry Lake II, AZ (11-12)	Thompson and Bay 2012	Red Hills, OK (12-13)	Derby et al. 2013c
Elkhorn, OR (08)	Jeffrey et a. 2009b	Ripley, Ont (08)	Jacques Whitford 2009
Elkhorn, OR (10)	Enk et al. 2011b	Ripley, Ont (08-09)	Golder Associates 2010
Elm Creek, MN (09-10)	Derby et al. 2010c	Rollins, ME (12)	Stantec 2013c
Elm Creek II, MN (11-12)	Derby et al. 2012b	Rugby, ND (10-11)	Derby et al. 2011b
Foote Creek Rim, WY (Phase I; 99)	Young et al. 2003	Searsburg, VT (97)	Kerlinger 2002a
Foote Creek Rim, WY (Phase I; 00)	Young et al. 2003	Sheffield, VT (12)	Martin et al. 2013

Appendix B. Summary of publicly available studies at modern North American wind energy facilities that report fatality and species data for bats.

Data from the following sources:

Project, Location	Reference	Project, Location	Reference
Foote Creek Rim, WY (Phase I; 01-02)	Young et al. 2003	Sheffield Operational Mitigation Study (12)	Martinet al. 2013
Forward Energy Center, WI (08-10)	Grodsky and Drake 2011	Shiloh I, CA (06-09)	Kerlinger et al. 2009
Fowler I, IN (09)	Johnson et al. 2010a	Shiloh II, CA (09-10)	Kerlinger et al. 2010
Fowler III, IN (09)	Johnson et al. 2010b	Shiloh II, CA (10-11)	Kerlinger et al. 2013a
Fowler I, II, III, IN (10)	Good et al. 2011	Shiloh III, CA (12-13)	Kerlinger et al. 2013b
Fowler I, II, III, IN (11)	Good et al. 2012	SMUD Solano, CA (04-05)	Erickson and Sharp 2005
Fowler I, II, III, IN (12)	Good et al. 2013c	Solano III, CA (12-13)	AECOM 2013
Goodnoe, WA (09-10)	URS Corporation 2010a	Spruce Mountain, ME (12)	Tetra Tech 2013b
Grand Ridge I, IL (09-10)	Derby et al. 2010g	Stateline, OR/WA (01-02)	Erickson et al. 2004
Harrow, Ont (10)	Natural Resource Solutions 2011	Stateline, OR/WA (03)	Erickson et al. 2004
Harvest Wind, WA (10-12)	Downes and Gritski 2012a	Stateline, OR/WA (06)	Erickson et al. 2007
Hay Canyon, OR (09-10)	Gritski and Kronner 2010a	Steel Winds I, NY	Grehan 2008
Heritage Garden I, MI (12-14)	Kerlinger et al. 2014	Steel Winds I & II, NY (12)	Stantec 2013d
High Sheldon, NY (10)	Tidhar et al. 2012a	Stetson Mountain I, ME (09)	Stantec 2009c
High Sheldon, NY (11)	Tidhar et al. 2012b	Stetson Mountain I, ME (11)	Normandeau Associates 2011
High Winds, CA (03-04)	Kerlinger et al. 2006	Stetson Mountain I, ME (13)	Stantec 2014
High Winds, CA (04-05)	Kerlinger et al. 2006	Stetson Mountain II, ME (10)	Normandeau Associates 2010
Hopkins Ridge, WA (06)	Young et al. 2007	Stetson Mountain II, ME (12)	Stantec 2013e
Hopkins Ridge, WA (08)	Young et al. 2009c	Summerview, Alb (05-06)	Brown and Hamilton 2006b
Jersey Atlantic, NJ (08)	NJAS 2008a, 2008b, 2009	Summerview, Alb (06; 07)	Baerwald 2008
Judith Gap, MT (06-07)	TRC 2008	Top Crop I & II, IL (12-13)	Good et al. 2013a
Judith Gap, MT (09)	Poulton and Erickson 2010	Top of Iowa, IA (03)	Jain 2005
Kewaunee County, WI (99-01)	Howe et al. 2002	Top of Iowa, IA (04)	Jain 2005
Kibby, ME (11)	Stantec 2012a	Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010
Kittitas Valley, WA (11-12)	Stantec Consulting 2012	Vansycle, OR (99)	Erickson et al. 2000
Kittitas Valley, WA (12-13)	Stantec Consulting 2013	Vantage, WA (10-11)	Ventus Environmental Solutions 2012
Klondike, OR (02-03)	Johnson et al. 2003a	Vasco, CA (12-13)	Brown et al. 2013
Klondike II, OR (05-06)	NWC and WEST 2007	Wessington Springs, SD (09)	Derby et al. 2010f
Klondike III (Phase I), OR (07-09)	Gritski et al. 2010	Wessington Springs, SD (10)	Derby et al. 2011d
Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011	White Creek, WA (07-11)	Downes and Gritski 2012b
Lakefield Wind, MN (12)	Minnesota Public Utilities Commission (MPUC) 2012	Wild Horse, WA (07)	Erickson et al. 2008
Leaning Juniper, OR (06-08)	Gritski et al. 2008	Windy Flats, WA (10-11)	Enz et al. 2011
Lempster, NH (09)	Tidhar et al. 2010	Winnebago, IA (09-10)	Derby et al. 2010e
Lempster, NH (10)	Tidhar et al. 2011	Wolfe Island, Ont (May-June 09)	Stantec Ltd. 2010a
Linden Ranch, WA (10-11)	Enz and Bay 2011	Wolfe Island, Ont (July-December 09)	Stantec Ltd. 2010b
Locust Ridge, PA (Phase II; 09)	Arnett et al. 2011	Wolfe Island, Ont (January-June 10)	Stantec Ltd. 2011a
Locust Ridge, PA (Phase II; 10)	Arnett et al. 2011	Wolfe Island, Ont (July-December 10)	Stantec Ltd. 2011b
Madison, NY (01-02)	Kerlinger 2002b	Wolfe Island, Ont (January-June 11)	Stantec Ltd. 2011c
Maple Ridge, NY (06)	Jain et al. 2007	Wolfe Island, Ont (July-December 11)	Stantec Ltd. 2012
Maple Ridge, NY (07)	Jain et al. 2009a	Wolfe Island, Ont (January-June 12)	Stantec Ltd. 2014

Two Indiana bat fatalities are reported by USFWS (2010, 2011a), among other reports. Five additional Indiana bat fatalities have been reported (USFWS 2011b, 2012b, 2012c; Pruitt and Okajima 2014), but are not included in this list of public reports. One incidental long-eared bat (*Myotis evotis*) was recorded at Tehachapi, California (Anderson et al. 2004), but is not included in this list of public reports. Additional bat fatalities (evening bat, eastern red bat, hoary bat, tricolored bat, Mexican free-tailed bat, and unidentified bat) have been found in Texas (Hale and Karsten 2010), but the number of fatalities by species is not reported.

C2. Aquatic Resources Survey Report

Fountain Wind Energy Project

Aquatic Resources Survey Report

December 23, 2019

Prepared for:

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Acronyms and Abbreviations

ac	Acre
ºF	degrees Fahrenheit
ft	foot/feet
OHWM	ordinary high water mark
Project	Fountain Wind Project
Stantec	Stantec Consulting Services Inc.
USACE	United States Army Corps of Engineers

Executive Summary

On behalf of Fountain Wind LLC (Fountain Wind), Stantec Consulting Services Inc. (Stantec) conducted a delineation of potential waters of the United States including wetlands occurring in the 6,118.06-acre (ac) Fountain Wind Project survey area near the community of Montgomery Creek in Shasta County, California. The survey area includes the 4,000 ac project area plus appropriate buffers and also includes areas previously proposed for development under and earlier project iteration. The delineation was conducted in accordance with the *Corps of Engineers Wetlands Delineation Manual*[1] and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*[2]. A total of 51.900 acres (ac) of potential waters of the United States were mapped within the survey area and include fresh emergent wetland (0.967 ac, 156 linear feet [ft]), riparian wetland (26.808 ac), seasonal wetland (0.120 ac), vegetated ditch (0.174 ac, 2,432 linear ft), wetland meadow (8.714 ac), wetland seep/spring (1.809 ac), ephemeral stream (0.559 ac, 10,224.323 linear ft), intermittent stream (2.861 ac, 24,900 linear ft), non-vegetated ditch (0.239 ac, 4,975 linear ft), perennial stream (9.468 ac, 30,495.398 linear ft), and pond (0.181 ac).

This delineation documents and describes aquatic features and wetlands occurring within the project survey area that may be waters of the United States. The report provides sufficient information that may be used to support a Preliminary Jurisdictional Determination from the United States Army Corps of Engineers (USACE), which would be subject to verification by USACE, Sacramento District. Stantec advises all parties to treat the information contained herein as preliminary until USACE provides written verification of the boundaries of its jurisdiction.

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[1] Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Technical Report Y-87-1.
[2] United States Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).

1.0 INTRODUCTION

Fountain Wind LLC, is proposing to construct and operate the Fountain Wind Project (project), an industrial-scale renewable energy generation facility to be located in Shasta County, California (Figure 1). The project would consist of up to 72 wind turbines and associated facilities, including wind measurement towers, an electrical collection system, access roads, construction staging areas, an operations and maintenance facility, and a transmission interconnection and associated point of interconnection. The project would have a nameplate capacity of up to 216 megawatts.

Wind turbines would be installed on land owned and managed by Shasta Cascade Timberlands, LLC. Proposed turbine locations are situated east of Round Mountain, in Shasta County, California (Figure 1).

Stantec conducted a delineation of aquatic resources to support project permitting. This Aquatic Resources Survey Report summarizes the methods and results of Stantec's survey of potentially jurisdictional waters.

The survey area encompasses a total of 6,118.06 acres (ac) within a project area encompassing approximately 29,500 acres (Figure 1). It includes a 700-foot (ft) radius centered on proposed turbine locations, a 200- to 400-ft corridor centered on project roads, a 300-ft corridor centered on the electrical collection line, a 200-ft buffer around proposed project facilities, and a 100-ft buffer around proposed construction staging areas.

The delineation comprised three surveys efforts: the first in 2017, the second in 2018, and the third in 2019. The initial survey effort was conducted between October and December 2017 and was focused on tower locations, access roads, construction staging areas, and an operations and maintenance facility for a prior project iteration. The second survey effort was conducted in August 2018 and was focused on the electrical collection line, a transmission interconnection and associated point of interconnection, additional staging areas, and expanded buffers around some areas surveyed during 2017. The third survey effort conducted in October 2019 was focused on several modifications to the project site plan and expanded buffers around various project components. The 2017, 2018, and 2019 surveys provide a comprehensive survey of the project site, including the most current site plan and associated survey buffers (Figure 1-3).

2.0 ENVIRONMENTAL SETTING

The survey area is within coniferous forest habitat near the southern end of the Cascade Range, between two volcanoes: Lassen Peak and Mount Shasta. The area's climate is characterized as Mediterranean with moderate winters and hot, dry summers. Based on data collected from the National Oceanic and Atmospheric Administration Western Regional Climate Center Applied Climate Information System Buckhorn station, precipitation occurs as rain and snow within the survey area. The average annual precipitation is approximately 68 inches with an average annual snowfall of 70 inches (Western Regional Climate Center 2019). Air temperatures range between an average January high of 58 degrees Fahrenheit (ºF), and an average July high of 99ºF. The annual average high is

approximately 101ºF (Western Regional Climate Center 2019). The growing season (i.e., 50% probability of air temperature 28ºF or higher) in the study area is approximately 120 days and occurs between May and September.

The project would be built on privately owned and managed lands in rural, unincorporated Shasta County, 3 miles east of Montgomery Creek, 7 miles west of Burney, and 28 miles northeast of Redding. The survey area is accessible from Highway 299 west of Hatchet Peak and is in the quadrangles, townships, ranges, and sections shown in Table 1. The project would be located to the west and south of the existing Hatchet Ridge Wind Farm, along several ridgelines and peaks.

Table 1. Survey Area Locations

Quadrangle(s)	Township	Range	Section(s)
Hatchet Mountain Pass Miller Mountain	33 North	1 East	3
Hatchet Mountain Pass Montgomery Creek	34 North	1 East	1–4, 8, 10–17, 20–28, 33–36
Hatchet Mountain Pass	34 North	2 East	5–8, 18
Chalk Mountain Hatchet Mountain Pass Roaring Creek	35 North	1 East	8–10, 13–15, 21–28, 33–36
Hatchet Mountain Pass	35 North	2 East	29–32

The survey area consists primarily of managed timberlands. Approximately half the survey area is within the boundary of the area burned in the 1992 Fountain Fire. The portion of the survey area that is within the fire boundary is predominantly ponderosa pine (*Pinus ponderosa*) forest, while the remaining survey area is predominantly mixed conifer forest. There are grassland, hardwood, and chaparral inclusions scattered throughout the survey area. In addition to timber production, a few areas are managed for cattle grazing.

2.1 TOPOGRAPHY AND HYDROLOGY

The survey area is in the Sacramento River Basin (Central Valley Region), which covers 17.42 million ac and includes the entire Sacramento River watershed. The Sacramento River Basin is divided into 24 hydrologic units and is further divided into hydrologic areas and hydrologic subareas. The survey area is located within two hydrological units: Whitmore and Pit River (Table 2). Each of the hydrologic units within the survey area ultimately flow west to the Sacramento River. The survey area crosses numerous unnamed drainages and wetlands as well as several named drainages, including Richardson Creek, Little Hatchet Creek, Hatchet Creek, Carberry Creek, Goat Creek, North Fork Montgomery Creek, Indian Spring, South Fork Montgomery Creek, Cedar Creek, North Fork Little Cow Creek, Little Cow Creek, and Mill Creek. Hydrology for these features is provided by sheet flow, snow melt, seeps, springs, and groundwater. Several of the streams provide hydrology that supports adjacent riparian wetlands.

Table 2. Hydrologic Units, Areas, and Subareas within the Survey Area

Hydrological Units	Hydrological Areas	Hydrological Subareas
526.00 Pit River	526.10 Lower Pit River	26.13 Montgomery Creek 26.14 Hatchet Creek
507.00 Whitmore	507.30 Cow Creek	07.33 Little Cow Creek

Source: Water Quality Control Plan for the Central Valley Region (RWQCB 2018)

Topography within the survey area varies widely from gently sloping mountain meadows to steep hillsides and drainages. The survey area occurs between 3,550 and 6,300 ft in elevation. Named topographical features occurring in the survey area include Carberry Flat, Carberry Mountain, Fauries Peak, Fuller Flat, Fuller Mountain, Lookout Mountain, and Sanders Ridge.

2.2 VEGETATION COMMUNITIES

Stantec biologists classified vegetation communities within the survey area during the aquatic resources survey. Vegetation communities are based on descriptions provided in *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988) and are as follows:

Barren. Barren occurs as dirt and paved roads and their associated road shoulders. Vegetation is usually not present, although sparse cover of grasses and forbs or weedy species occasionally occurs on road shoulders or infrequently used roads.

Fresh Emergent Wetland. Fresh emergent wetland occurs in a seasonally inundated pond and within a few low gradient streams in the survey area. Plant species observed in fresh emergent wetlands include common tule (*Schoenoplectus acutus*), Rocky Mountain pond-lily (*Nuphar polysepala*), reed canary grass (*Phalaris arundinacea*), smartweed (*Persicaria* sp.), small fruited bulrush (*Scirpus microcarpus*), and American brooklime (*Veronica americana*).

Lodgepole Pine. Lodgepole pine occurs at higher elevations within the survey area. The lodgepole pine vegetation community is bordered by and interspersed among the wet meadow vegetation community at the headwaters of the North Fork of Montgomery Creek. Lodgepole pine (*Pinus contorta*) is the dominant overstory species, while understory species include cascara (*Frangula purshiana*), western blueberry (*Vaccinium uliginosum*), Douglas spiraea (*Spiraea douglasii*), California oat grass (*Danthonia californica*), tufted hair grass (*Deschampsia cespitosa*), and Bigelow's sneezeweed (*Helenium bigelovii*).

Montane Hardwood. Montane hardwood occurs on a hillside west of Carberry Flat. The dominant overstory species is California black oak (*Quercus kelloggii*). The understory consists of a moderate canopy of deer brush (*Ceanothus integerrimus*) and snowberry (*Symphoricarpos albus*), with a sparse herbaceous layer of Pacific starflower (*Lysimachia latifolia*).

Montane Chaparral. Montane chaparral occurs at a few locations throughout the survey area, including at the highest elevations in the southeastern portion of the survey area. It is composed of a dense shrub layer and borders woodlands or forest. Shrub species present include of Brewer's oak (*Quercus garryana*), green leaf manzanita (*Arctostaphylos patula*), dear brush, and other manzanita (*Arctostaphylos* spp.) and ceanothus (*Ceanothus* spp.) species. The herbaceous layer is poorly developed.

Montane Riparian. The montane riparian community occurs adjacent to streams and ponds and around some seep springs in the survey area. Many of the riparian areas are dominated by shrubs, including arroyo willow (*Salix lasiolepis*), Pacific willow (*Salix lasiandra*), Scouler's willow (*Salix scouleriana*), vine maple (*Acer circinatum*), and mountain alder (*Alnus incana*). Some of the larger streams also support tree species, including white alder (*Alnus rhombifolia*), Oregon ash (*Fraxinus latifolia*), and big-leaf maple (*Acer macrophyllum*). Other shrubs include American

dogwood (*Cornus sericea*), wild rose (*Rosa* sp.), and Himalayan blackberry (*Rubus armeniacus*). Herbaceous species include sedges (*Carex* sp.), western lady fern (*Athyrium filix-femina*), cow parsnip (*Heracleum maximum*), horsetail (*Equisetum* spp.), hedge nettle (*Stachys ajugoides*), creeping wild ginger (*Asarum caudatum*), stream violet (*Viola glabella*), western columbine (*Aquilegia formosa*), California tiger lily (*Lilium pardalinum*), and ridged manna grass (*Glyceria striata*).

Perennial Grassland. Perennial grasslands occur around Carberry Flat. The herbaceous layer is dominant and includes meadow foxtail (*Alopecurus pratensis*), Kentucky blue grass (*Poa pratensis*), blue wild-rye (*Elymus glaucus*), common velvet grass (*Holcus lanatus*), gumweed (*Grindelia* sp.), sticky cinquefoil (*Drymocallis glandulosa*), and common yarrow (*Achillea millefolium*).

Ponderosa Pine. Ponderosa pine occurs in the northern portion of the survey area in plantations established after the Fountain Fire in 1992. These stands are dense, with ponderosa pine dominating the overstory canopy. However, there is some natural regeneration of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), and California black oak. The understory layer varies from dense shrubs including manzanita (*Arctostaphylos* spp.), ceanothus (*Ceanothus* spp.), mountain dogwood (*Cornus nuttallii*), bush chinquapin (*Chrysolepis sempervirens*), Oregon boxwood (*Paxistima myrsinites*), thimbleberry (*Rubus parviflorus*), and bitter cherry (*Prunus emarginata*) to sparse grasses and forbs including blue wild-rye, Pacific starflower, fireweed (*Chamerion angustifolium*), and bracken fern (*Pteridium aquilinum*).

Riverine. Riverine vegetation occurs in the larger streams and is dominated by run and riffle areas with boulder, cobble, gravel, and sand substrates. Vegetation within the active river channel is sparse with occasional clumps of sedges.

Sierran Mixed Conifer. Sierran mixed conifer occurs throughout the unburned southern portion of the survey area. Dominant conifers include ponderosa pine, Douglas-fir, white fir, incense-cedar, and sugar pine (*Pinus lambertiana*). A few deciduous trees occur irregularly among the conifers, including California black oak and big-leaf maple. The understory varies greatly from dense stands with little understory to more open stands supporting many of the same understory species listed under the ponderosa pine vegetation community

Wet Meadow. Wet meadows occur in gently sloping areas adjacent to lodgepole pine and perennial grassland vegetation communities. They also occur as openings on seepy hillsides surrounded by Sierran mixed conifer or ponderosa pine forest, interspersed with montane riparian vegetation. Herbaceous vegetation dominates wetland meadows, including big-leaf sedge (*Carex amplifolia*), rushes (*Juncus* spp.), spearmint (*Mentha spicata*), tundra aster (*Oreostemma alpigenum*), western mountain aster (*Symphyotrichum spathulatum*), white-flowered bog-orchid (*Platanthera dilatata*), giant checkerbloom (*Sidalcea gigantea*), narrow leaved lotus (*Hosackia oblongifolia*), three petaled bedstraw (*Galium trifidum*), pull-up muhly (*Muhlenbergia filiformis*), seep monkey flower (*Mimulus guttatus*), tufted hair grass, and cultivated timothy (*Phleum pratense*).

2.3 SOIL

Shasta County spans five geologic provinces: the Klamath Range, Coast Range, Great Valley, Cascade Range, and Modoc Plateau. The survey area is in the Cascade Range Province within the Cohasset-Windy-McCarthy soil association. This soil association is composed of gently sloping to steep soils underlain by volcanic rock (Soil Conservation Service and Forest Service 1974). The U.S. Department of Agriculture Natural Resources Conservation

Service has mapped 27 soil map units within the survey area (NRCS 2019) (Table 3, Figure 2). Two of the soil map units are rated as hydric, while the remaining 25 are not hydric and do not have any hydric components.

Table 3. Soil Map Units Within the Survey Area

Map Unit Symbol	Map Unit Name	Hydric Rating Status
Cohasset-McCarthy complex, 0 to 30 percent slopes	CrD	N
Cohasset-McCarthy complex, 30 to 50 percent slopes	CrE	N
Cohasset-McCarthy complex, 50 to 70 percent slopes	CrG	N
Cohasset loam, 0 to 30 percent slopes	ClD	N
Cohasset stony loam, 0 to 30 percent slopes	CmD	N
Cohasset stony loam, 10 to 50 percent slopes	CmE	N
Cohasset very stony loam, moderately deep, 8 to 50 percent slopes	CoE	N
Colluvial land	CsF	N
Gardens-Jacksback complex, 0 to 2 percent slopes	169, 169im	Y
Gasper-Scarface complex, moist, 2 to 15 percent slopes	172, 172im	N
Gasper-Scarface complex, moist, 15 to 30 percent slopes	173, 173im	N
Gasper-Scarface complex, moist, 30 to 50 percent slopes	174, 174im	N
Goulder gravelly sandy loam, 15 to 30 percent slopes	179, 179im	N
Jacksback loam, 2 to 9 percent slopes	190, 190im	Y
Lyonsville-Jiggs complex, deep, 10 to 50 percent slopes	LhE	N
Lyonsville-Jiggs soils, 50 to 70 percent slopes	LkF	N
Nanny gravelly sandy loam, 0 to 8 percent slopes	NaB	N
Nanny stony sandy loam, 0 to 8 percent slopes	NbB	N
Obie-Mounthat complex, 5 to 15 percent slopes	266, 266im	N
Obie-Mounthat complex, 30 to 50 percent slopes	268, 268im	N
Rubbleland	RyF	N
Stukel complex, 15 to 30 percent slopes	316	N
Toomes very rocky loam, 0 to 50 percent slopes	TcE	N
Windy and McCarthy stony sandy loams, 0 to 30 percent slopes	WeD	N
Windy and McCarthy very rocky sandy loams, 8 to 50 percent slopes	WgE	N
Windy and McCarthy very stony sandy loams, 30 to 50 percent slopes	WfE	N
Windy and McCarthy very stony sandy loams, 50 to 75 percent slopes	WfG	N

Source: Natural Resources Conservation Service. 2019. USDA Web Soil Survey. Available: http://websoilsurvey.nrcs.usda.gov. Accessed October 2019.

3.0 METHODS

The delineation reflects three phases of work: desktop review, field assessment, and classification. Each is described below.

3.1 DESKTOP REVIEW

Prior to conducting fieldwork, Stantec biologists reviewed the following resources:

- U.S. Fish and Wildlife Service National Wetland Inventory (USFWS 2019);
- Google Earth aerial imagery dating back to 1984;
- U.S. Geological Survey 7.5-minute topographic maps (USGS 1990a,b,c; 1995a,b); and
- U.S. Geological Survey National Hydrography Dataset (USGS 2019)

These resources were used to identify potential aquatic features based on changes in vegetation, topographic changes, or visible drainage patterns. Prior to field surveys, potential features were digitized into a working field map that was then used as a reference during field surveys.

3.2 AQUATIC RESOURCES FIELD ASSESSMENT

The aquatic resources field survey was conducted between October 10, 2017, and August 30, 2018, by the following Stantec biologists:

- John Holson
- Allison Loveless
- Andrew Sorci
- Gabe Youngblood

The 2019 field survey was conducted between October 14 and 18, 2019, by the following Stantec biologists:

- John Holson
- Sheryl Creer
- Cristian Singer
- Brendan Cohen
- Sara Cortez

The qualifications of these biologists are provided in Appendix E.

3.2.1 Wetlands

Stantec biologists delineated potential wetlands and classified them into different types based on function, hydrological source/regime, topography, plant species composition, and origin (i.e., natural vs. man-made). Stantec conducted an on-site routine delineation of wetlands of the United States based on field observations of positive indicators for wetland vegetation, hydrology, and soils. The routine delineation includes establishing sample points and investigating three parameters at each point to determine and document the wetland-upland boundary. This methodology is consistent with the approach outlined in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation*

Manual: Western Mountains Valleys and Coast (USACE 2010). At least one set of data points was selected to best represent the wetland feature type and the adjacent uplands. Data points were also placed in suspect areas to confirm wetland or upland status.

Wetland boundaries were determined by following a combination of the limits of hydrophytic vegetation, limits of observed wetland hydrology, topographic breaks, and aerial ortho-photo interpretation. Sample pits and wetland boundaries were mapped using a sub-meter-accurate Bad Elf™ Global Positioning Service Unit paired with Collector for ArcGIS™. All spatial data was collected in the World Geodetic System (WGS84) datum. Representative photographs were also taken of sample points and features (Appendix D). All potential wetland areas were evaluated to identify their connection to onsite and offsite hydrologic resources, and all potentially jurisdictional wetland areas were mapped if they met all three USACE-required parameters.

Plant taxonomy follows the Jepson Flora Project (2019). Wetland indicator status for plant species was confirmed with *The National Wetland Plant List* (Lichvar et al. 2016). Soil pits were excavated in representative wetland features to a depth sufficient to document the presence or confirm the absence of hydric soil or wetland hydrology indicators. Positive indicators of hydric soils were observed in the field following the criteria outlined in *Field Indicators of Hydric Soils in the United States* (Vasilas et al. 2017). Soil hue and chroma were determined using a Munsell® soil color chart. The hydric status of each soil map unit occurring in the survey area was reviewed using the Web Soil Survey (NRCS 2019). Stantec biologists used the Cowardin et al. (1979) system, as amended by subsequent updates (Federal Geographic Data Committee 2013) to assign all features a Cowardin type.

3.2.2 Other Waters

Stantec biologists delineated non-wetland features and classified them into different types based on function, hydrological source/regime, and origin (i.e., natural vs. man-made). These features were designated “other waters” of the United States and were delineated based on indicators of an ordinary high water mark (OHWM) and bed and banks. The OHWM was determined using the approach outlined in *A Guide to Ordinary High Water Mark (OHWM) Delineation for Non-Perennial Streams in the Western Mountains, Valleys, and Coast Region of the United States* (USACE 2014). Other waters are jurisdictional either (1) by rule or (2) because they have a significant nexus to a traditional navigable water (TNW), interstate water, territorial sea, or impoundment of a water of the U.S. Waters jurisdictional by rule are defined as (1) a TNW, interstate water, territorial sea, or impoundment of a water of the U.S. or (2) a tributary to or adjacent to a interstate water, territorial sea, or impoundment of a water of the U.S. (33 CFR 328.4). Delineation and potential jurisdiction of other waters was based guidance in USACE regulations (33 CFR 328.3 and 33 CFR 328.4). Physical characteristics of an OHWM include, but are not limited to, the following conditions: a natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, presence of litter and debris, leaf litter disturbed or washed away, scour, deposition, presence of bed and bank, and water staining. Either a data point was selected to best represent the OHWM of other waters or attributes were averaged along the length of the feature within the survey area.

A custom data dictionary in Collector was used to ensure consistent data collection in the field, and all spatial data was collected in the WGS84 datum. The following attributes were collected or measured for each mapped drainage: average OHWM width and depth, average top-of-bank width and depth, hydrologic regime, OHWM indicators, substrate below OHWM, substrate above OHWM and depth of water (if present). Representative photographs of features were also taken (Appendix D). In some instances, culverts or drainages were obscured by thick brush or inaccessible due to steep terrain. In these cases, full-color aerial imagery and/or topographic maps were used to

assist mapping the jurisdictional features. All potentially jurisdictional drainages with primary or secondary indicators of OHWM and bed and bank were mapped and assumed to have either connectivity in some capacity (subsurface, adjacent, etc.) or a significant nexus with traditionally navigable waters as defined by the Clean Water Rule. Stantec biologists used the Cowardin et al. (1979) system, as amended by subsequent updates (Federal Geographic Data Committee 2013) to assign all features a Cowardin type.

3.2.3 Data Points and Delineation Map

Seventy-eight 3-parameter data points were used to characterize and document each wetland and the adjacent upland or other water feature type. The boundaries of delineated features and the associated data points were mapped using a Trimble Mapping Grade Global Positioning System (GPS) capable of sub-foot accuracy. Where the use of the GPS was not practicable, or satellites were not available, the features were delineated utilizing ortho-rectified color aerial photographs. The GPS and hand-drawn location data were overlaid onto an aerial photograph of the survey area to develop the delineation map.

4.0 RESULTS

Stantec biologists mapped 38.592 ac of wetlands and 13.311 ac (70,595.54 linear ft) of other waters (Appendix A). A summary of the delineated features is presented in Table 4, routine wetland determination data forms are presented in Appendix B, a plant list is provided in Appendix C, and representative photographs of the delineated features and data point locations are presented in Appendix D.

Table 4. Summary of Potentially Jurisdictional Aquatic Resources within the Survey Area

Feature Type	Acres	Linear Feet	Cowardin Code[1]
Wetlands			
Fresh Emergent Wetland	0.967	156[2]	PEM
Riparian Wetland	26.808	N/A	PSS, PFO
Seasonal Wetland	0.120	N/A	PEM
Vegetated Ditch	0.174	2,432	PEM
Wetland Meadow	8.714	N/A	PEM, PSS, PFO
Wetland Seep/Spring	1.809	N/A	PEM, PSS
Subtotal – Wetlands	**38.592**	**2,588**	
Other Waters			
Ephemeral Stream	0.559	10,224	R4SB
Intermittent Stream	2.861	24,900	R4SB
Non-vegetated Ditch	0.239	4,975	R4
Perennial Stream	9.468	30,495	R3UB
Pond	0.181	N/A	PUB
Subtotal – Other waters	**13.311**	**70,595**	
Total Jurisdictional Area	**51.900**	**73,183**	

[1] PEM = palustrine emergent, PSS = palustrine scrub-shrub, PFO = palustrine forested, R4SB = riverine intermittent streambed, R4 = Riverine intermittent, R3UB = riverine upper perennial unconsolidated bottom, PUB = palustrine unconsolidated bottom. Codes based on Cowardin et al. 1979.

[2] Linear distance for stream segments mapped as fresh emergent wetlands.

4.1 WETLANDS

Stantec biologists mapped 206 wetlands and classified them into 1 of 6 wetland types: fresh emergent wetland, riparian wetland, seasonal wetland, vegetated ditch, wetland meadow, and wetland seep/spring. In total, Stantec biologists examined and mapped 5 fresh emergent wetlands, 134 riparian wetlands, 5 seasonal wetlands, 12 vegetated ditches, 17 wetland meadows and 33 wetland seep/springs within the survey area. They also categorized mapped wetlands into 1 of 3 Cowardin classifications: palustrine emergent, palustrine forested, and palustrine scrub-shrub habitats (Figure 3).

4.1.1 Vegetation

Fresh Emergent Wetland

Fresh emergent wetlands occur infrequently throughout the survey area. They are associated with ponded depressions and low gradient vegetated portions of perennial stream channels. Vegetation found in fresh emergent wetlands includes American brooklime (OBL[3]), marsh purslane (*Ludwigia palustris*, OBL), common tule (OBL), Rocky Mountain pond-lily (OBL), and ridged manna grass (OBL).

Riparian Wetland

Riparian wetlands are the most common wetland type in the survey area. They are most often associated with intermittent or perennial drainages. Riparian wetlands in the survey area consist of tree- or shrub-dominated features. Dominant species within the survey area include white alder (FACW), Oregon ash (FACW), mountain alder (FACW), American dogwood (FACW), and Pacific willow (FACW). An herbaceous understory is often present and includes ridged manna grass (OBL), reed canary grass (FACW), hedge nettle (OBL), western lady fern (FAC), horsetail (*Equisetum* spp., FAC-OBL), stream violet (FACW), California tiger lily (FACW), and cow parsnip (FAC).

Seasonal Wetland

Seasonal wetlands occur infrequently in the survey area in a variety of landscape positions from shallow depressions to hillslopes. Seasonal wetlands are typically dominated by herbaceous vegetation that dies back during the dry season. Species present in seasonal wetlands include annual hair grass (*Deschampsia danthonioides*, FACW), Baltic rush (*Juncus balticus*, FACW), needle spikerush (*Eleocharis acicularis*, OBL), white brodiaea (*Triteleia hyacinthine*, FAC), and needleleaf navarretia (*Navarretia intertexta*, FACW).

[3] FAC = facultative. FACU = facultative upland, FACW = facultative wetland, OBL = obligate, UPL = upland. Status based on Lichvar, R. W., D. L. Banks, W. N. Kirchner, and N. C. Melvin. 2016. The National Wetland Plant List: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X.

Vegetated Ditch

Vegetated ditches are man-made ditches that support a hydrologic regime sufficient to support hydrophytic vegetation. Vegetated ditches in the survey area typically convey water from perennial streams to areas outside the survey area for agricultural use. Herbaceous vegetation dominates these features including small fruited bulrush (OBL), western mountain aster (FAC), and big-leaf sedge (OBL).

Wetland Meadow

The wetland meadow classification is used for low gradient features in the survey area. Wetland meadows are dominated by herbaceous vegetation, including lamp rush (*Juncus effusus*, FACW), spearmint (FACW), big-leaf sedge (OBL), southern beaked sedge (*Carex utriculata*, OBL), white-flowered bog-orchid (FACW), Bigelow's sneezeweed (FACW), tufted hair grass (FACW), western mountain aster (FAC), long-stalked clover (FAC), and California oat grass (FAC). Wetland meadows at the headwaters of the North Fork of Montgomery Creek also support trees and shrubs, including lodgepole pine (FAC), Douglas spiraea (FACW), cascara (FAC), and western blueberry (FACW).

Wetland Seep/Spring

Wetland seep/springs occur as large, seepy hillsides or smaller seeps associated with road cuts. Herbaceous vegetation dominates these features, although hillside seeps often have shrubs or trees scattered throughout the wetland. Species observed in seep spring wetlands include white alder, mountain alder, Pacific yew (*Taxus brevifolia*, FAC), vine maple (FAC), Pacific willow (FACW), arroyo willow (FACW), pull-up muhly (FACW), giant checkerbloom (UPL), California tiger lily (FACW), narrow-leaved lotus (OBL), western mountain aster (FAC), seep monkey flower (OBL), Tinker's penny (*Hypericum anagalloides*, OBL), grayswamp whiteheads (*Sphenosciadium capitellatum*, FACW), and feathery false lily of the valley (*Maianthemum racemosum,* FAC).

4.1.2 Soils

Stantec biologists examined soils at wetland and upland data points. Several hydric soil indicators were observed in soil samples, including Histosol (A1), Histic Epipedon (A2), Hydrogen Sulfide (A4), Sandy Mucky Mineral (S1), Sandy Redox (S5), Loamy Mucky Mineral (F1), Loamy Gleyed Matrix (F2), Depleted Matrix (F3), Redox Dark Surface (F6), and Depleted Dark Surface (F7). Stantec documented problematic hydric soils in riparian wetlands, a seasonal wetland, a wetland meadow, and a vegetated ditch. Problematic soils in riparian wetlands were associated with vegetated gravel bars where indicators of hydric soils are often absent due to deposition of new soil material, low iron and manganese levels, and lack of organic content. The only seasonal wetland with problematic hydric soils occurred on a hillslope with shallow soils over bedrock. Soils in the vegetated ditch were inundated at the time of the survey and the feature was dominated by obligate hydrophytic vegetation. The vegetated ditch in question appears to be inundated perennially based on historical imagery. The wetland meadow with problematic hydric soils was inundated at the time of the survey and exhibited a positive reaction to alpha-alpha-Dipyridyl, indicating a presence of ferrous (Fe^{++}) iron. In addition, Stantec observed and documented dominant hydrophytic vegetation and indicators of wetland hydrology at four locations where problematic hydric soils were observed in wetland determinations.

4.1.3 Hydrology

Stantec biologists evaluated wetland hydrology at all established data points. Several primary indicators of wetland hydrology were observed within wetlands, including surface water (A1), high water table (A2), saturation (A3), water marks (B1), sediment deposits (B2), drift deposits (B3), algal mat or crust (B4), inundation visible on aerial imagery (B7), water stained leaves (B9), hydrogen sulfide odor (C1), oxidized rhizospheres (C3), and saturation visible on aerial imagery (C9). Stantec biologists also observed secondary indicators of wetland hydrology including drainage patterns (B10), geomorphic position (D2), and FAC-neutral test (D5).

4.2 OTHER WATERS

Stantec biologists mapped a total of 284 features designated “other waters” and classified them into 1 of 5 other waters types: ephemeral stream, intermittent stream, non-vegetated ditch, perennial stream, and pond. In total, Stantec biologists examined and mapped 41 ephemeral streams, 110 intermittent streams, 21 non-vegetated ditches, 109 perennial stream segments, and 3 ponds within the survey area. They also categorized other waters into one of four Cowardin classifications: riverine intermittent streambed, riverine intermittent, riverine upper perennial unconsolidated bottom, and palustrine unconsolidated bottom habitats (Figure 3).

4.2.1 Ephemeral Stream

Ephemeral streams exhibit indicators of scour and deposition, minor drift lines, and sediment deposits, but lack indication of a ground water component. Hydrology is provided by sheet flow during precipitation events. The poorly defined hydrology indicators, proximity to the headwaters, and small sizes of the ephemeral streams indicate short duration flow and lack of a groundwater component. Stantec biologists mapped 41 ephemeral stream segments within the survey area, which range from 1 to 6 ft wide. The streambed is devoid of vegetation and exhibit dominant substrates of soil, rock, and gravel. Drift deposits were the most commonly observed OHWM indicator in ephemeral streams.

4.2.2 Intermittent Stream

Intermittent streams flow seasonally but are fed by a groundwater component in addition to precipitation and sheet flow from adjacent slopes. Stantec biologists mapped 110 intermittent stream segments within the survey area. They are characterized as bed and bank features that exhibit indicators of scour, deposition, watermarks, and drift lines. Intermittent streams range from 1 to 20 ft wide and some support adjacent riparian wetlands. Rock, gravel, and soil are the dominant stream substrates. A few of the intermittent stream segments are named streams, including Richardson Creek and the upper reaches of Little Hatchet Creek.

4.2.3 Perennial Stream

Perennial streams are characterized by year-round surface water. Stantec biologists mapped 109 perennial stream segments within the survey area. They are characterized as features with bed and bank that exhibit indicators of scour, deposition, watermarks, and drift lines. Stream widths vary between 2 and 90 ft, and several of the perennial streams support adjacent riparian wetlands. Cobble, gravel, and sand are the dominant substrates in perennial streams. Several of the perennial stream segments are named streams, including Hatchet Creek, the lower reaches

of Little Hatchet Creek, Carberry Creek, Goat Creek, the North and South Forks of Montgomery Creek, North Fork of Cedar Creek, the North Fork of Little Cow Creek, Little Cow Creek, and Mill Creek.

4.2.4 Non-Vegetated Ditch

Non-vegetated ditches are man-made ditches that do not support hydrophytic vegetation, have OHWM and bed and bank, and are connected to a wetland or other water. There were two types of non-vegetated ditches in the survey area: roadside ditches that convey runoff from adjacent roads to wetlands or other waters, and irrigation ditches that convey water from streams or vegetated ditches. Stantec biologists mapped 21 non-vegetated ditch segments within the survey area, which range from 1 to 8 ft wide. Soil, rock, and gravel are the dominant substrates in non-vegetated ditches.

4.2.5 Pond

Ponds in the survey area are constructed features either with a seasonally high water table or created by pooling water adjacent to natural springs. Stantec biologists mapped three ponds in the survey area. They occur adjacent to fresh emergent wetlands or wetland seep/springs but lack the vegetation component required to qualify as wetlands. Ponds were either fully inundated at the time of the survey or the ordinary high water mark was delineated based on drift deposits and inundation visible on historical imagery.

4.3 NEGATIVE OBSERVATIONS

There were some areas where existing data (i.e., National Wetland Inventory and National Hydrography Dataset) indicated features were present (e.g., headwaters of streams), but no evidence of overland flow or indicators of wetlands were observed during the field examination. No features were mapped at these locations and because there was no physical evidence of any wetland or other waters feature, no data was taken at these locations.

5.0 CONCLUSION

Potential waters of the United States, including wetlands, delineated within the survey area occupy a total of 51.900 ac in the survey area and include fresh emergent wetland (0.967 ac, 156 linear ft), riparian wetland (26.808 ac), seasonal wetland (0.120 ac), vegetated ditch (0.174 ac, 2,432 ft), wetland meadow (8.714 ac), wetland seep/spring (1.809 ac), ephemeral stream (0.559 ac, 10,224 linear ft), intermittent stream (2.784 ac, 24,900 linear ft), non-vegetated ditch (0.239 ac, 4,975 linear ft), perennial stream (9.468 ac, 30,495 linear ft), and pond (0.181 ac).

Determinations of waters of the United States, including wetlands, are based on current conditions, (i.e., normal circumstances) and made in accordance with June 2015t U.S. Environmental Protection Agency and USACE guidance (33 CFR 328). Determinations may be subject to verification by the USACE. Stantec advises all interested parties to treat the information contained herein as preliminary as written verification of jurisdictional boundaries by USACE may be required.

6.0 REFERENCES

Cowardin, L.M., V. Carter V., F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service Report No. FWS/OBS/-79/31.Washington, D.C.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Technical Report Y-87-1.

Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.

Jepson Flora Project. 2019. Jepson eFlora. http://ucjeps.berkeley.edu/eflora/. Accessed October 2019.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. The National Wetland Plant List: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X.

Mayer and Laudenslayer. 1988. A Guide to Wildlife Habitats of California. 1988. State of California, Resources Agency, Department of Fish and Wildlife. Sacramento, CA.

Natural Resources Conservation Service (NRCS). 2019. USDA Web Soil Survey. http://websoilsurvey.nrcs.usda.gov. Accessed October 2019.

Soil Conservation Service and Forest Service. 1974. Soil Survey of Shasta County Area, California. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/california/CA607/0/shasta.pdf. Accessed October 2019.

United States Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).

_____. 2014. A Guide to Ordinary High Water Mark (OHWM) Delineation for Non-Perennial Streams in the Western Mountains, Valleys, and Coast Region of the United States.

United States Geological Survey (USGS). 1990a. Chalk Mountain, California 7.5-minute topographic quadrangle. Denver, Colorado: U.S. Department of the Interior.

_____. 1990b. Montgomery Creek, California 7.5-minute topographic quadrangle. Denver, Colorado: U.S. Department of the Interior

_____. 1990c. Roaring Creek, California 7.5-minute topographic quadrangle. Denver, Colorado: U.S. Department of the Interior.

_____. 1995a. Hatchet Mountain Pass, California 7.5-minute topographic quadrangle. Denver, Colorado: U.S. Department of the Interior.

_____. 1995b. Miller Mountain, California 7.5-minute topographic quadrangle. Denver, Colorado: U.S. Department of the Interior.

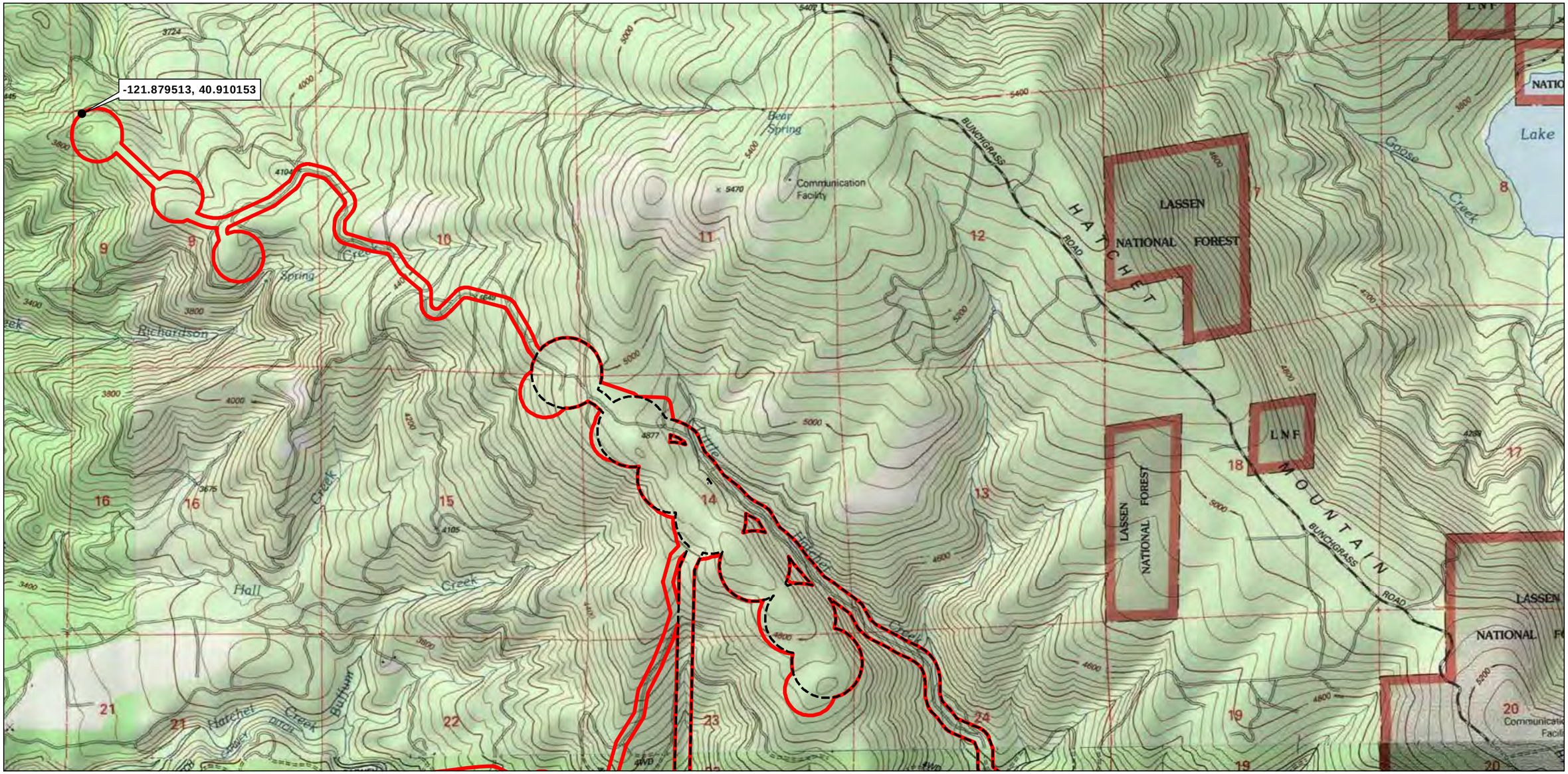
_____. 2019. National Hydrography Dataset: https://nhd.usgs.gov. Accessed October 2019.

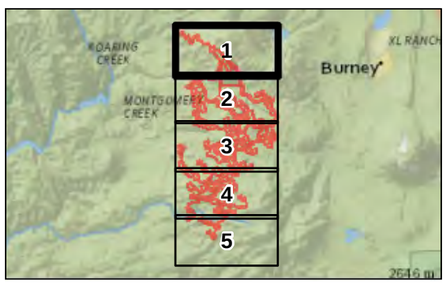
U.S. Fish and Wildlife Service (USFWS). 2019. National Wetlands Inventory. http://www.fws.gov/wetlands/. Accessed October 2019.

Vasilas, L. M.,G. W. Hurt, and J. F. Berkowitz, eds. 2017. Field indicators of hydric soils in the United States. A guide for identifying and delineating hydric soils. Version 8.1. USDA, NRCS in cooperation with the National Technical Committee for Hydric Soils.

Western Regional Climate Center. 2019. Buckhorn, California (041149) Period of Record Monthly Climate Summary, Period of Record: 1948 to 2019. http://agacis.rcc-acis.org/?fips=06089. Accessed October 2019.

FIGURES





Survey Area (6,118 acres)

Project Site

Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Base map: ESRI USA Topo Maps web mapping service.
3. USGS Quad:
Chalk Mountain, Hatchet Mountain Pass, Montgomery Creek, Miller Mountain, Roaring Creek
4. Public Land Survey
Township 33 North Range 1 East
Township 33 North Range 2 East
Township 34 North Range 1 East
Township 34 North Range 2 East
Township 35 North Range 1 East

0 2,000 4,000 Feet

(At original document size of 11x17)
1:24,000

N

Stantec

Project Location
Shasta County, California

Prepared by REM on 2019-10-31
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

Client/Project
ConnectGen Operating LLC
Fountain Wind Project

185804576

Figure No.
1

DRAFT

Title
Project Location

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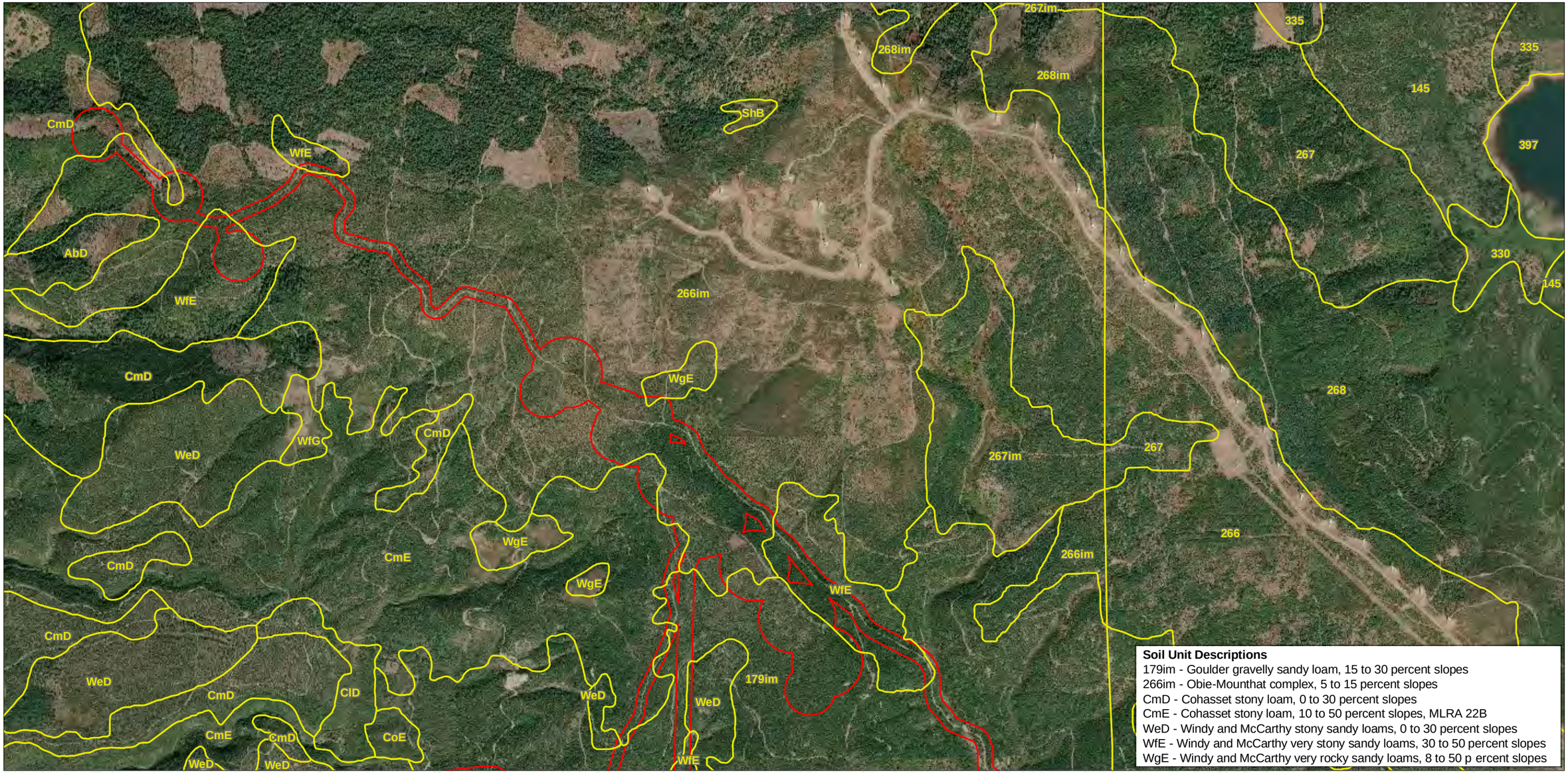
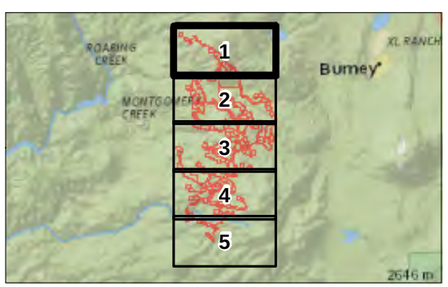


Soil Unit Descriptions
179im - Goulder gravelly sandy loam, 15 to 30 percent slopes
266im - Obie-Mounthat complex, 5 to 15 percent slopes
CmD - Cohasset stony loam, 0 to 30 percent slopes
CmE - Cohasset stony loam, 10 to 50 percent slopes, MLRA 22B
WeD - Windy and McCarthy stony sandy loams, 0 to 30 percent slopes
WfE - Windy and McCarthy very stony sandy loams, 30 to 50 percent slopes
WgE - Windy and McCarthy very rocky sandy loams, 8 to 50 p ercent slopes



Survey Area (6,118 acres)
Soil Unit Boundary

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Base map: ESRI World Imagery Map web mapping service.
3. Soils Data Source: USDA Natural Resources Conservation Services SSURGO Soils Database

0 2,000 4,000 Feet
(At original document size of 11x17)
1:24,000

N

Stantec

Project Location
Shasta County, California

Prepared by REM on 2019-10-31
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

Client/Project
185804576
ConnectGen Operating LLC
Fountain Wind Project

Figure No.
2

DRAFT

Title
Soils

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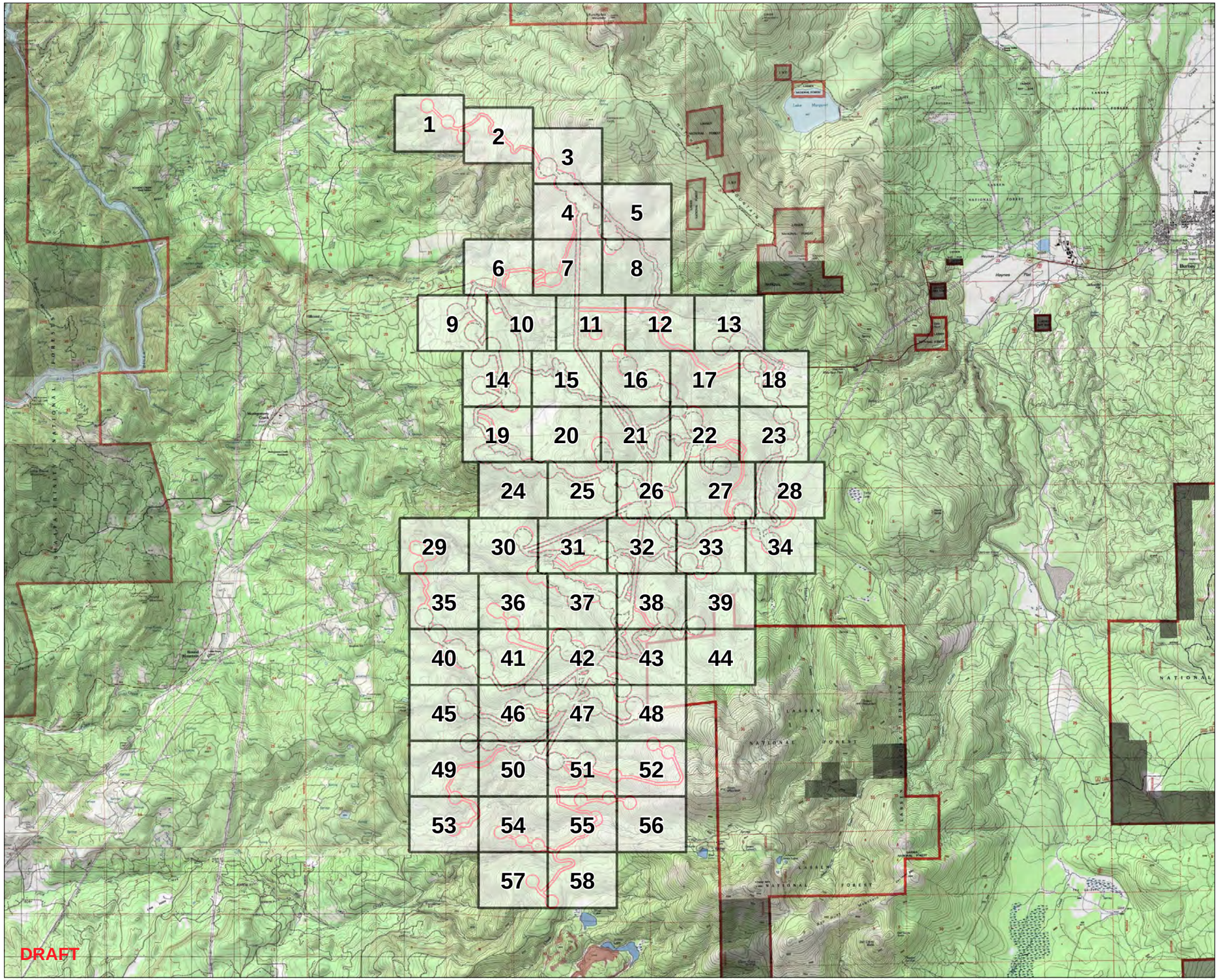


Figure No.
3 Overview

Title
Potential Waters of the United States

DRAFT

Client/Project 185804576
ConnectGen Generating LLC
Fountain Wind Project

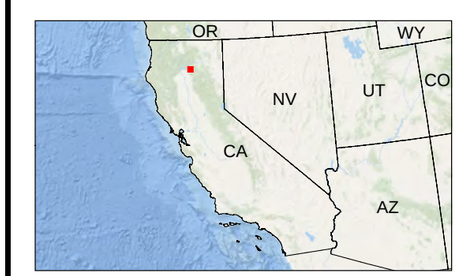
Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

N

0 3,500 7,000 Feet
(At original document size of 24x36)
1:42,000

Survey Area (6,118 acres)
Project Site



Notes
1. Delineators: John Holson, Allison Loveless, Andrew Sorci, Gabe Youngblood
2. Delineation Dates: October-December 2017, August 2018
3. Coordinate System: NAD 1983 UTM Zone 10N
4. Base map: ESRI USA Topo Maps web mapping service

Stantec

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Figure No.
3

DRAFT

Title
Potential Waters of the United States

Client/Project
185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

N

0 200 400 Feet
(At original document size of 24x36)
1:2,400

- Survey Area (6,118 acres)
- Project Site
- 2 ft Contour
- Culvert
- Historic Ditch
- Ordinary High Water Mark
- 3-Parameter Data Point
- Feature Width Change
- Test Pit
- Map Reference Point

Waters of the United States (2019)

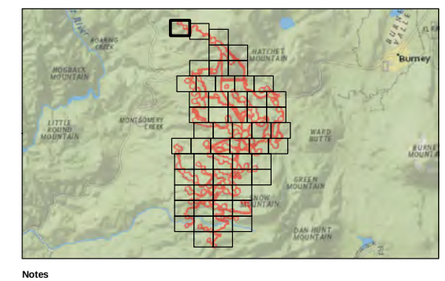
Type
- Riparian Wetland (2.520 acres)
- Wetland Meadow (0.340 acre)
- Wetland Seep/Spring (0.019 acre)

Other Waters
- Ephemeral Stream (0.118 acres)
- Intermittent Stream (0.711 acres)
- Perennial Stream (2.165 acres)

Waters of the United States (2017, 2018)

Type
- Fresh Emergent Wetland (0.967 acre)
- Riparian Wetland (24.288 acres)
- Seasonal Wetland (0.120 acre)
- Vegetated Ditch (0.174 acre)
- Wetland Meadow (8.374 acres)
- Wetland Seep/Spring (1.790 acres)

Other Waters
- Ephemeral Stream (0.441 acre)
- Intermittent Stream (2.150 acres)
- Non-Vegetated Ditch (0.239 acre)
- Perennial Stream (7.300 acres)
- Pond (0.181 acre)



Notes
1. Delineators: John Holson, Allison Loveless, Andrew Sorci, Gabe Youngblood, Sheryl Creer
2. Delineation Dates: October-December 2017, August 2018, September 2019
3. Coordinate System: NAD 1983 UTM Zone 10N
4. Base map: ESRI World Imagery Map web mapping service

Stantec

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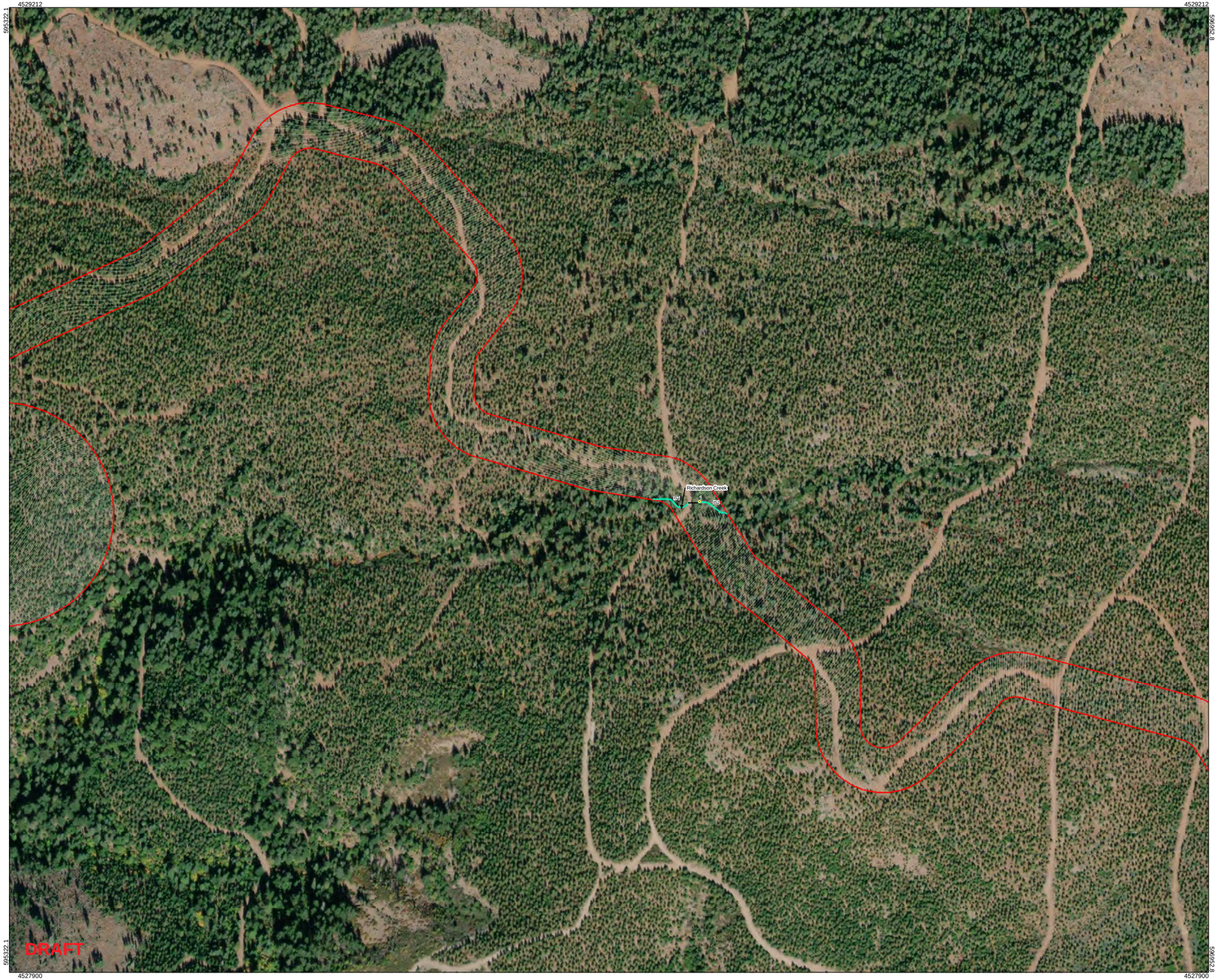

Figure No.
3

DRAFT

Title
Potential Waters of the United States

Client/Project 185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

N

0 200 400 Feet
(At original document size of 24x36)
1:2,400

- Survey Area (6,118 acres)
- Project Site
- 2 ft Contour
- Culvert
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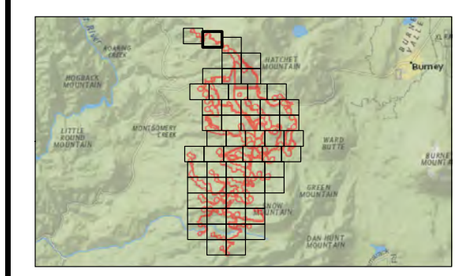

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Stantec

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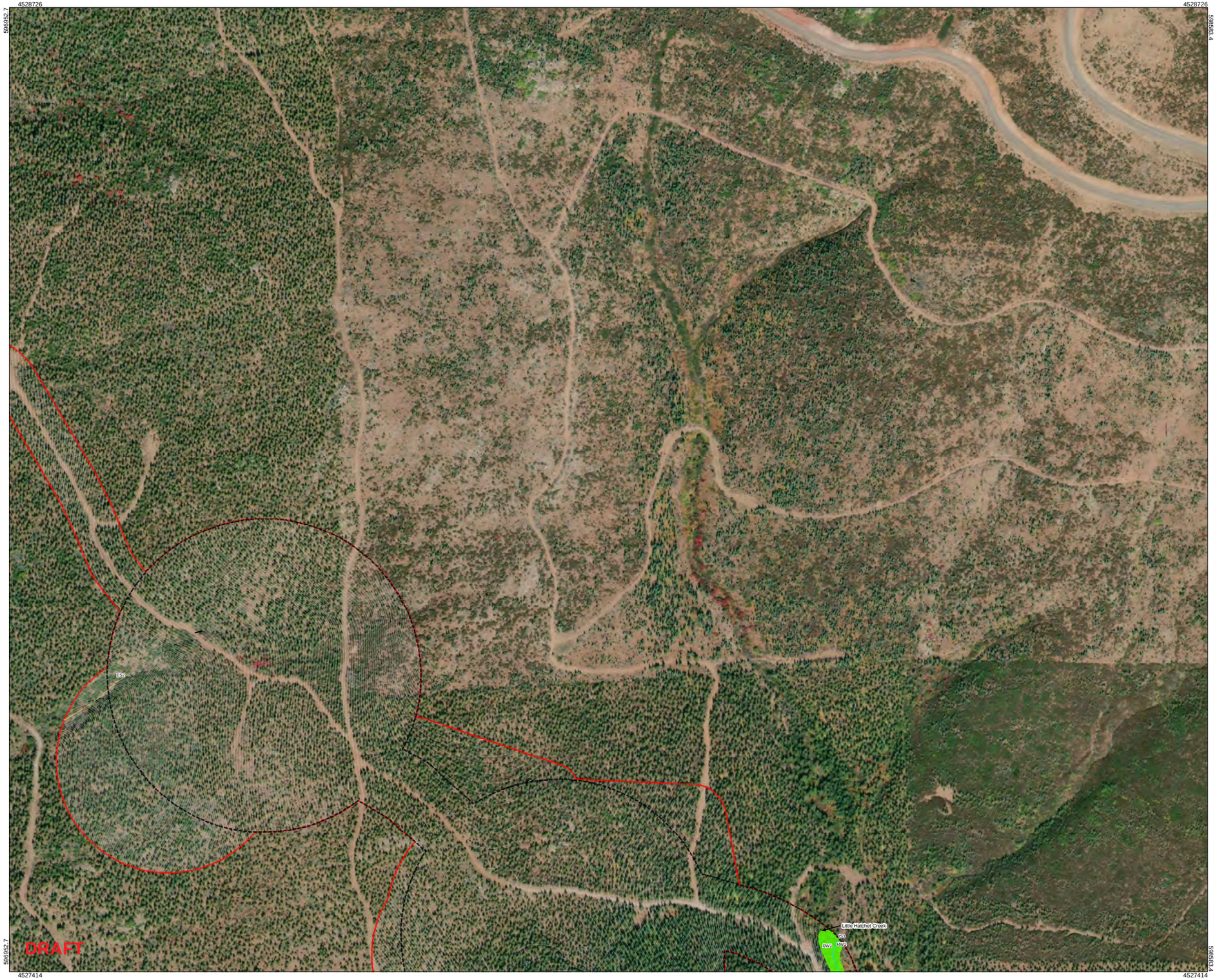

Figure No.
3

DRAFT

Title
Potential Waters of the United States

Client/Project 185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

N

0 200 400 Feet
(At original document size of 24x36)
1:2,400

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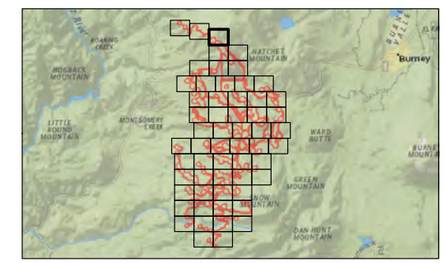

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Stantec

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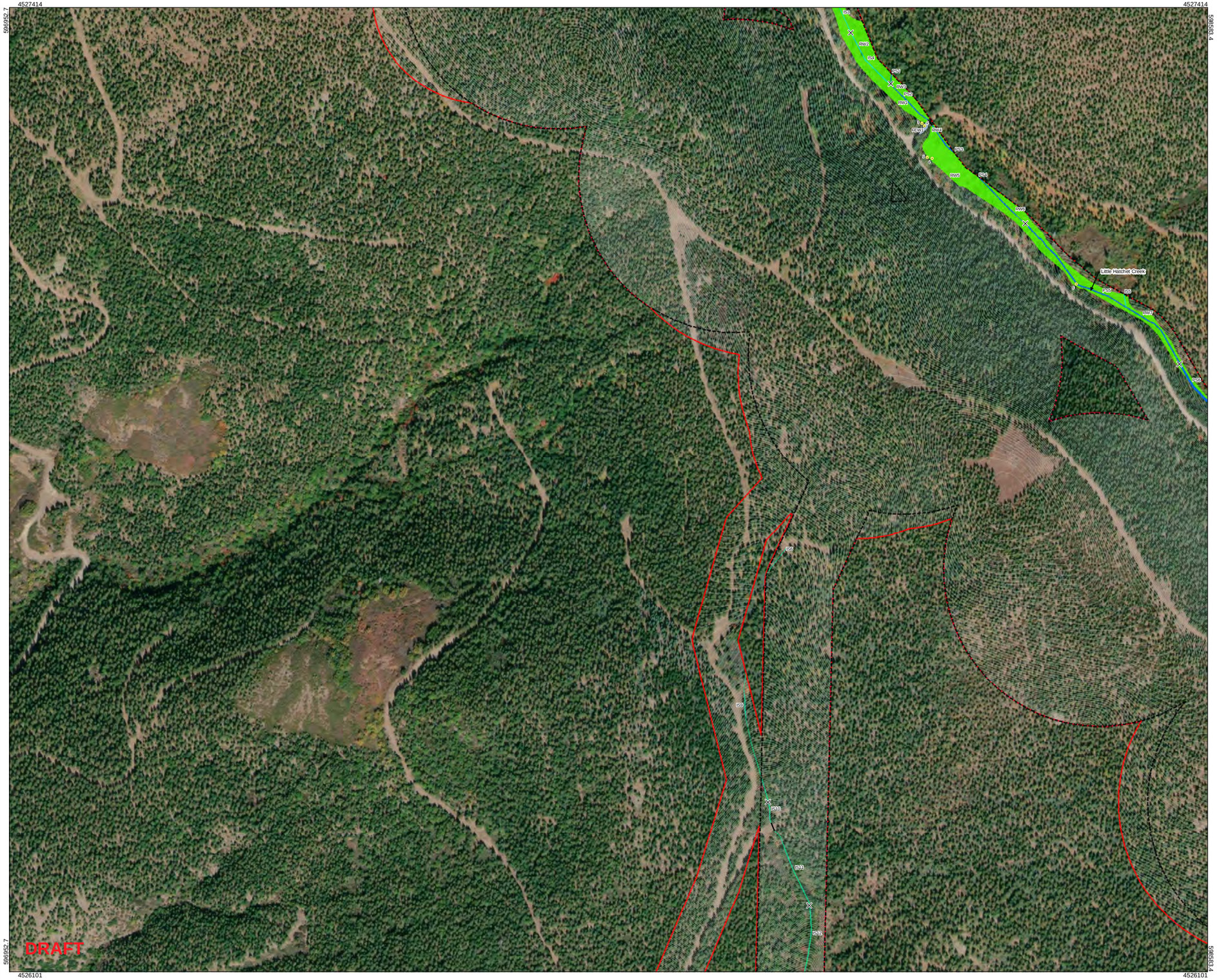

Figure No.
3

DRAFT

Title
Potential Waters of the United States

Client/Project
185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

N

0 200 400 Feet
(At original document size of 24x36)
1:2,400

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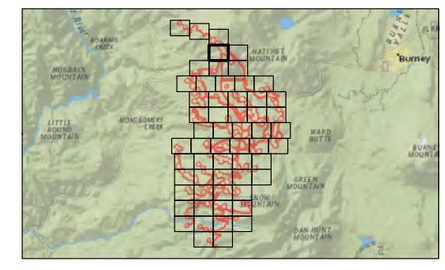

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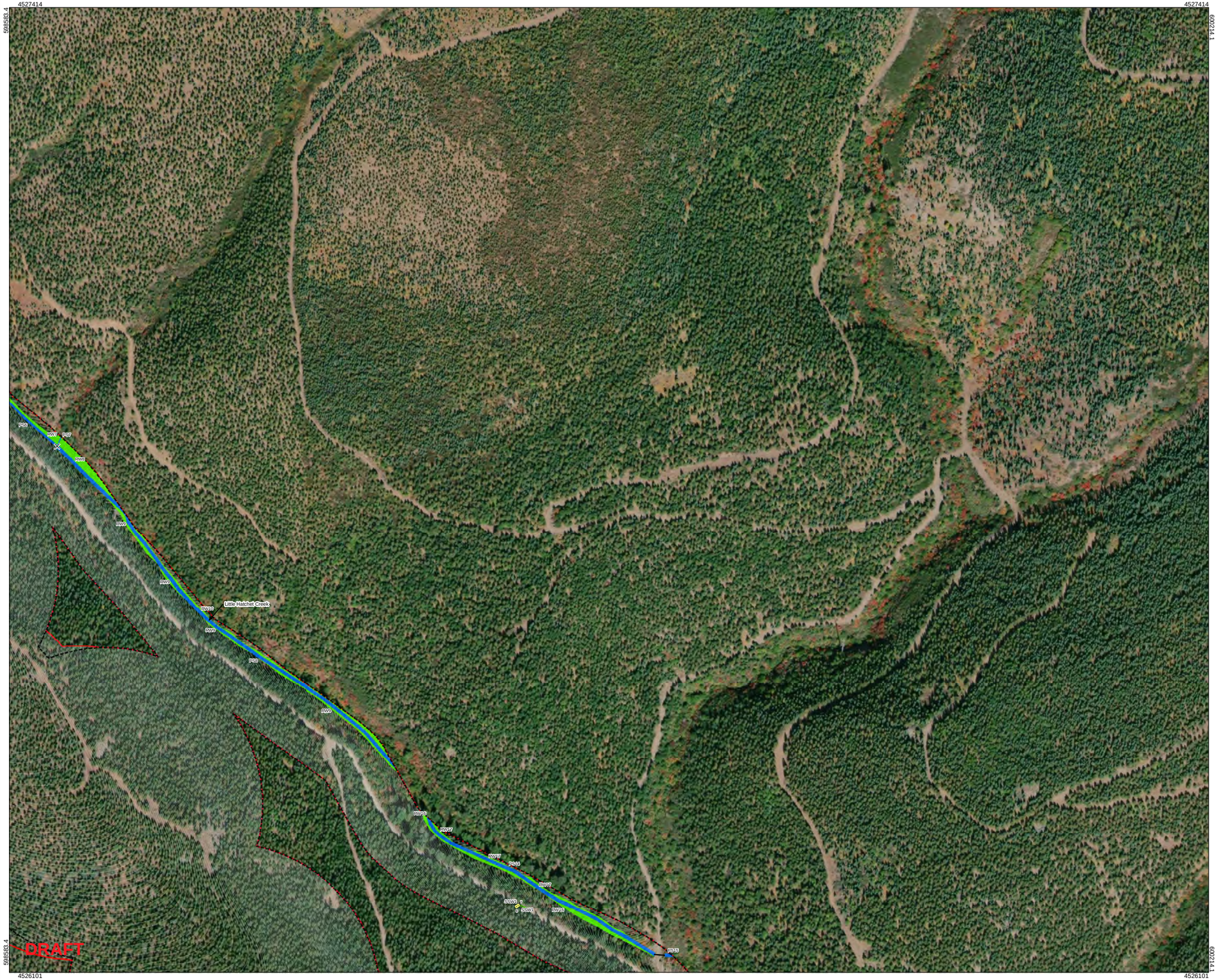

Figure No.
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Title
Potential Waters of the United States

Client/Project
185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

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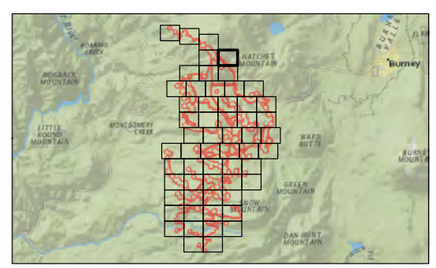

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Stantec

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Figure No.
3

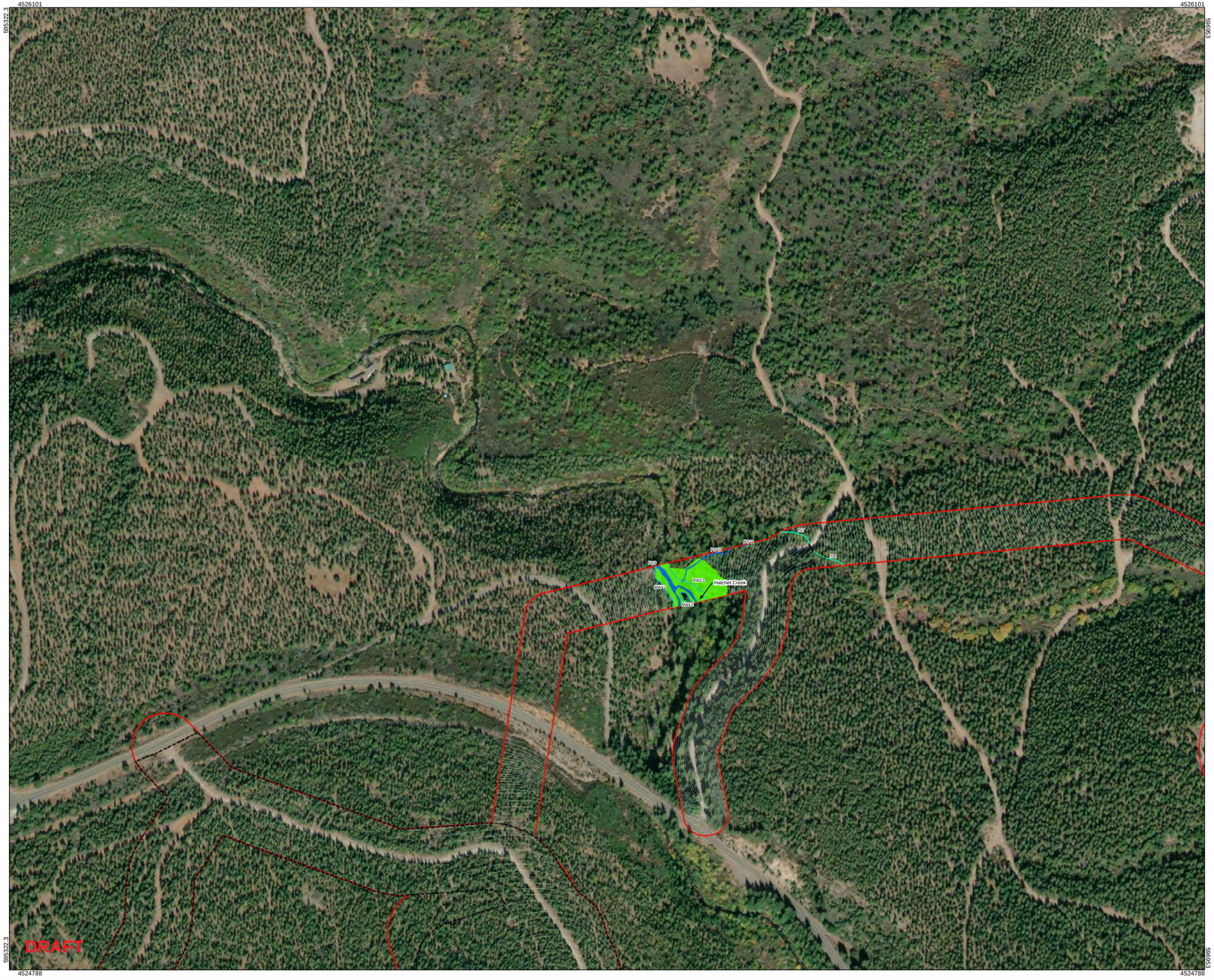
DRAFT

Title
Potential Waters of the United States

Client/Project 185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05



N

0 200 400 Feet
(At original document size of 24x36)
1:2,400

- Survey Area (6,118 acres)
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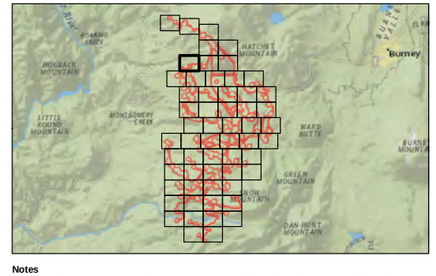

Notes
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Stantec

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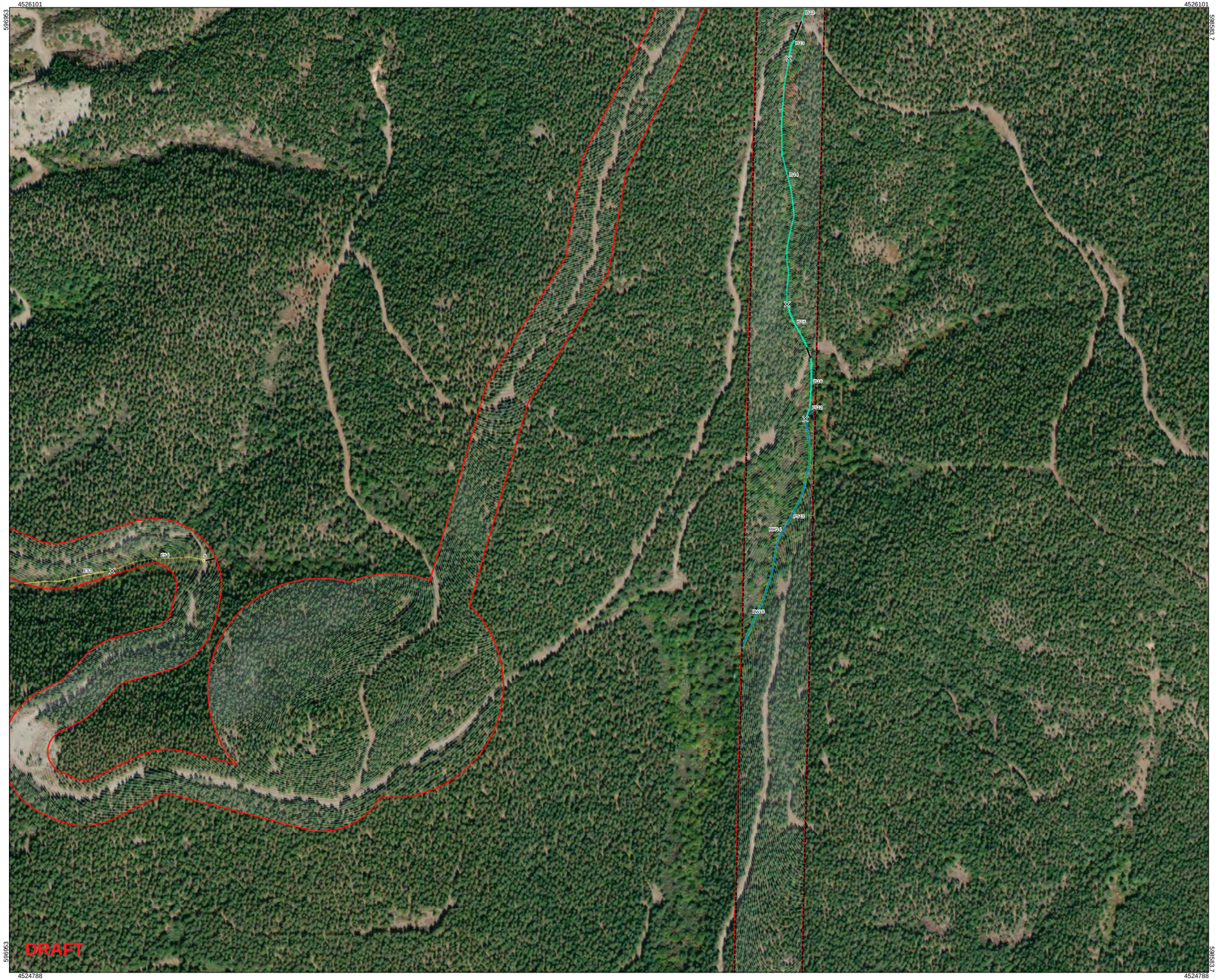

Figure No.
3

DRAFT

Title
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Fountain Wind Project

Project Location
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- Feature Width Change
- Test Pit
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- Wetland Meadow (0.340 acre)
- Wetland Seep/Spring (0.019 acre)

Other Waters
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- Intermittent Stream (0.711 acres)
- Perennial Stream (2.165 acres)

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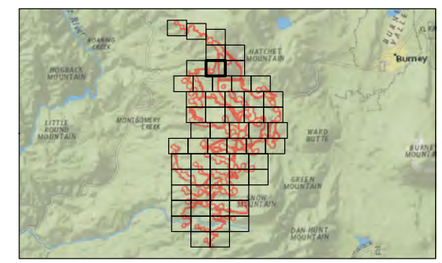

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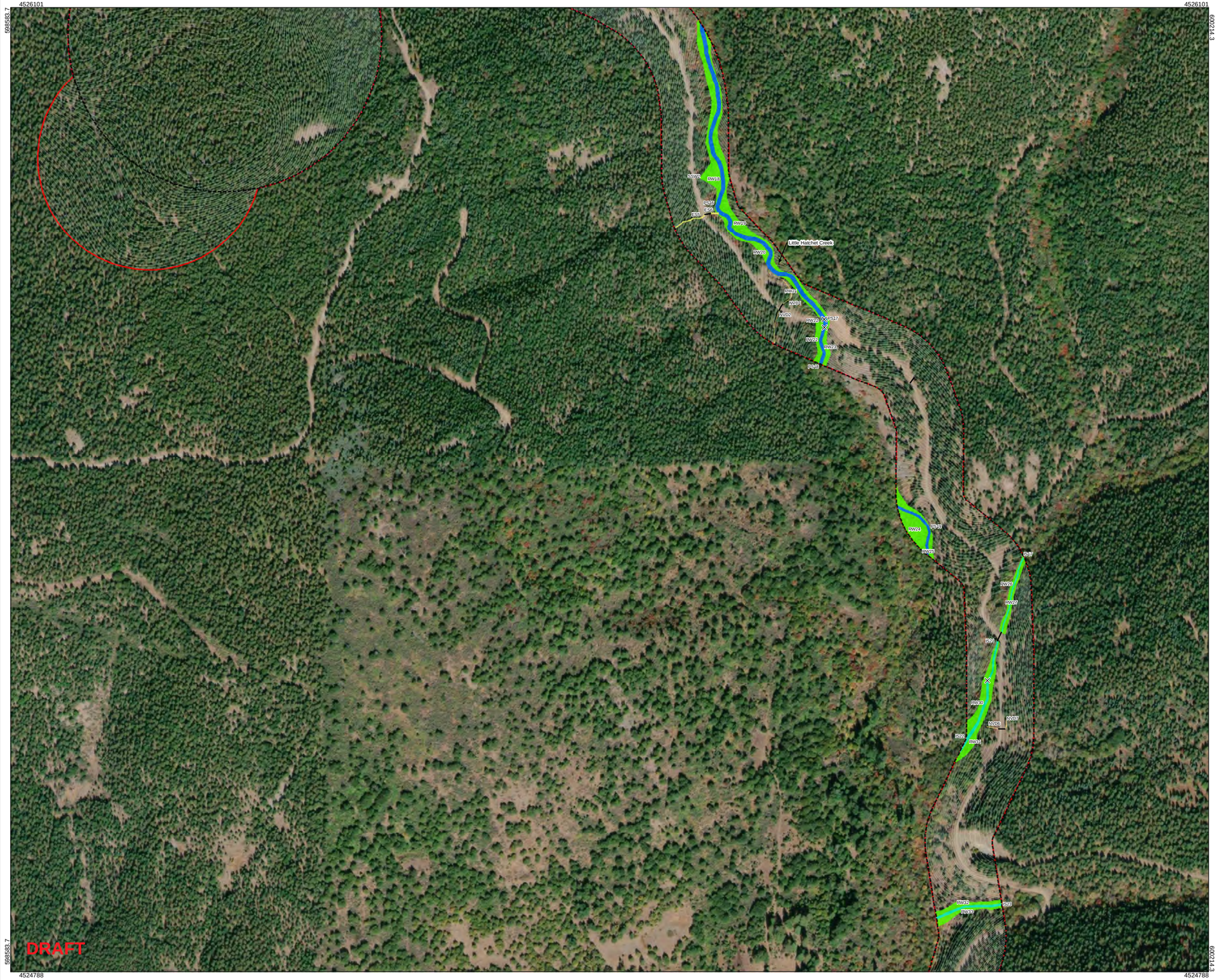
Potential Waters of the United States

Client/Project 185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05



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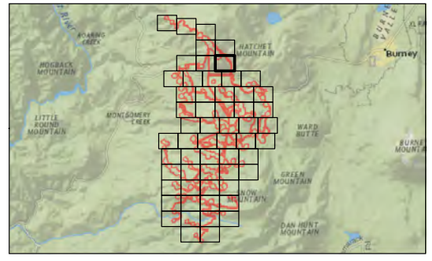

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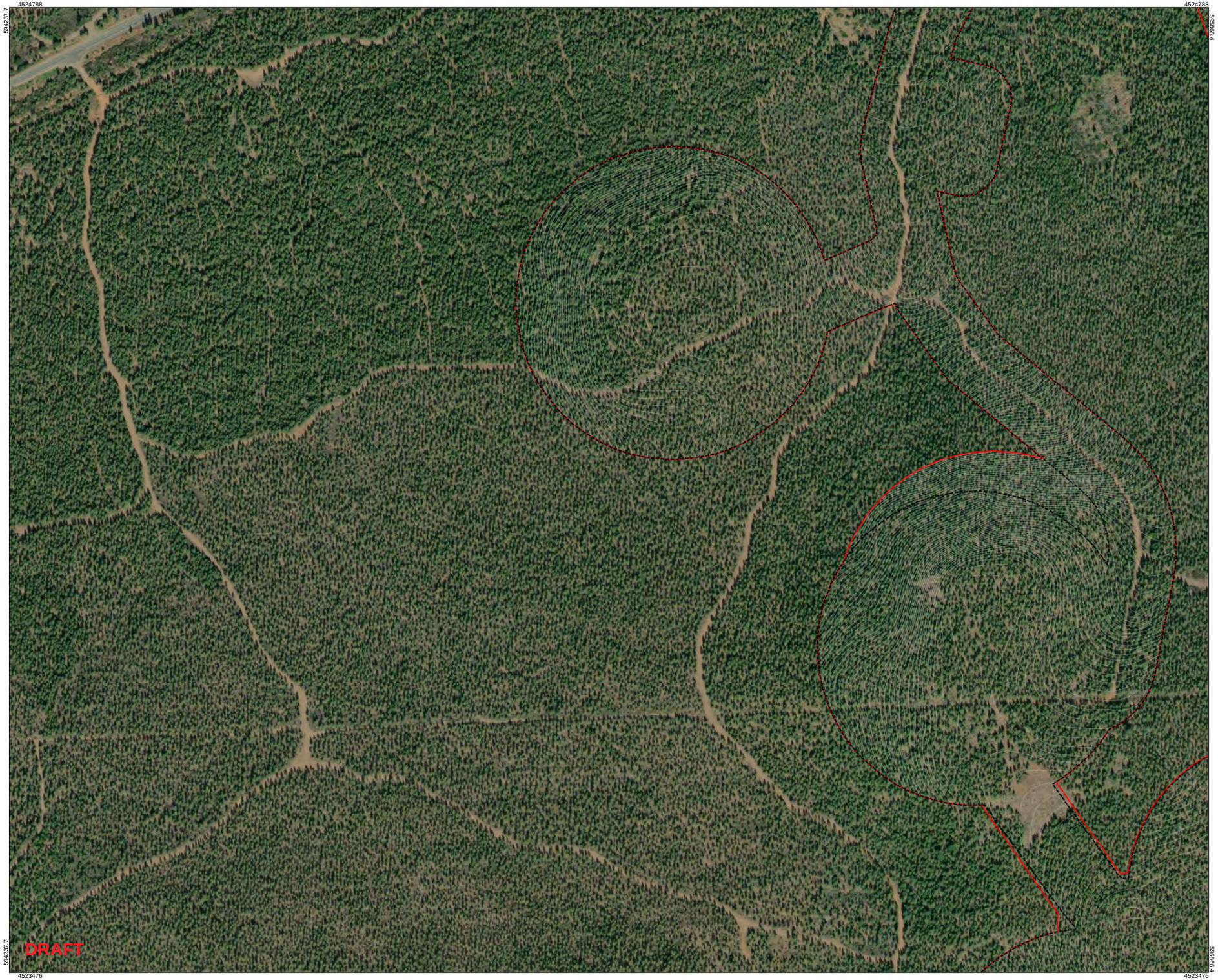

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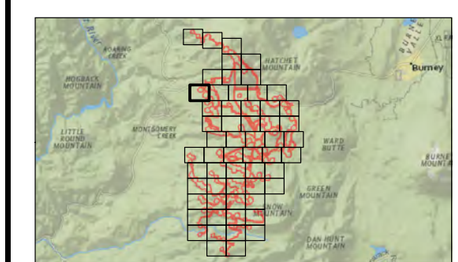

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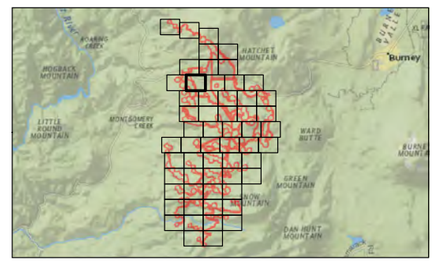

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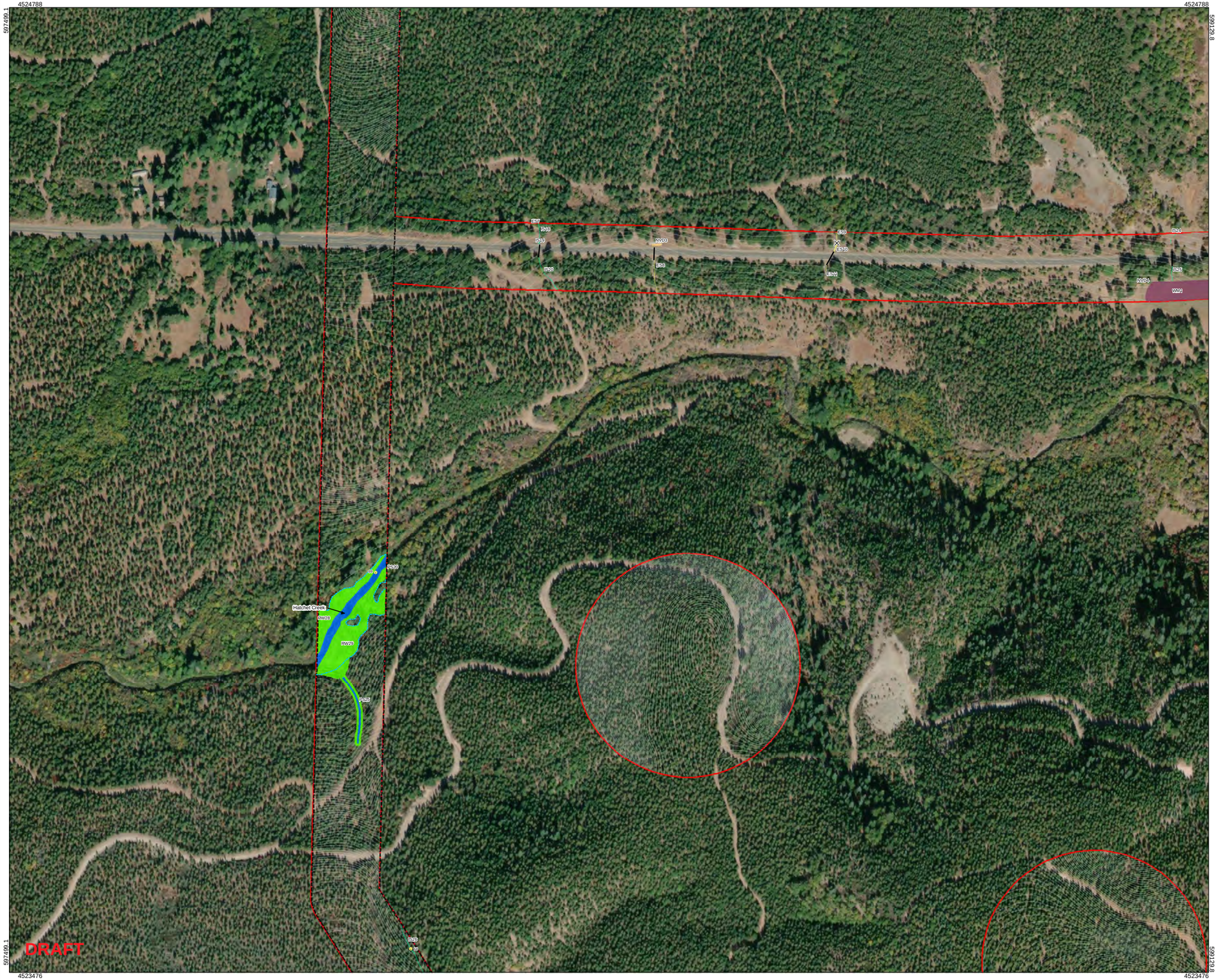

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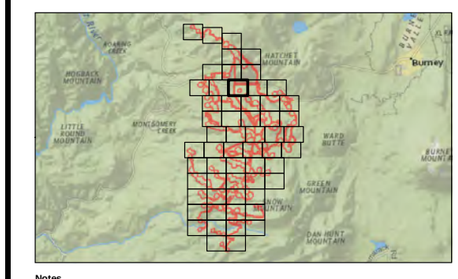

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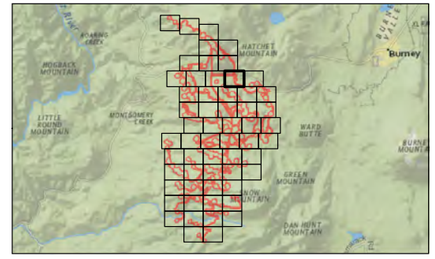

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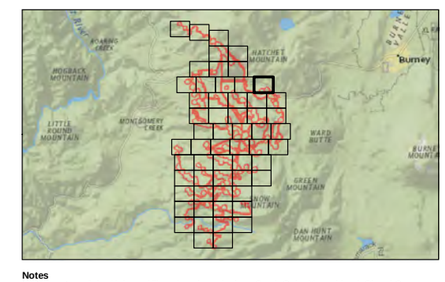

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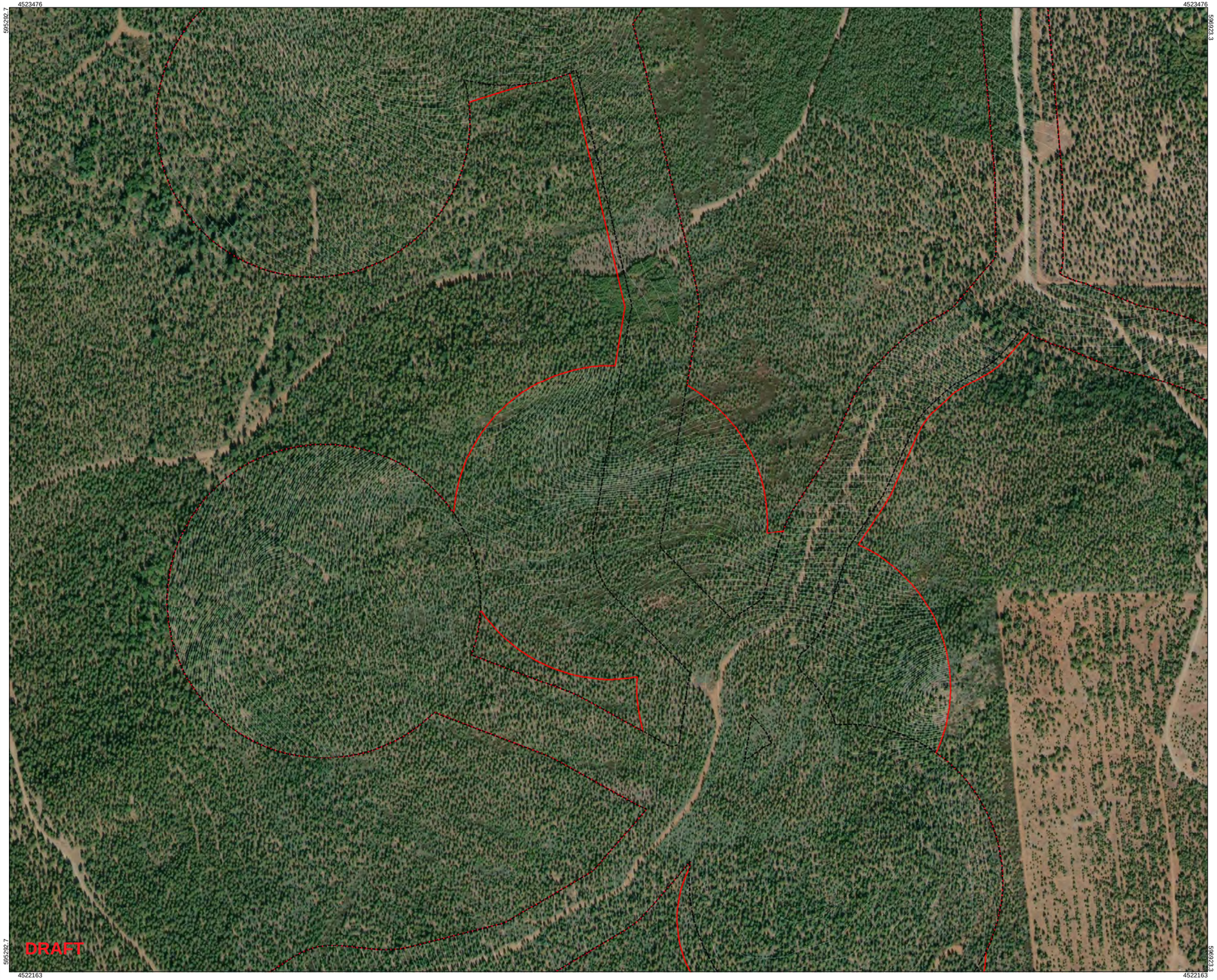

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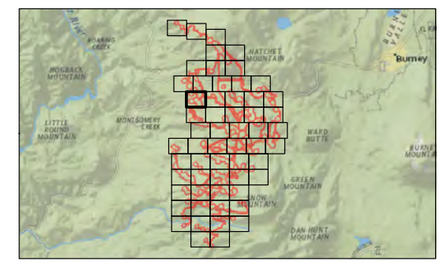

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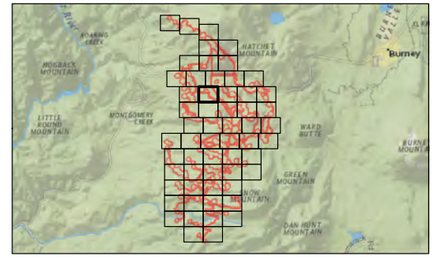

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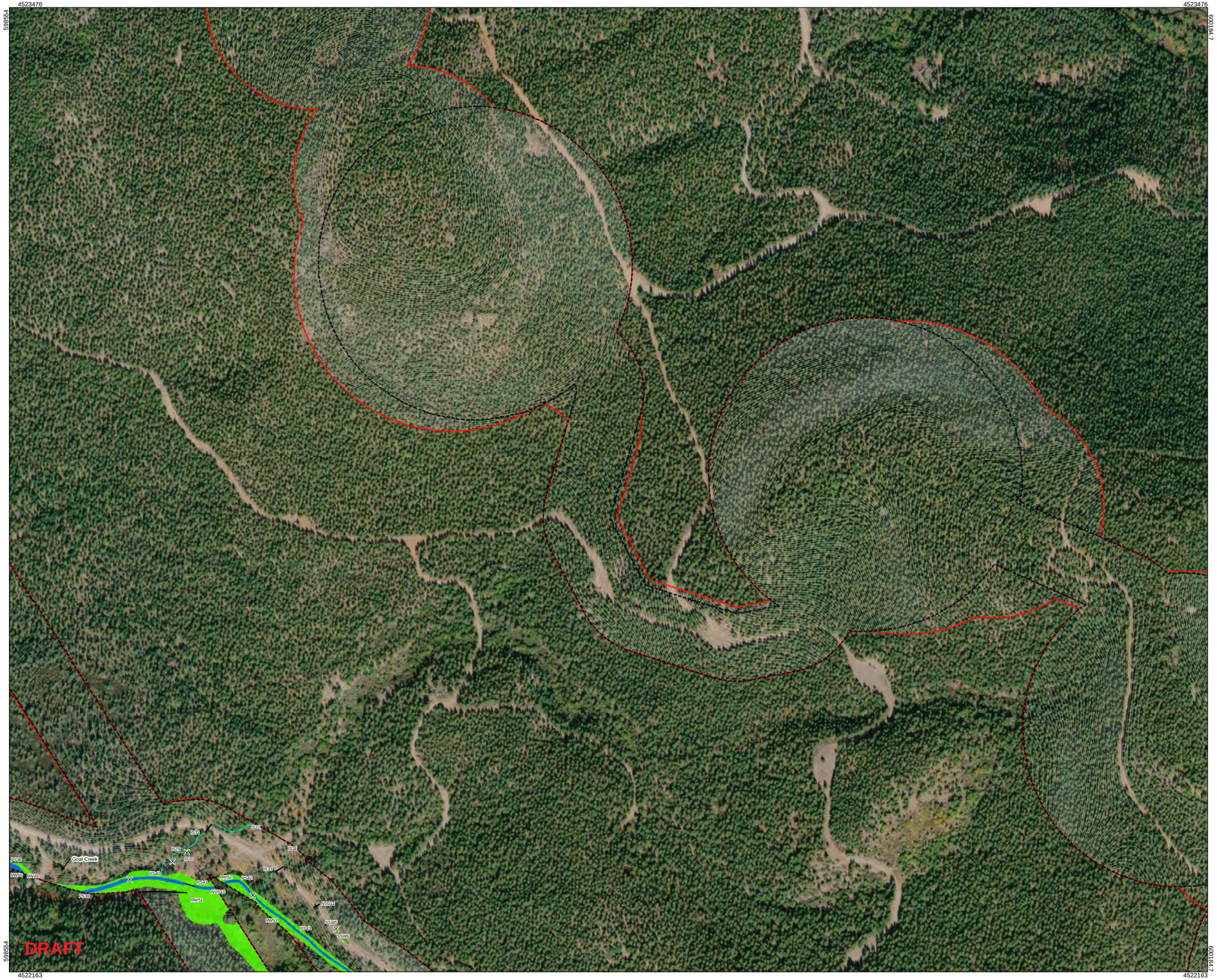

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- Seasonal Wetland (0.120 acre)
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- Wetland Meadow (8.374 acres)
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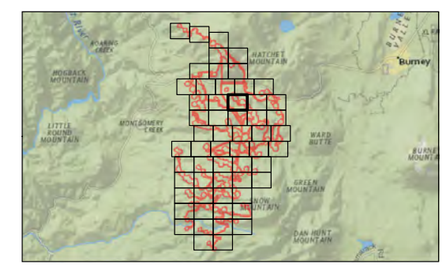

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Figure No.
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Title
Potential Waters of the United States

Client/Project 185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

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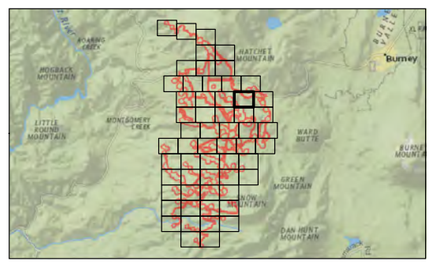

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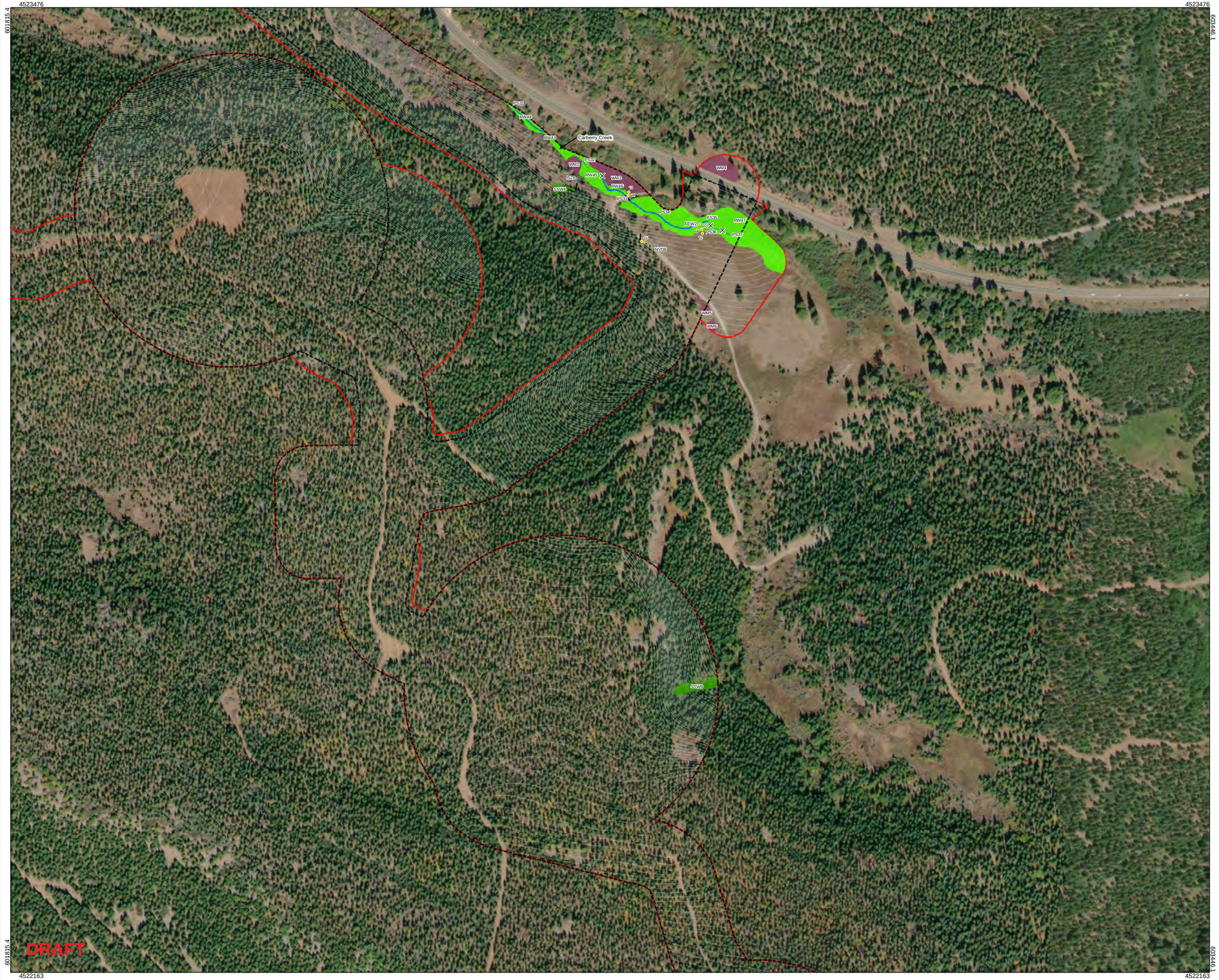

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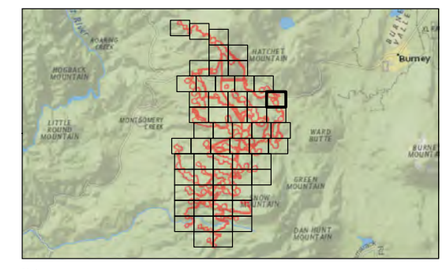

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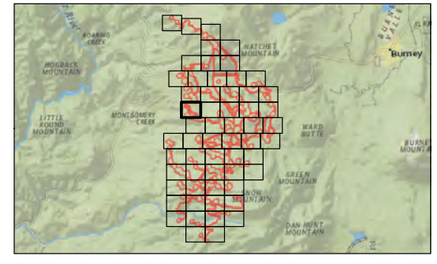

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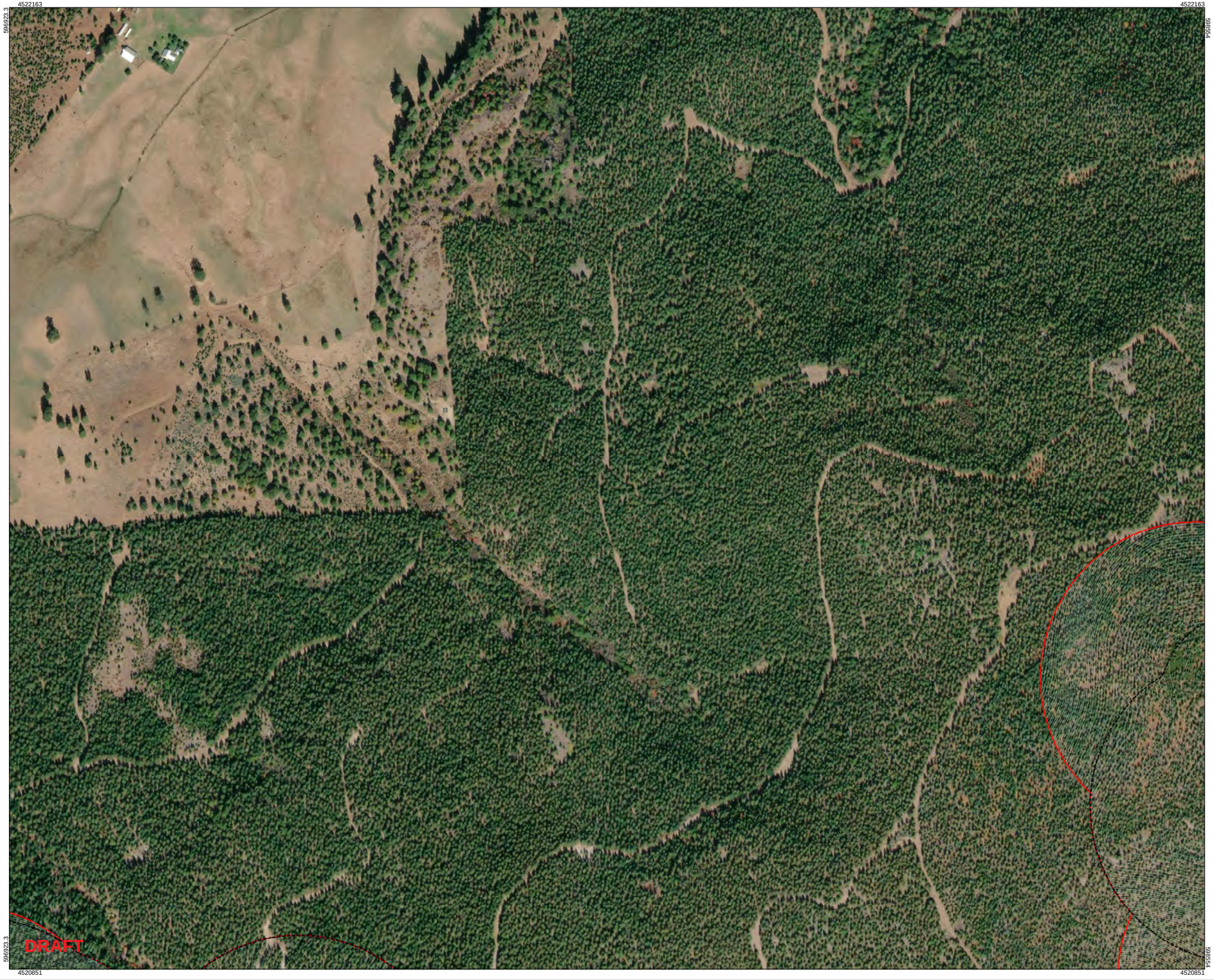

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Fountain Wind Project

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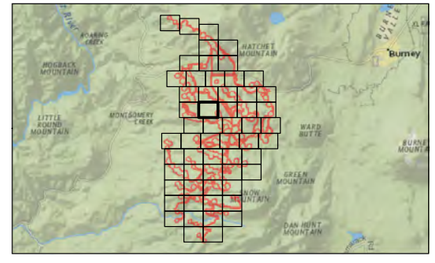

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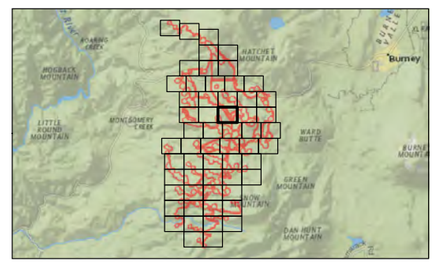

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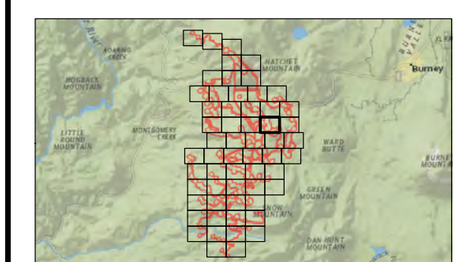

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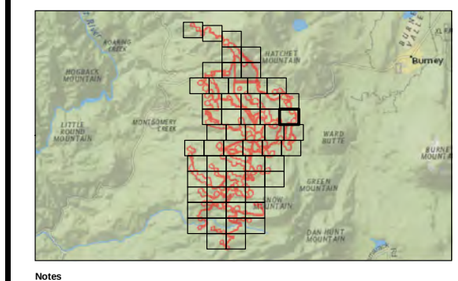

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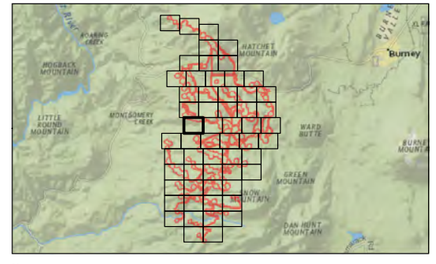

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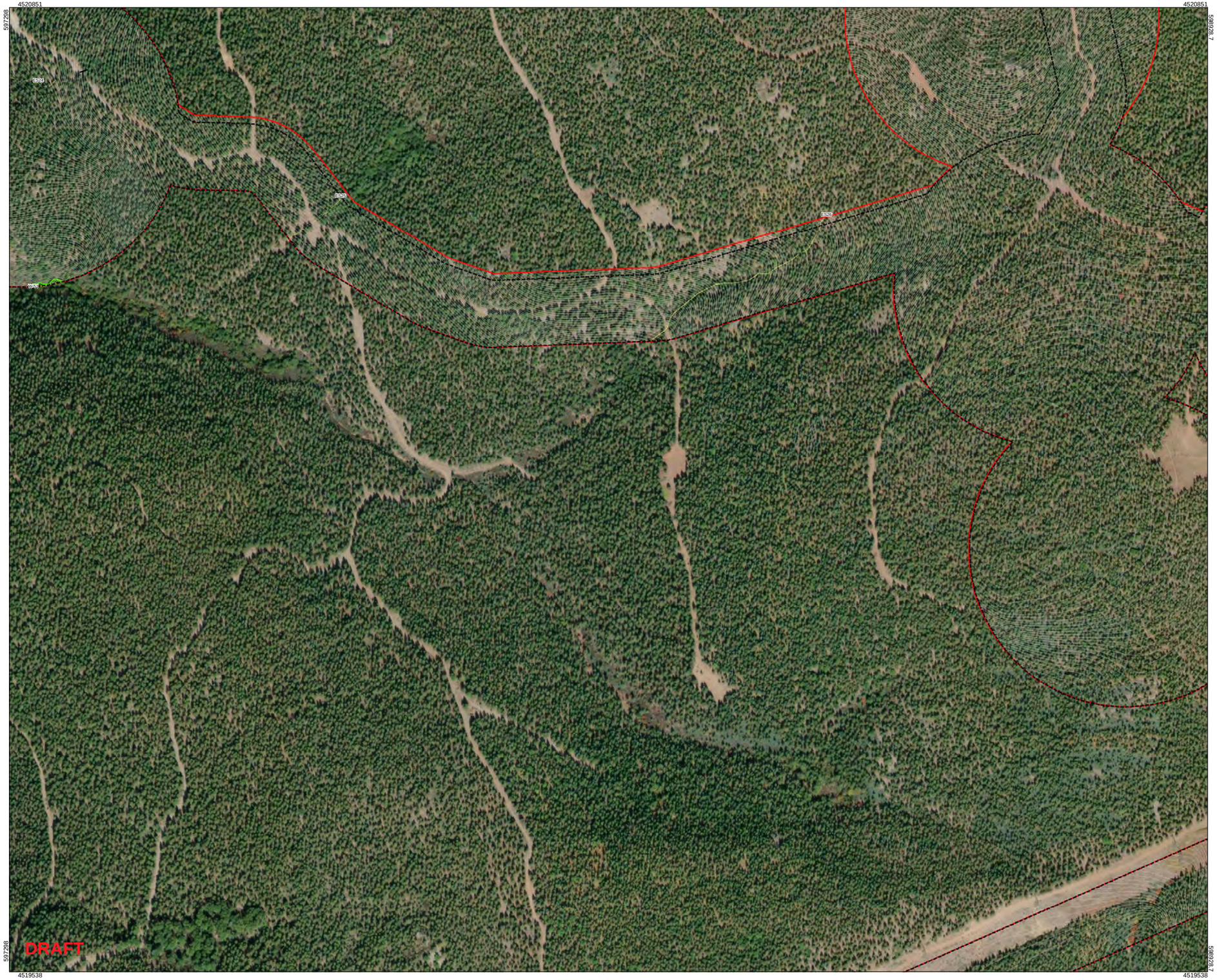

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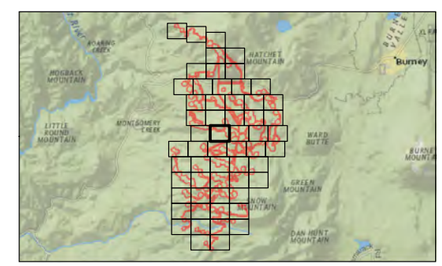

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Figure No.
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Title
Potential Waters of the United States

Client/Project 185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

N

0 200 400 Feet
(At original document size of 24x36)
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- Survey Area (6,118 acres)
- Project Site
- 2 ft Contour
- Culvert
- Historic Ditch
- Ordinary High Water Mark
- 3-Parameter Data Point
- Feature Width Change
- Test Pit
- Map Reference Point

Waters of the United States (2019)

Type
- Riparian Wetland (2.520 acres)
- Wetland Meadow (0.340 acre)
- Wetland Seep/Spring (0.019 acre)

Other Waters
- Ephemeral Stream (0.118 acres)
- Intermittent Stream (0.711 acres)
- Perennial Stream (2.165 acres)

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Type
- Fresh Emergent Wetland (0.967 acre)
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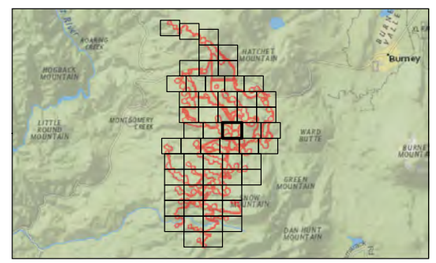

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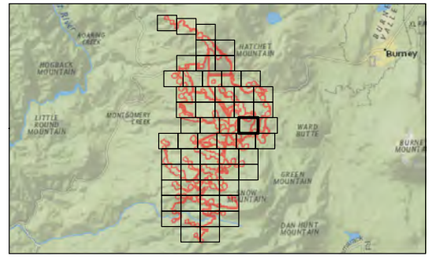

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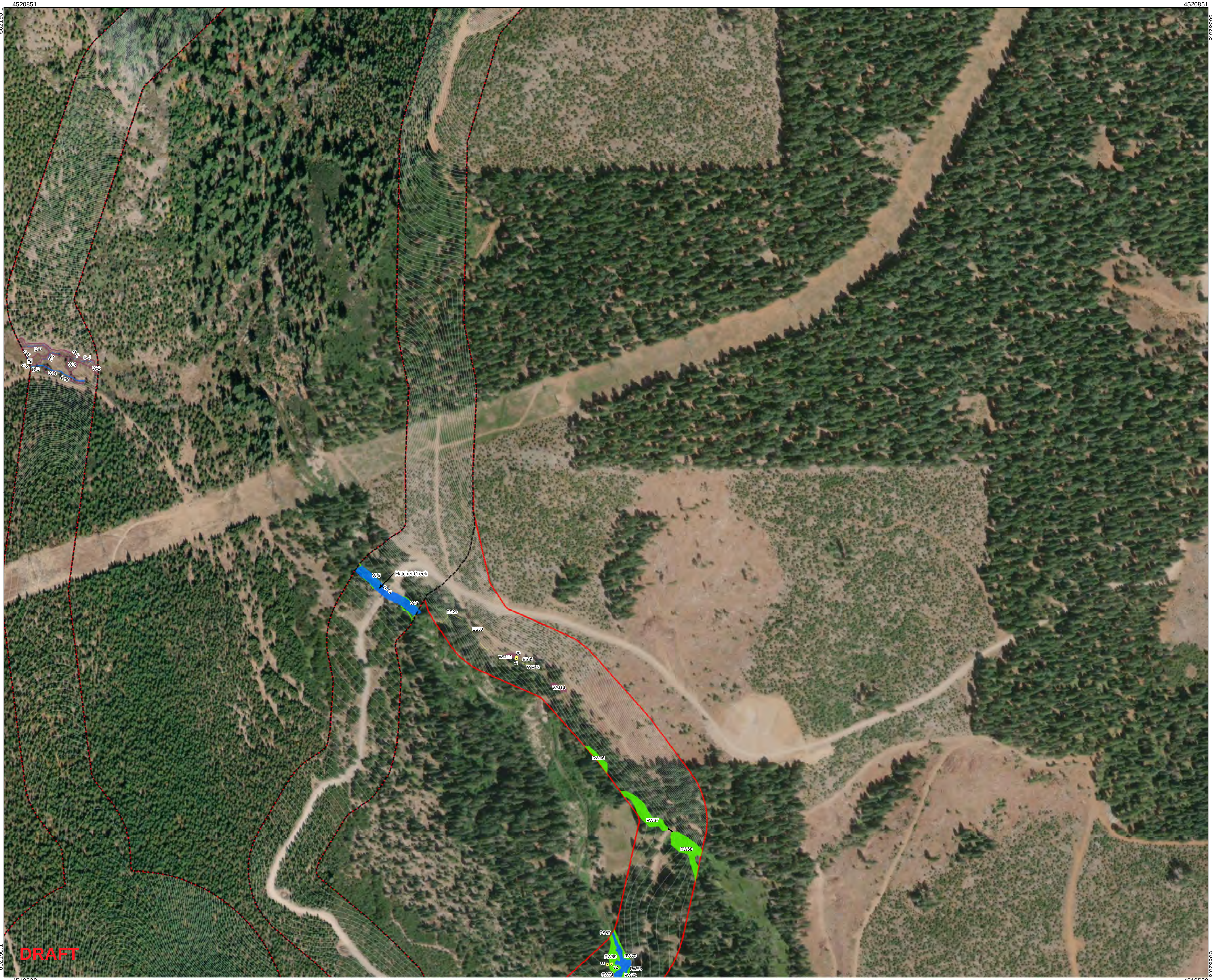

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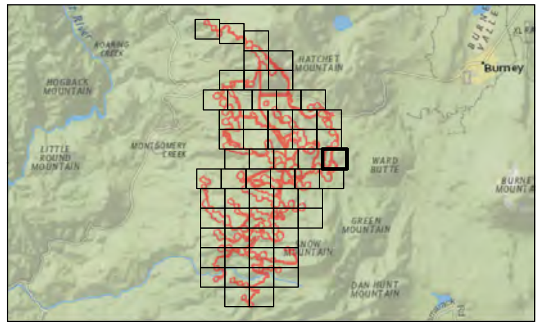

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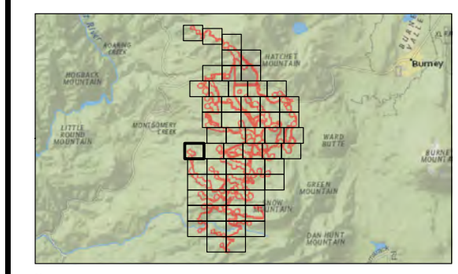

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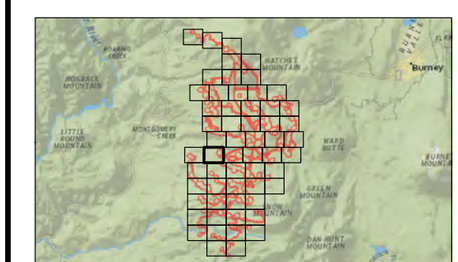

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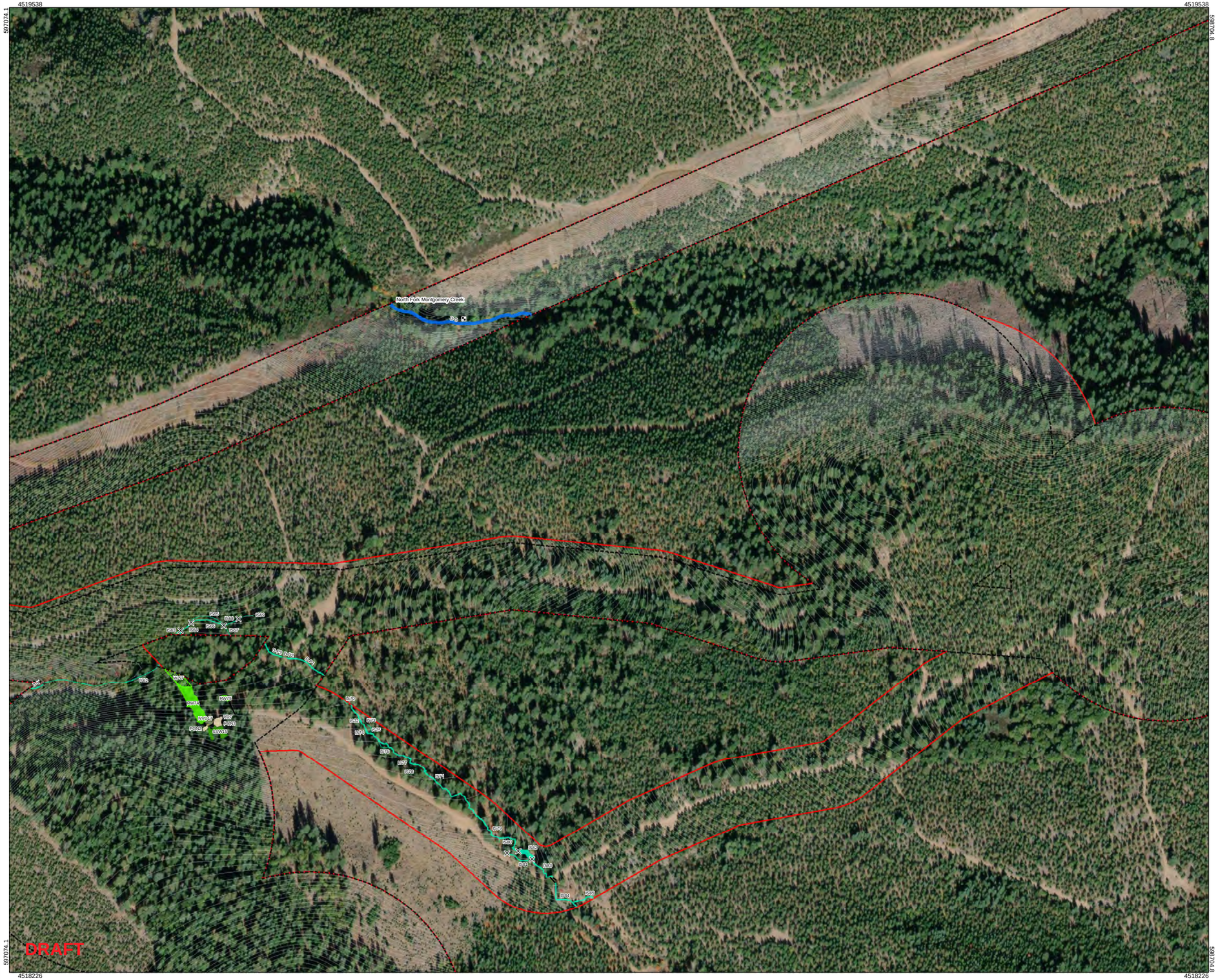

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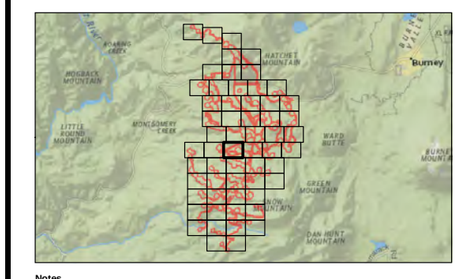

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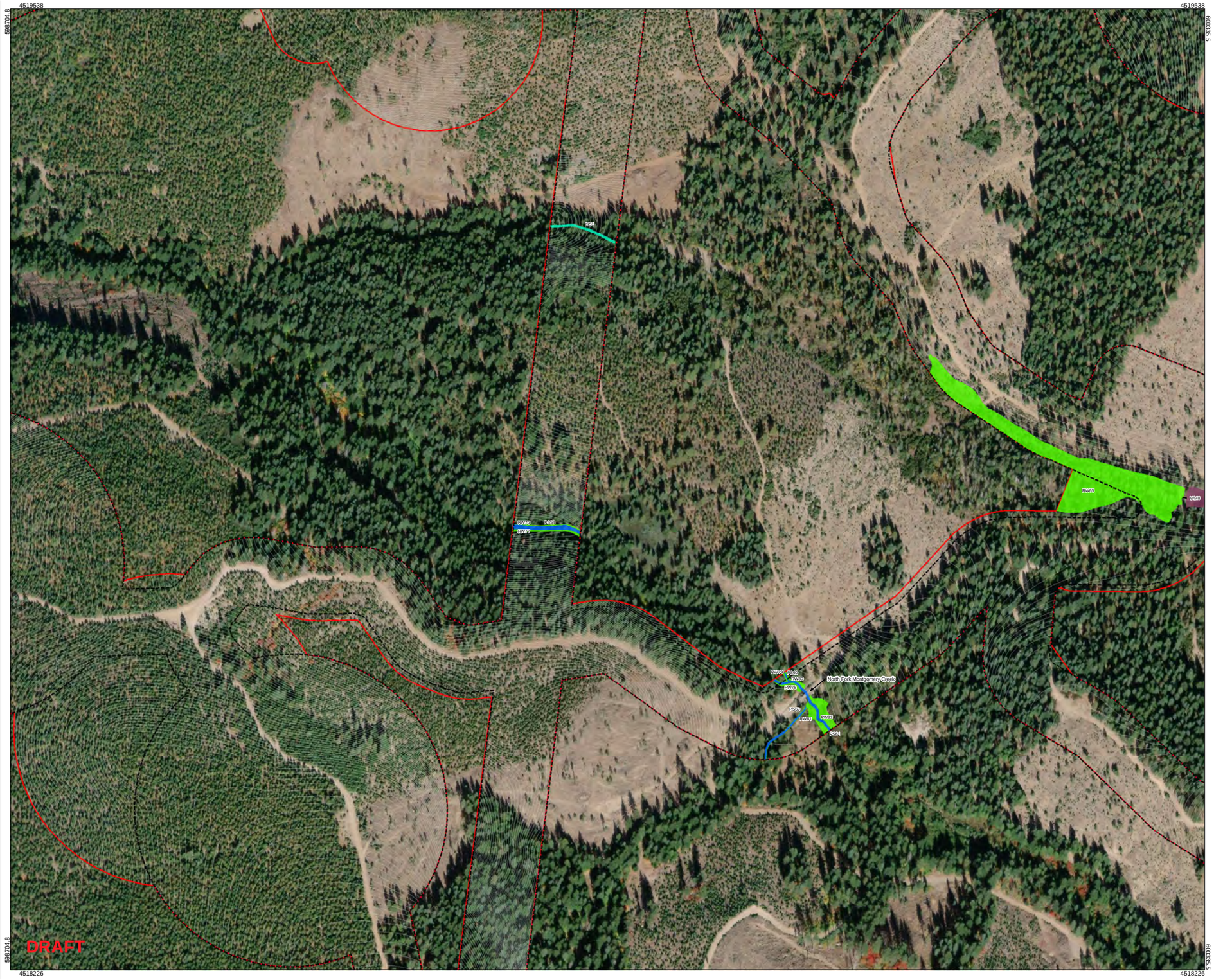

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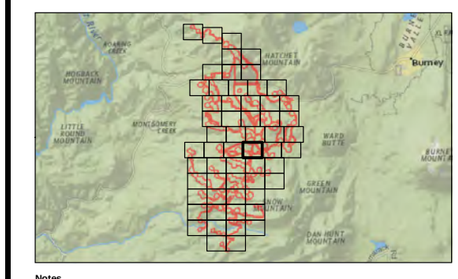

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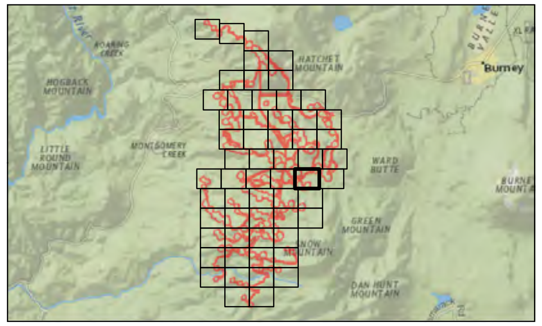

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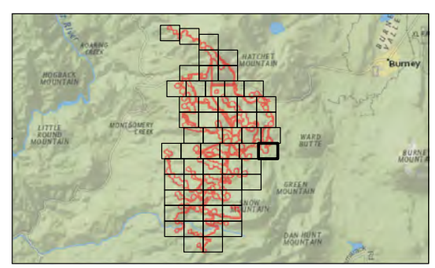

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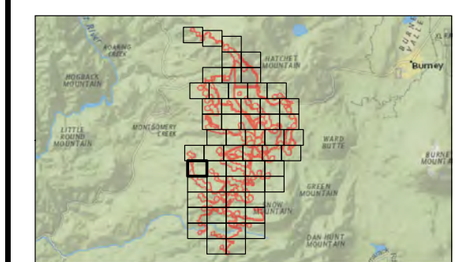

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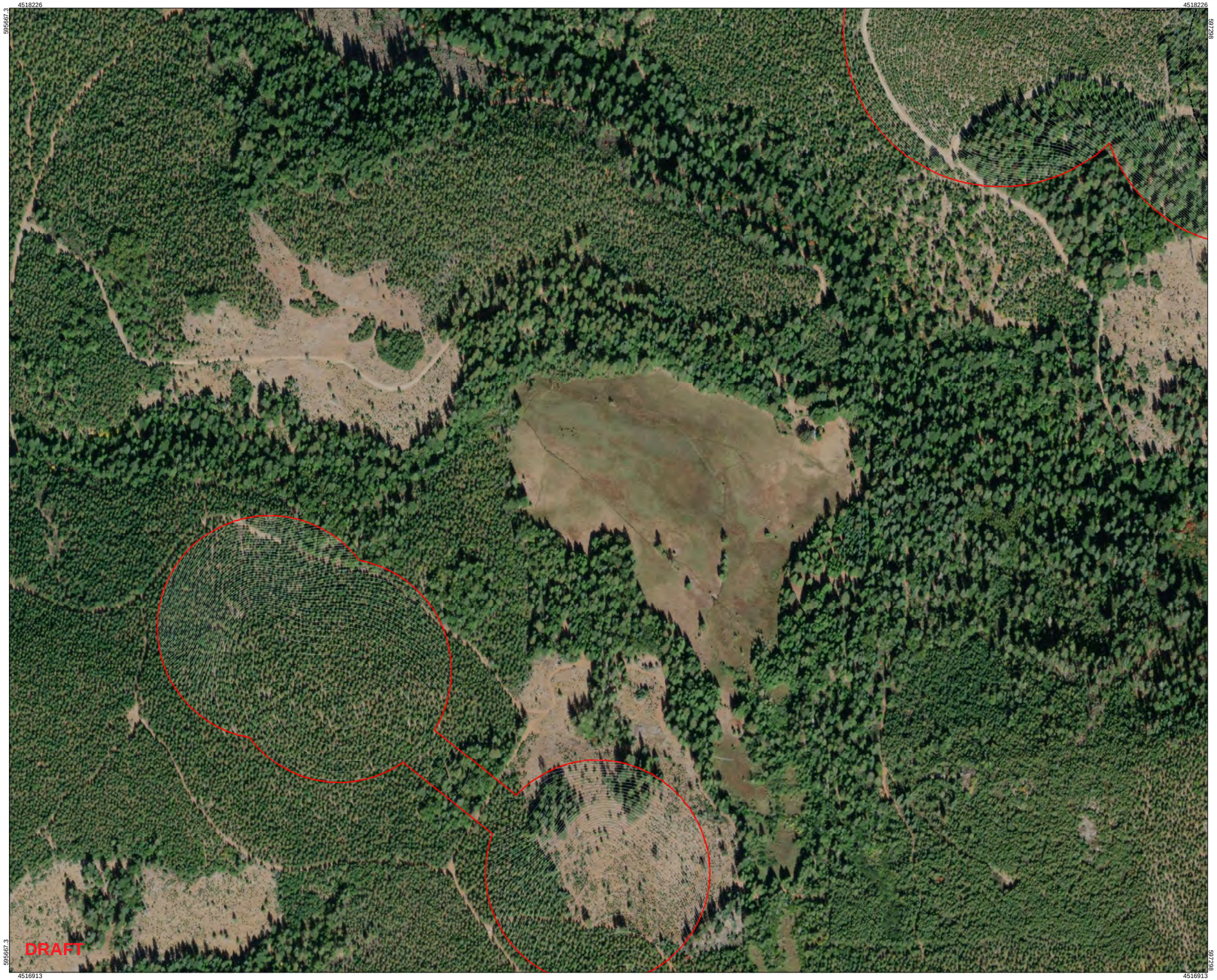

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185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
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Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

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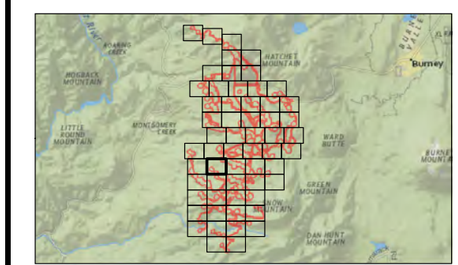

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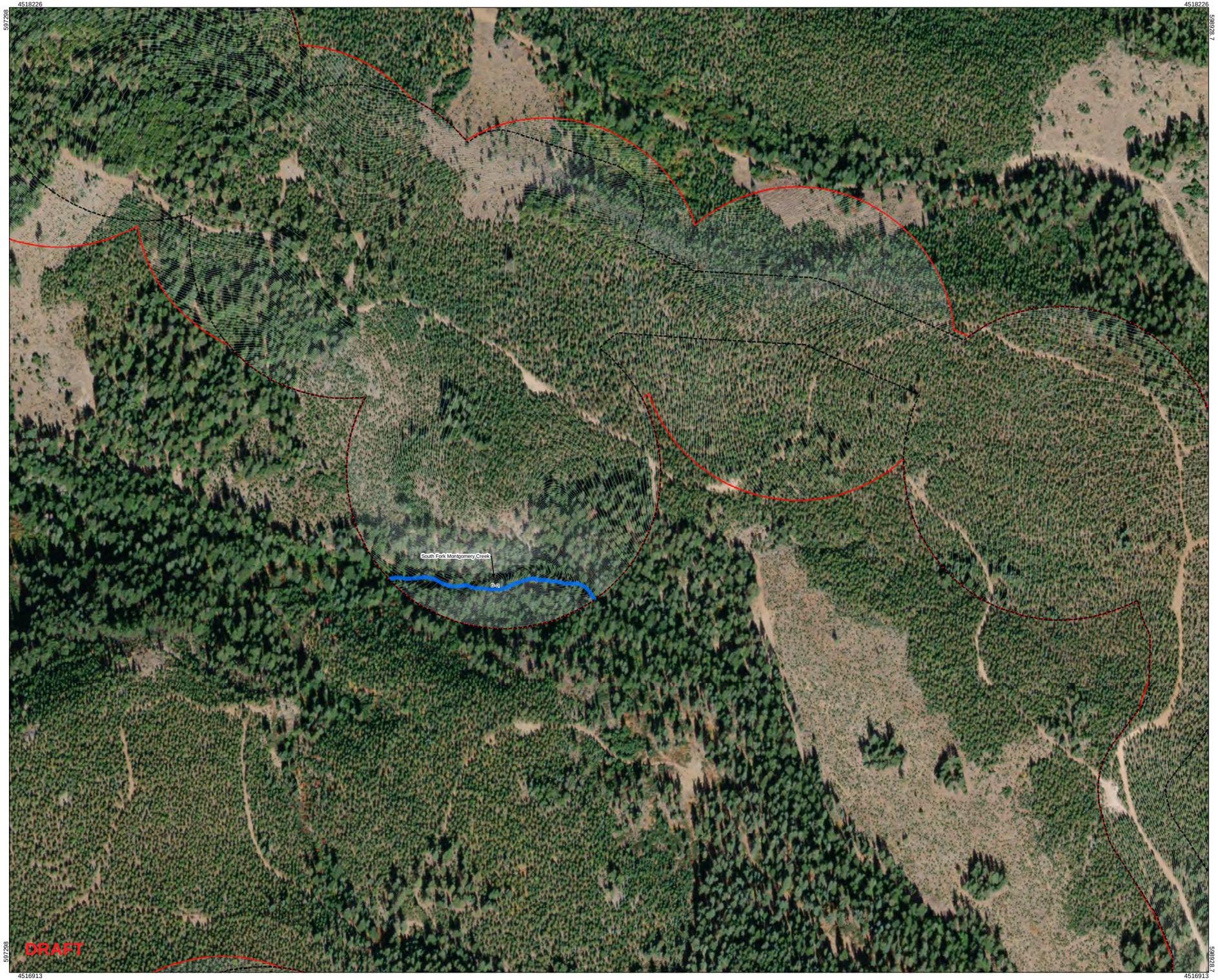

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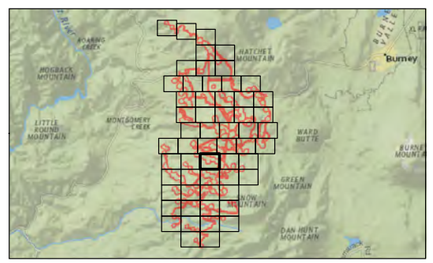

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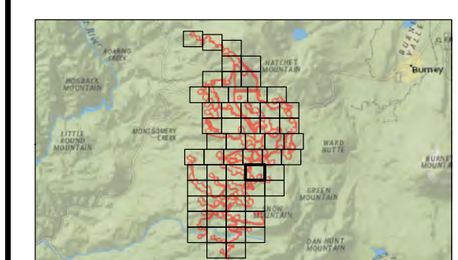

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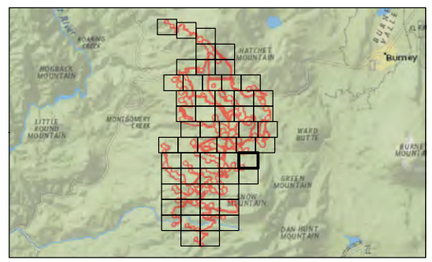

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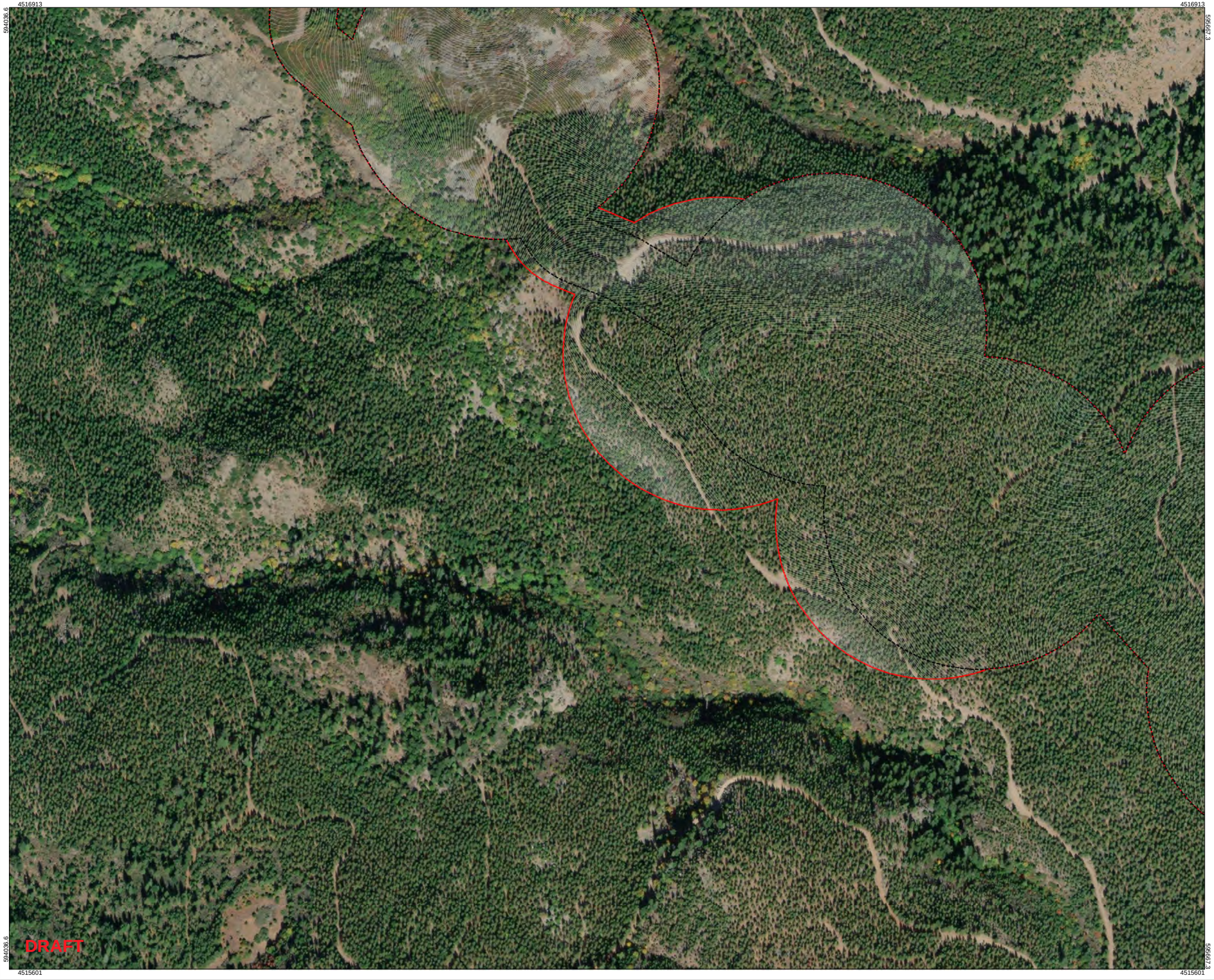

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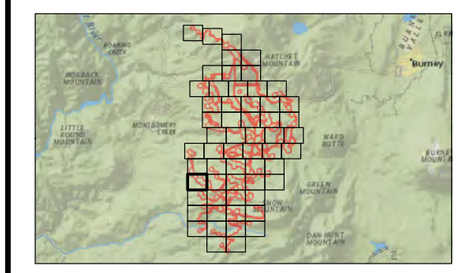

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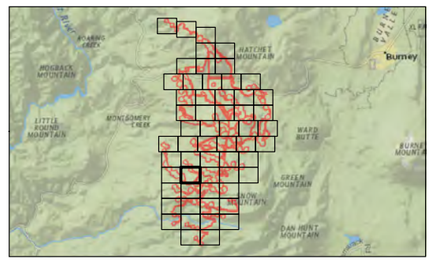

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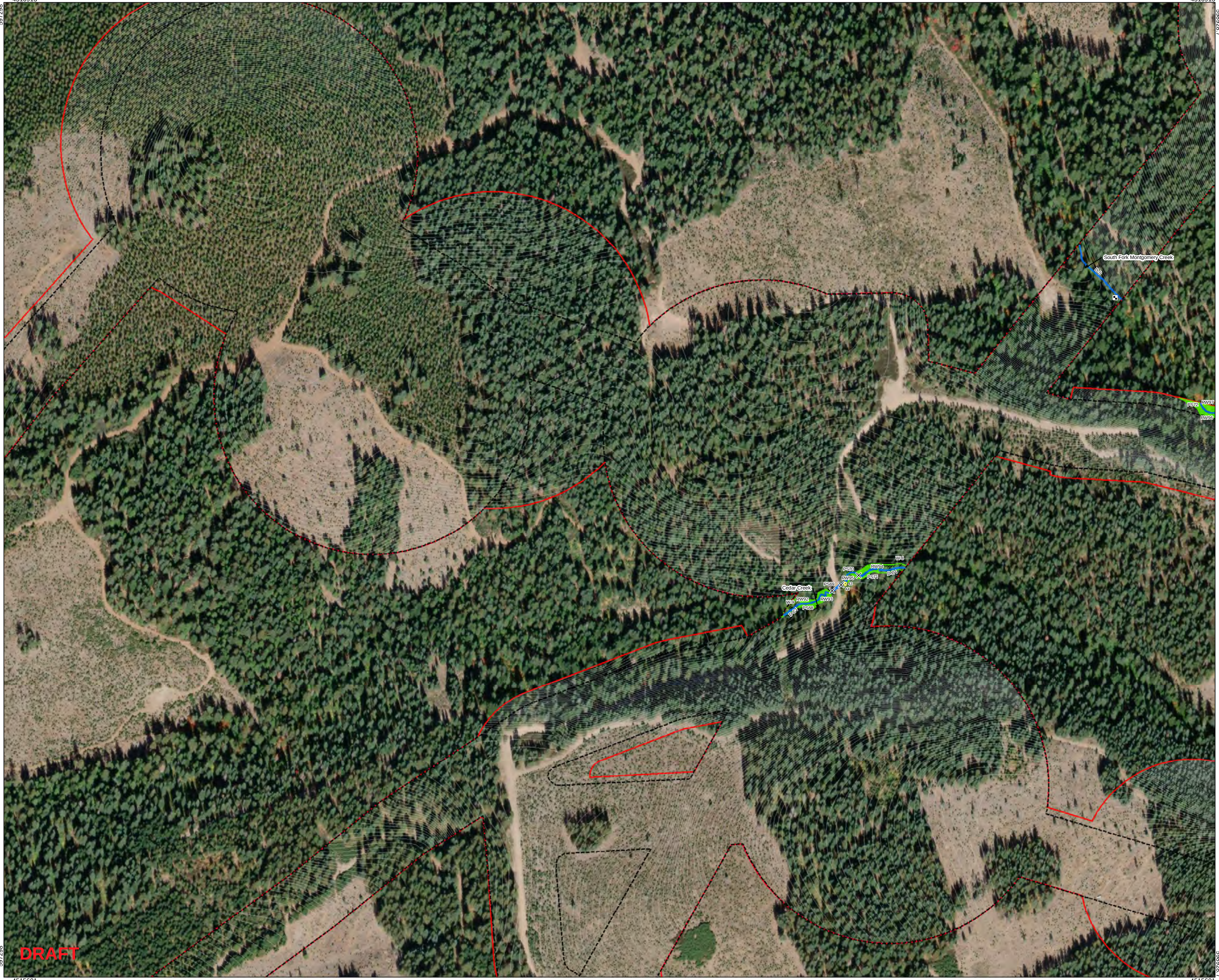

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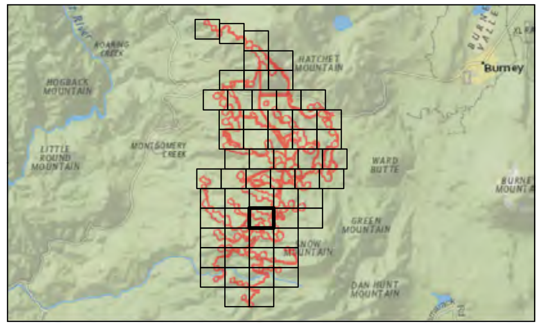

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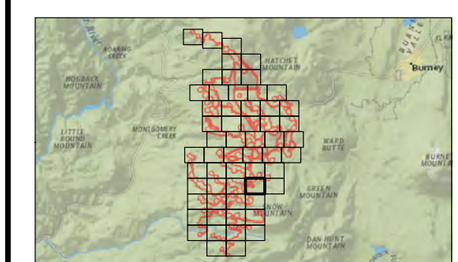

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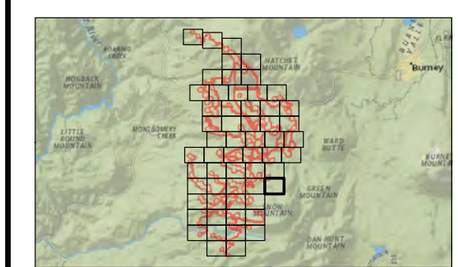

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Figure No.
3

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Title
Potential Waters of the United States

Client/Project
185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

N

0 200 400 Feet
(At original document size of 24x36)
1:2,400

- Survey Area (6,118 acres)
- Project Site
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- Culvert
- Historic Ditch
- Ordinary High Water Mark
- 3-Parameter Data Point
- Feature Width Change
- Test Pit
- Map Reference Point

Waters of the United States (2019)

Type
- Riparian Wetland (2.520 acres)
- Wetland Meadow (0.340 acre)
- Wetland Seep/Spring (0.019 acre)

Other Waters
- Ephemeral Stream (0.118 acres)
- Intermittent Stream (0.711 acres)
- Perennial Stream (2.165 acres)

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Type
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- Riparian Wetland (24.288 acres)
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Other Waters
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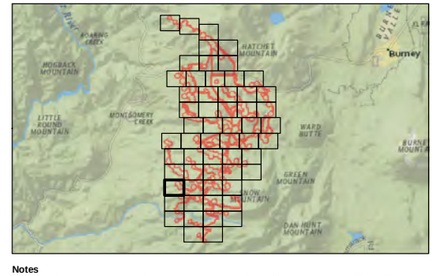

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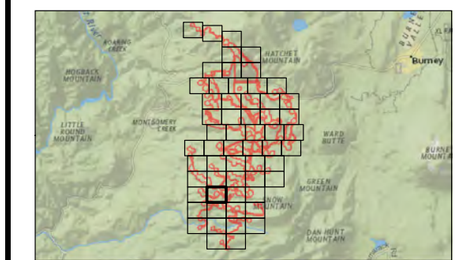

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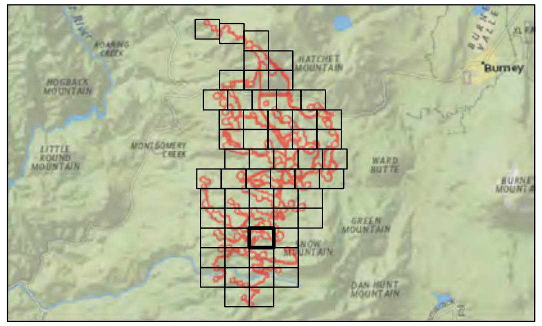

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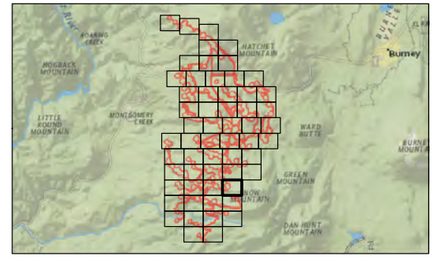

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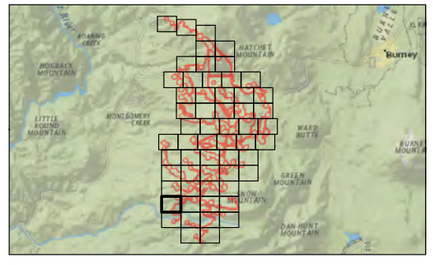

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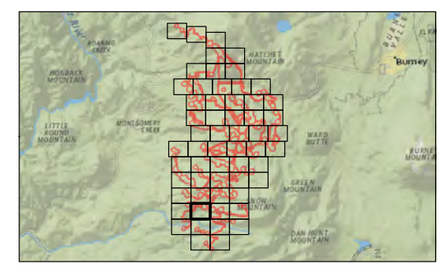

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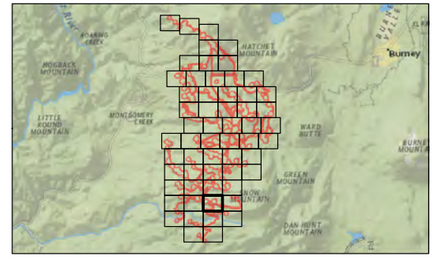

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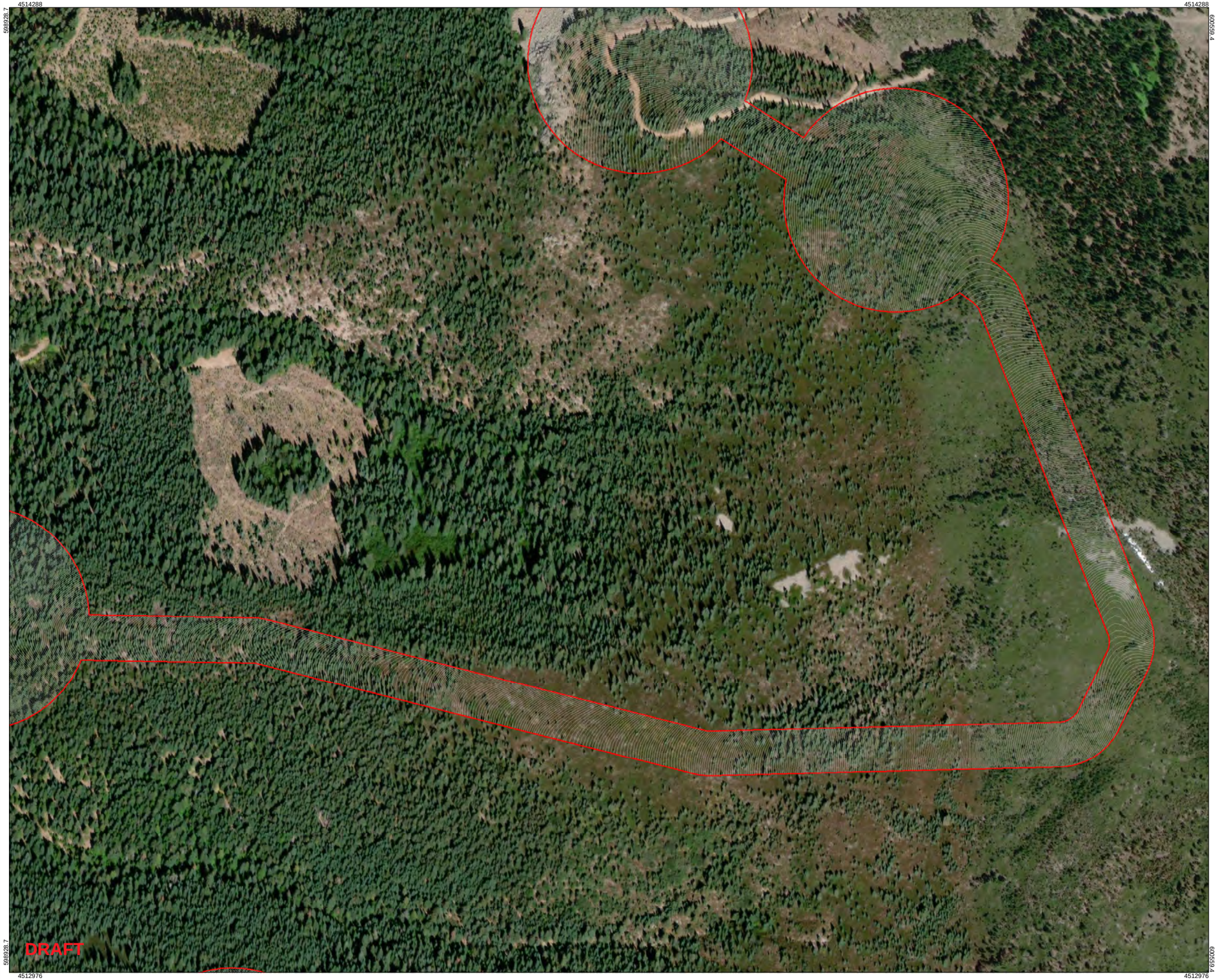

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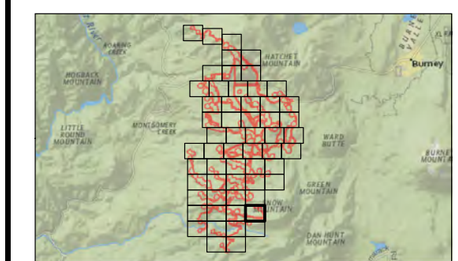

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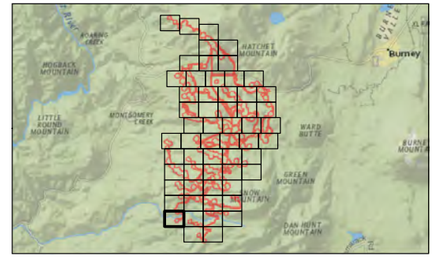

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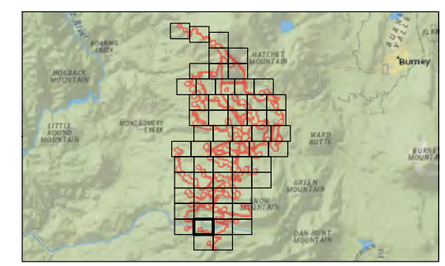
- Pond (0.181 acre)



Notes
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2. Delineation Dates: October-December 2017, August 2018, September 2019
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Figure No.
3

DRAFT

Title
Potential Waters of the United States

Client/Project
185804576
ConnectGen Generating LLC
Fountain Wind Project

Project Location
Shasta County, California

Prepared by REM on 2019-11-01
TR by GC on 2019-11-01
IR Review by SC on 2019-11-05

N

0 200 400 Feet
(At original document size of 24x36)
1:2,400

- Survey Area (6,118 acres)
- Project Site
- 2 ft Contour
- Culvert
- Historic Ditch
- Ordinary High Water Mark
- 3-Parameter Data Point
- Feature Width Change
- Test Pit
- Map Reference Point

Waters of the United States (2019)

Type
- Riparian Wetland (2.520 acres)
- Wetland Meadow (0.340 acre)
- Wetland Seep/Spring (0.019 acre)

Other Waters
- Ephemeral Stream (0.118 acres)
- Intermittent Stream (0.711 acres)
- Perennial Stream (2.165 acres)

Waters of the United States (2017, 2018)

Type
- Fresh Emergent Wetland (0.967 acre)
- Riparian Wetland (24.288 acres)
- Seasonal Wetland (0.120 acre)
- Vegetated Ditch (0.174 acre)
- Wetland Meadow (8.374 acres)
- Wetland Seep/Spring (1.790 acres)

Other Waters
- Ephemeral Stream (0.441 acre)
- Intermittent Stream (2.150 acres)
- Non-Vegetated Ditch (0.239 acre)
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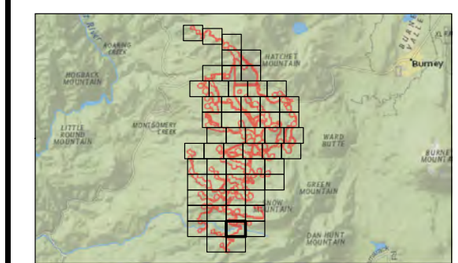
- Pond (0.181 acre)



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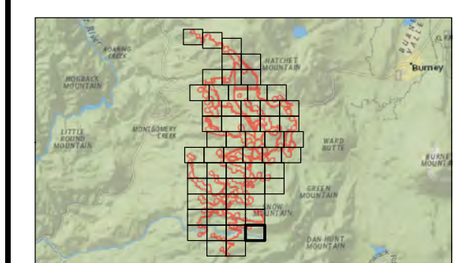

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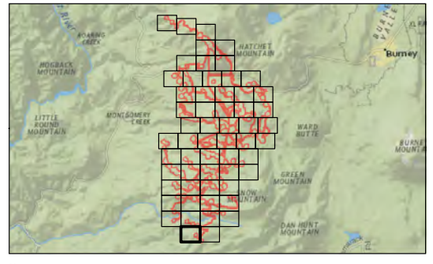

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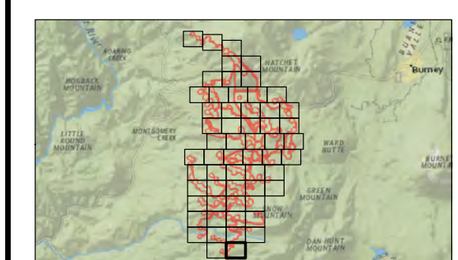

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APPENDICES

Appendix A AQUATIC RESOURCE SURVEY RESULTS

Table A-1. Aquatic Resources

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
Wetlands						
FEW1	fresh emergent	PEM	40.890447	-121.834332	0.017	--
FEW2	fresh emergent	PEM	40.853232	-121.780988	0.007	56
FEW3	fresh emergent	PEM	40.841437	-121.861347	0.882	--
FEW4	fresh emergent	PEM	40.840474	-121.821305	0.042	55
FEW5	fresh emergent	PEM	40.840517	-121.821061	0.019	45
RW1	riparian wetland	PSS	40.891495	-121.835363	0.780	--
RW2	riparian wetland	PSS	40.891599	-121.835343	0.494	--
RW3	riparian wetland	PSS	40.890837	-121.834593	0.166	--
RW4	riparian wetland	PSS	40.890337	-121.834052	0.025	--
RW5	riparian wetland	PSS	40.889439	-121.833081	1.268	--
RW6	riparian wetland	PSS	40.888925	-121.832221	0.447	--
RW7	riparian wetland	PSS	40.887418	-121.830094	0.258	--
RW8	riparian wetland	PSS	40.886252	-121.828624	0.246	--
RW9	riparian wetland	PSS	40.884149	-121.826098	0.268	--
RW10	riparian wetland	PSS	40.883870	-121.825625	0.239	--
RW11	riparian wetland	PFO	40.873218	-121.858120	0.114	--
RW12	riparian wetland	PFO	40.873100	-121.857852	0.060	--
RW13	riparian wetland	PFO	40.873292	-121.857597	0.703	--
RW14	riparian wetland	PFO	40.873670	-121.836937	0.050	--
RW15	riparian wetland	PFO	40.873635	-121.836923	0.051	--
RW16	riparian wetland	PSS	40.880939	-121.821330	0.291	--
RW17	riparian wetland	PSS	40.881021	-121.821352	0.131	--
RW18	riparian wetland	PSS	40.878541	-121.818671	0.481	--
RW19	riparian wetland	PSS	40.877669	-121.818184	0.549	--
RW20	riparian wetland	PSS	40.877059	-121.818055	0.114	--
RW21	riparian wetland	PSS	40.876417	-121.817259	0.057	--
RW22	riparian wetland	PSS	40.875833	-121.816962	0.099	--
RW23	riparian wetland	PSS	40.875776	-121.816837	0.082	--
RW24	riparian wetland	PSS	40.873509	-121.815448	0.290	--
RW25	riparian wetland	PSS	40.873640	-121.815454	0.136	--
RW26	riparian wetland	PSS	40.872656	-121.813937	0.067	--
RW27	riparian wetland	PSS	40.872654	-121.813875	0.090	--
RW28	riparian wetland	PFO	40.860975	-121.837816	0.500	--

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
RW29	riparian wetland	PFO	40.860524	-121.837613	1.235	--
RW30	riparian wetland	PSS	40.871419	-121.814428	0.191	--
RW31	riparian wetland	PSS	40.871190	-121.814446	0.225	--
RW32	riparian wetland	PSS	40.868878	-121.814728	0.126	--
RW33	riparian wetland	PSS	40.868779	-121.814774	0.115	--
RW34	riparian wetland	PSS	40.865209	-121.818110	0.010	--
RW35	riparian wetland	PSS	40.864723	-121.818203	0.039	--
RW36	riparian wetland	PSS	40.865208	-121.818005	0.006	--
RW37	riparian wetland	PSS	40.864720	-121.818083	0.012	--
RW38	riparian wetland	PSS	40.863026	-121.814215	0.114	--
RW39	riparian wetland	PSS	40.862944	-121.814297	0.102	--
RW40	riparian wetland	PSS	40.852568	-121.844232	0.062	--
RW41	riparian wetland	PSS	40.851808	-121.844058	0.154	--
RW42	riparian wetland	PSS	40.851444	-121.844056	0.077	--
RW43	riparian wetland	PSS	40.854344	-121.783416	0.144	--
RW44	riparian wetland	PSS	40.854555	-121.783674	0.028	--
RW45	riparian wetland	PSS	40.853794	-121.782600	0.207	--
RW46	riparian wetland	PSS	40.853914	-121.782609	0.076	--
RW47	riparian wetland	PSS	40.853190	-121.780694	1.690	--
RW48	riparian wetland	PFO	40.841212	-121.861894	0.471	--
RW49	riparian wetland	PSS	40.845914	-121.831109	0.071	--
RW50	riparian wetland	PSS	40.845931	-121.831647	0.037	--
RW51	riparian wetland	PSS	40.845351	-121.827945	1.649	--
RW52	riparian wetland	PSS	40.844681	-121.825535	0.451	--
RW53	riparian wetland	PSS	40.844679	-121.825674	0.479	--
RW54	riparian wetland	PSS	40.842373	-121.822825	0.338	--
RW55	riparian wetland	PSS	40.841967	-121.822511	0.456	--
RW56	riparian wetland	PSS	40.840733	-121.821993	0.208	--
RW57	riparian wetland	PSS	40.840582	-121.820956	0.065	--
RW58	riparian wetland	PSS	40.840503	-121.820908	0.042	--
RW59	riparian wetland	PSS	40.840597	-121.816460	0.008	--
RW60	riparian wetland	PSS	40.840642	-121.816399	0.016	--
RW61	riparian wetland	PSS	40.834212	-121.817283	0.014	--
RW62	riparian wetland	PSS	40.834188	-121.817289	0.013	--
RW63	riparian wetland	PSS	40.833724	-121.816664	0.015	--
RW64	riparian wetland	PSS	40.833732	-121.816641	0.015	--

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
RW65	riparian wetland	PFO	40.815172	-121.812451	3.298	--
RW66	riparian wetland	PSS	40.823068	-121.778623	0.071	--
RW67	riparian wetland	PSS	40.822403	-121.777886	0.226	--
RW68	riparian wetland	PSS	40.821951	-121.777227	0.269	--
RW69	riparian wetland	PFO	40.820653	-121.778426	0.119	--
RW70	riparian wetland	PFO	40.820769	-121.778299	0.034	--
RW71	riparian wetland	PFO	40.820366	-121.778372	0.006	--
RW72	riparian wetland	PFO	40.820404	-121.778264	0.015	--
RW73	riparian wetland	PFO	40.820227	-121.778185	0.081	--
RW74	riparian wetland	PFO	40.812569	-121.846053	0.201	--
RW75	riparian wetland	PFO	40.812629	-121.845533	0.014	--
RW76	riparian wetland	PSS	40.814488	-121.820920	0.034	--
RW77	riparian wetland	PSS	40.814419	-121.820983	0.066	--
RW78	riparian wetland	PSS	40.812468	-121.817060	0.027	--
RW79	riparian wetland	PSS	40.812562	-121.817172	0.009	--
RW80	riparian wetland	PSS	40.812526	-121.816962	0.025	--
RW81	riparian wetland	PSS	40.812052	-121.816732	0.105	--
RW82	riparian wetland	PSS	40.812152	-121.816532	0.146	--
RW83	riparian wetland	PFO	40.814566	-121.810205	0.003	--
RW84	riparian wetland	PFO	40.801414	-121.879709	0.287	--
RW85	riparian wetland	PSS	40.796313	-121.810630	0.209	--
RW86	riparian wetland	PSS	40.796408	-121.810553	0.136	--
RW87	riparian wetland	PSS	40.795604	-121.810194	0.072	--
RW88	riparian wetland	PSS	40.795361	-121.810729	0.029	--
RW89	riparian wetland	PSS	40.795248	-121.810832	0.005	--
RW90	riparian wetland	PSS	40.795221	-121.810645	0.033	--
RW91	riparian wetland	PSS	40.795062	-121.810106	0.374	--
RW92	riparian wetland	PSS	40.790117	-121.833817	0.045	--
RW93	riparian wetland	PSS	40.790047	-121.833793	0.069	--
RW94	riparian wetland	PSS	40.790446	-121.832991	0.051	--
RW95	riparian wetland	PSS	40.790362	-121.833069	0.038	--
RW96	riparian wetland	PSS	40.792191	-121.826971	0.301	--
RW97	riparian wetland	PSS	40.792341	-121.827458	0.041	--
RW98	riparian wetland	PSS	40.792227	-121.826803	0.049	--
RW99	riparian wetland	PSS	40.792068	-121.826113	0.008	--
RW100	riparian wetland	PSS	40.791793	-121.825514	0.069	--

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
RW101	riparian wetland	PSS	40.791591	-121.825292	0.052	--
RW102	riparian wetland	PSS	40.791175	-121.824461	0.149	--
RW103	riparian wetland	PSS	40.791207	-121.824287	0.080	--
RW104	riparian wetland	PSS	40.791193	-121.822844	0.014	--
RW105	riparian wetland	PSS	40.773617	-121.852219	0.011	--
RW106	riparian wetland	PSS	40.773563	-121.852166	0.013	--
RW107	riparian wetland	PSS	40.773601	-121.850887	0.008	--
RW108	riparian wetland	PSS	40.773663	-121.850833	0.011	--
RW109	riparian wetland	PSS	40.773549	-121.850483	0.012	--
RW110	riparian wetland	PSS	40.773623	-121.850581	0.002	--
RW111	riparian wetland	PSS	40.773621	-121.850358	0.008	--
RW112	riparian wetland	PSS	40.773944	-121.849629	0.004	--
RW113	riparian wetland	PSS	40.773861	-121.849497	0.009	--
RW114	riparian wetland	PSS	40.773926	-121.849114	0.008	--
RW115	riparian wetland	PSS	40.773981	-121.848678	0.011	--
RW116	riparian wetland	PSS	40.774095	-121.848464	0.005	--
RW117	riparian wetland	PSS	40.774359	-121.847838	0.008	--
RW118	riparian wetland	PSS	40.774336	-121.847781	0.008	--
RW119	riparian wetland	PSS	40.774418	-121.847670	0.008	--
RW120	riparian	PFO	40.759667	-121.867426	0.045	--
RW121	riparian	PFO	40.759582	-121.867279	0.146	--
RW122	riparian	PFO	40.761524	-121.871080	0.028	--
RW123	riparian	PSS	40.757966	-121.833940	0.033	--
RW124	riparian	PSS	40.757819	-121.834125	0.039	--
SW1	seasonal	PEM	40.855418	-121.796332	0.087	--
SW2	seasonal	PEM	40.830941	-121.848041	0.006	--
SW3	seasonal	PEM	40.830981	-121.847850	0.019	--
SW4	seasonal	PEM	40.832394	-121.847031	0.003	--
SW5	seasonal	PEM	40.815233	-121.804631	0.005	--
VD1	vegetated ditch	PEM	40.864946	-121.821408	0.005	114
VD2	vegetated ditch	PEM	40.864915	-121.821259	0.003	73
VD3	vegetated ditch	PEM	40.864944	-121.821061	0.006	146
VD4	vegetated ditch	PEM	40.865218	-121.820776	0.014	739
VD5	vegetated ditch	PEM	40.836493	-121.820790	0.001	52
VD6	vegetated ditch	PEM	40.816789	-121.789207	0.003	54
VD7	vegetated ditch	PEM	40.812409	-121.845484	0.003	59

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
VD8	vegetated ditch	PEM	40.806278	-121.880500	0.003	152
VD9	vegetated ditch	PEM	40.805908	-121.880505	0.027	235
VD10	vegetated ditch	PEM	40.803975	-121.879762	0.020	219
VD11	vegetated ditch	PEM	40.802449	-121.879872	0.057	415
VD12	vegetated ditch	PEM	40.801865	-121.879357	0.032	174
WM1	meadow	PEM	40.864720	-121.822380	2.578	--
WM2	meadow	PEM	40.853997	-121.782958	0.095	--
WM3	meadow	PEM	40.853828	-121.782279	0.327	--
WM4	meadow	PEM	40.853931	-121.780587	0.266	--
WM5	meadow	PEM	40.852239	-121.780911	0.046	--
WM6	meadow	PEM	40.851990	-121.780767	0.038	--
WM7	meadow	PEM	40.841956	-121.861564	0.147	--
WM8	meadow	PFO	40.814975	-121.805890	4.614	--
WM9	meadow	PEM	40.818286	-121.794219	0.039	--
WM10	meadow	PEM	40.818246	-121.793875	0.030	--
WM11	meadow	PEM	40.818302	-121.793441	0.133	--
WM12	meadow	PEM	40.824337	-121.780008	0.028	--
WM13	meadow	PEM	40.824205	-121.779653	0.005	--
WM14	meadow	PEM	40.823941	-121.779240	0.028	--
SSW1	seep/spring	PEM	40.880767	-121.821626	0.011	--
SSW2	seep/spring	PEM	40.877874	-121.818932	0.002	--
SSW3	seep/spring	PSS	40.865232	-121.819485	0.414	--
SSW4	seep/spring	PSS	40.853703	-121.783179	0.062	--
SSW5	seep/spring	PEM	40.845116	-121.825675	0.001	--
SSW6	seep/spring	PEM	40.844968	-121.825528	0.023	--
SSW7	seep/spring	PSS	40.843166	-121.822585	0.066	--
SSW8	seep/spring	PEM	40.840315	-121.815487	0.002	--
SSW9	seep/spring	PSS	40.847580	-121.781099	0.185	--
SSW10	seep/spring	PSS	40.836221	-121.820897	0.172	--
SSW11	seep/spring	PSS	40.836672	-121.820496	0.057	--
SSW12	seep/spring	PEM	40.837776	-121.818593	0.114	--
SSW13	seep/spring	PEM	40.834990	-121.816054	0.004	--
SSW14	seep/spring	PEM	40.838192	-121.815089	0.003	--
SSW15	seep/spring	PSS	40.812212	-121.845667	0.067	--
SSW16	seep/spring	PEM	40.791346	-121.825301	0.012	--
SSW17	seep/spring	PEM	40.790844	-121.820400	0.007	--

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
SSW18	seep/spring	PEM	40.791067	-121.820056	0.003	--
SSW19	seep/spring	PEM	40.791744	-121.819765	0.005	--
SSW20	seep/spring	PEM	40.791531	-121.819862	0.004	--
SSW21	seep/spring	PEM	40.791221	-121.819697	0.005	--
SSW22	seep/spring	PEM	40.791351	-121.819529	0.002	--
SSW23	seep/spring	PEM	40.791289	-121.819441	0.004	--
SSW24	seep/spring	PEM	40.773057	-121.857046	0.010	--
SSW25	seep/spring	PEM	40.773023	-121.856441	0.011	--
SSW26	seep/spring	PSS	40.774072	-121.849235	0.153	--
SSW27	seep/spring	PSS	40.774109	-121.848712	0.051	--
SSW28	seep/spring	PSS	40.775018	-121.847328	0.100	--
SSW29	seep/spring	PEM	40.769698	-121.835837	0.005	--
SSW30	seep/spring	PSS	40.759478	-121.867748	0.004	--
SSW31	seep/spring	PFO	40.758601	-121.867078	0.230	--
1	riparian	PSS	40.83385673	-121.78377	1.020	--
2	meadow	PEM	40.82826307	-121.787843	0.244	--
3	meadow	PSS	40.82781361	-121.787015	0.072	--
4	meadow	PSS	40.82791797	-121.787333	0.024	--
5	riparian	PSS	40.82542795	-121.782464	0.083	--
6	riparian	PSS	40.82508067	-121.781715	0.093	--
8	riparian	PFO	40.790353	-121.832811	0.087	--
9	riparian	PFO	40.79003735	-121.83405	0.067	--
10	seep/spring	PEM	40.7750096	-121.847283	0.002	--
11	seep/spring	PEM	40.77491331	-121.847382	0.016	--
50	riparian	PSS	40.84053307	-121.863502	0.373	--
51	riparian	PSS	40.82953048	-121.845301	0.032	--
53	riparian	PFO	40.78585444	-121.851623	0.634	--
56	riparian	PFO	40.79689706	-121.810473	0.048	--
57	riparian	PFO	40.81279719	-121.846088	0.084	--
Other Waters						
ES1	ephemeral stream	R4SB	40.906356	-121.871535	0.004	160
ES2	ephemeral stream	R4SB	40.895389	-121.847652	0.015	323
ES3	ephemeral stream	R4SB	40.873249	-121.848448	0.027	395
ES4	ephemeral stream	R4SB	40.873446	-121.846996	0.020	428
ES5	ephemeral stream	R4SB	40.877326	-121.819019	0.022	153
ES6	ephemeral stream	R4SB	40.877415	-121.818606	0.005	42

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
ES7	ephemeral stream	R4SB	40.865603	-121.834594	0.001	54
ES8	ephemeral stream	R4SB	40.864961	-121.832654	0.007	153
ES9	ephemeral stream	R4SB	40.865410	-121.829715	0.001	48
ES10	ephemeral stream	R4SB	40.865286	-121.829737	0.005	43
ES11	ephemeral stream	R4SB	40.864870	-121.829891	0.004	156
ES12	ephemeral stream	R4SB	40.851954	-121.846311	0.003	112
ES13	ephemeral stream	R4SB	40.841939	-121.862610	0.017	139
ES14	ephemeral stream	R4SB	40.839359	-121.862111	0.003	137
ES15	ephemeral stream	R4SB	40.838893	-121.861779	0.019	272
ES16	ephemeral stream	R4SB	40.842927	-121.826460	0.005	114
ES17	ephemeral stream	R4SB	40.843052	-121.826202	0.008	329
ES18	ephemeral stream	R4SB	40.840847	-121.824265	0.006	237
ES19	ephemeral stream	R4SB	40.839643	-121.823468	0.006	262
ES20	ephemeral stream	R4SB	40.839820	-121.822907	0.0003	14
ES21	ephemeral stream	R4SB	40.838333	-121.819333	0.003	112
ES22	ephemeral stream	R4SB	40.838442	-121.861017	0.014	294
ES23	ephemeral stream	R4SB	40.838295	-121.860787	0.004	78
ES24	ephemeral stream	R4SB	40.832081	-121.846274	0.016	686
ES25	ephemeral stream	R4SB	40.830269	-121.841112	0.007	303
ES26	ephemeral stream	R4SB	40.829453	-121.834288	0.047	1,025
ES27	ephemeral stream	R4SB	40.838263	-121.819891	0.009	202
ES28	ephemeral stream	R4SB	40.826878	-121.818557	0.066	956
ES29	ephemeral stream	R4SB	40.824791	-121.781061	0.002	111
ES30	ephemeral stream	R4SB	40.824625	-121.780605	0.008	369
ES31	ephemeral stream	R4SB	40.824258	-121.779830	0.002	78
ES32	ephemeral stream	R4SB	40.791800	-121.822685	0.008	111
ES33	ephemeral stream	R4SB	40.791404	-121.822874	0.017	148
ES34	ephemeral stream	R4SB	40.778938	-121.841781	0.010	109
ES35	ephemeral stream	R4SB	40.778336	-121.842372	0.001	19
ES36	ephemeral stream	R4SB	40.778746	-121.841329	0.049	713
ES37	ephemeral stream	R4SB	40.759364	-121.825149	0.003	145
IS1	intermittent stream	R4SB	40.902292	-121.857570	0.033	173
IS2	intermittent stream	R4SB	40.902230	-121.856919	0.027	147
IS3	intermittent stream	R4SB	40.891986	-121.835677	0.020	285
IS4	intermittent stream	R4SB	40.891287	-121.835221	0.040	292
IS5	intermittent stream	R4SB	40.888301	-121.831137	0.006	62

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
IS6	intermittent stream	R4SB	40.885150	-121.836824	0.007	148
IS7	intermittent stream	R4SB	40.873832	-121.856003	0.021	154
IS8	intermittent stream	R4SB	40.873543	-121.855497	0.018	152
IS9	intermittent stream	R4SB	40.882989	-121.837240	0.027	592
IS10	intermittent stream	R4SB	40.882074	-121.836977	0.007	97
IS11	intermittent stream	R4SB	40.881399	-121.836616	0.026	374
IS12	intermittent stream	R4SB	40.880431	-121.836389	0.034	365
IS13	intermittent stream	R4SB	40.879618	-121.836687	0.017	88
IS14	intermittent stream	R4SB	40.877990	-121.836783	0.153	1,112
IS15	intermittent stream	R4SB	40.876214	-121.836658	0.039	214
IS16	intermittent stream	R4SB	40.875449	-121.836446	0.051	277
IS17	intermittent stream	R4SB	40.872689	-121.813895	0.049	357
IS18	intermittent stream	R4SB	40.865501	-121.834510	0.005	100
IS19	intermittent stream	R4SB	40.865383	-121.834581	0.001	38
IS20	intermittent stream	R4SB	40.865005	-121.834400	0.008	179
IS21	intermittent stream	R4SB	40.871875	-121.814210	0.034	185
IS22	intermittent stream	R4SB	40.871195	-121.814471	0.096	332
IS23	intermittent stream	R4SB	40.868844	-121.814664	0.084	309
IS24	intermittent stream	R4SB	40.865301	-121.824299	0.002	101
IS25	intermittent stream	R4SB	40.864913	-121.824317	0.002	70
IS26	intermittent stream	R4SB	40.856538	-121.836553	0.020	431
IS27	intermittent stream	R4SB	40.855561	-121.835742	0.012	256
IS28	intermittent stream	R4SB	40.853804	-121.782916	0.001	29
IS29	intermittent stream	R4SB	40.845932	-121.828274	0.013	191
IS30	intermittent stream	R4SB	40.845955	-121.828123	0.004	77
IS31	intermittent stream	R4SB	40.846156	-121.827878	0.011	123
IS32	intermittent stream	R4SB	40.846328	-121.827286	0.019	211
IS33	intermittent stream	R4SB	40.845678	-121.826722	0.005	111
IS34	intermittent stream	R4SB	40.845972	-121.826426	0.002	105
IS35	intermittent stream	R4SB	40.840640	-121.815959	0.113	355
IS36	intermittent stream	R4SB	40.840927	-121.815144	0.031	166
IS37	intermittent stream	R4SB	40.841785	-121.812045	0.032	344
IS38	intermittent stream	R4SB	40.841435	-121.813888	0.023	253
IS39	intermittent stream	R4SB	40.841661	-121.813144	0.029	211
IS40	intermittent stream	R4SB	40.841169	-121.814585	0.026	1,840
IS41	intermittent stream	R4SB	40.841230	-121.814087	0.008	178

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
IS42	intermittent stream	R4SB	40.841105	-121.813507	0.006	127
IS43	intermittent stream	R4SB	40.841216	-121.813413	0.012	236
IS44	intermittent stream	R4SB	40.839558	-121.806713	0.080	1726
IS45	intermittent stream	R4SB	40.832597	-121.847999	0.017	240
IS46	intermittent stream	R4SB	40.832019	-121.847418	0.005	235
IS47	intermittent stream	R4SB	40.831425	-121.847554	0.009	187
IS48	intermittent stream	R4SB	40.837736	-121.819629	0.011	232
IS49	intermittent stream	R4SB	40.837735	-121.819103	0.005	112
IS50	intermittent stream	R4SB	40.834977	-121.820063	0.007	106
IS51	intermittent stream	R4SB	40.818108	-121.820309	0.085	31
IS52	intermittent stream	R4SB	40.818174	-121.797261	0.011	93
IS53	intermittent stream	R4SB	40.818237	-121.796939	0.032	136
IS54	intermittent stream	R4SB	40.818502	-121.796227	0.115	331
IS55	intermittent stream	R4SB	40.818492	-121.794751	0.022	52
IS56	intermittent stream	R4SB	40.818431	-121.794486	0.026	64
IS57	intermittent stream	R4SB	40.816631	-121.789141	0.011	45
IS58	intermittent stream	R4SB	40.816557	-121.789016	0.006	54
IS59	intermittent stream	R4SB	40.816286	-121.788860	0.012	174
IS60	intermittent stream	R4SB	40.816586	-121.788614	0.012	254
IS61	intermittent stream	R4SB	40.816687	-121.788219	0.003	17
IS62	intermittent stream	R4SB	40.812871	-121.847505	0.038	552
IS63	intermittent stream	R4SB	40.813439	-121.846288	0.002	26
IS64	intermittent stream	R4SB	40.813487	-121.846167	0.009	810
IS65	intermittent stream	R4SB	40.813601	-121.845811	0.008	171
IS66	intermittent stream	R4SB	40.813566	-121.845797	0.014	152
IS67	intermittent stream	R4SB	40.813453	-121.845488	0.003	53
IS68	intermittent stream	R4SB	40.813548	-121.845423	0.005	74
IS69	intermittent stream	R4SB	40.813555	-121.845068	0.004	164
IS70	intermittent stream	R4SB	40.812561	-121.843594	0.002	30
IS71	intermittent stream	R4SB	40.811568	-121.842162	0.160	1,102
IS72	intermittent stream	R4SB	40.812329	-121.843345	0.001	19
IS73	intermittent stream	R4SB	40.812293	-121.843261	0.004	91
IS74	intermittent stream	R4SB	40.812184	-121.843268	0.001	23
IS75	intermittent stream	R4SB	40.812181	-121.843193	0.001	18
IS76	intermittent stream	R4SB	40.812020	-121.843019	0.003	65
IS77	intermittent stream	R4SB	40.811839	-121.842595	0.000	17

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
IS78	intermittent stream	R4SB	40.811714	-121.842425	0.002	81
IS79	intermittent stream	R4SB	40.810935	-121.841241	0.001	31
IS80	intermittent stream	R4SB	40.810775	-121.841096	0.002	77
IS81	intermittent stream	R4SB	40.810621	-121.840841	0.011	123
IS82	intermittent stream	R4SB	40.810671	-121.840711	0.038	84
IS83	intermittent stream	R4SB	40.810468	-121.840460	0.020	146
IS84	intermittent stream	R4SB	40.810142	-121.840144	0.026	181
IS85	intermittent stream	R4SB	40.810108	-121.839803	0.014	98
IS86	intermittent stream	R4SB	40.783412	-121.837431	0.014	103
IS87	intermittent stream	R4SB	40.783452	-121.837191	0.012	40
IS88	intermittent stream	R4SB	40.783465	-121.836918	0.025	180
IS89	intermittent stream	R4SB	40.783254	-121.836246	0.035	128
IS90	intermittent stream	R4SB	40.783318	-121.836240	0.003	79
IS91	intermittent stream	R4SB	40.778848	-121.842346	0.003	52
IS92	intermittent stream	R4SB	40.778335	-121.842501	0.044	321
NVD1	ditch	R4	40.876514	-121.817529	0.013	175
NVD2	ditch	R4	40.876009	-121.817651	0.009	69
NVD3	ditch	R4	40.865345	-121.832613	0.008	49
NVD4	ditch	R4	40.864771	-121.824826	0.002	90
NVD5	ditch	R4	40.865351	-121.822307	0.028	611
NVD6	ditch	R4	40.871062	-121.814232	0.005	55
NVD7	ditch	R4	40.871095	-121.814017	0.004	438
NVD8	ditch	R4	40.852910	-121.781686	0.008	165
NVD9	ditch	R4	40.841927	-121.862077	0.013	188
NVD10	ditch	R4	40.845502	-121.827824	0.003	109
NVD11	ditch	R4	40.845267	-121.825812	0.002	87
NVD12	ditch	R4	40.839173	-121.822651	0.002	61
NVD13	ditch	R4	40.837795	-121.860348	0.015	327
NVD14	ditch	R4	40.837425	-121.859655	0.004	190
NVD15	ditch	R4	40.832313	-121.847360	0.012	170
NVD16	ditch	R4	40.834850	-121.816129	0.002	80
NVD17	ditch	R4	40.812320	-121.845772	0.003	38
NVD18	ditch	R4	40.806514	-121.880685	0.017	189
NVD19	ditch	R4	40.791069	-121.821182	0.022	477
NVD20	ditch	R4	40.773181	-121.854917	0.058	1,259
NVD21	ditch	R4	40.778783	-121.842090	0.010	148

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
PS1	perennial stream	R3UB	40.891052	-121.834861	0.004	47
PS2	perennial stream	R3UB	40.890757	-121.834580	0.022	234
PS3	perennial stream	R3UB	40.890288	-121.834029	0.018	162
PS4	perennial stream	R3UB	40.889536	-121.833095	0.027	292
PS5	perennial stream	R3UB	40.888392	-121.831478	0.132	161
PS6	perennial stream	R3UB	40.886975	-121.829703	0.116	515
PS7	perennial stream	R3UB	40.886555	-121.829011	0.004	38
PS8	perennial stream	R3UB	40.884426	-121.826436	0.709	2,570
PS9	perennial stream	R3UB	40.873235	-121.857989	0.101	209
PS10	perennial stream	R3UB	40.873519	-121.857510	0.035	301
PS11	perennial stream	R3UB	40.873715	-121.856838	0.002	19
PS12	perennial stream	R3UB	40.875151	-121.836440	0.002	34
PS13	perennial stream	R3UB	40.873657	-121.836928	0.150	950
PS14	perennial stream	R3UB	40.880994	-121.821371	0.410	1173
PS15	perennial stream	R3UB	40.880154	-121.819299	0.012	33
PS16	perennial stream	R3UB	40.877758	-121.818181	0.663	1608
PS17	perennial stream	R3UB	40.876049	-121.816853	0.019	36
PS18	perennial stream	R3UB	40.875770	-121.816901	0.055	170
PS19	perennial stream	R3UB	40.873544	-121.815365	0.082	299
PS20	perennial stream	R3UB	40.860908	-121.837674	0.408	558
PS21	perennial stream	R3UB	40.865306	-121.821159	0.007	79
PS22	perennial stream	R3UB	40.865207	-121.818055	0.050	306
PS23	perennial stream	R3UB	40.864722	-121.818136	0.097	306
PS24	perennial stream	R3UB	40.862986	-121.814253	0.218	474
PS25	perennial stream	R3UB	40.859710	-121.837571	0.058	313
PS26	perennial stream	R3UB	40.852640	-121.844214	0.026	113
PS27	perennial stream	R3UB	40.852397	-121.844109	0.028	77
PS28	perennial stream	R3UB	40.852198	-121.844210	0.052	88
PS29	perennial stream	R3UB	40.851947	-121.844247	0.036	99
PS30	perennial stream	R3UB	40.851470	-121.844024	0.063	269
PS31	perennial stream	R3UB	40.854543	-121.783690	0.025	184
PS32	perennial stream	R3UB	40.854006	-121.782781	0.009	189
PS33	perennial stream	R3UB	40.853705	-121.782355	0.021	155
PS34	perennial stream	R3UB	40.853338	-121.781588	0.043	312
PS35	perennial stream	R3UB	40.853261	-121.780828	0.007	50
PS36	perennial stream	R3UB	40.853187	-121.780676	0.004	55

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
PS37	perennial stream	R3UB	40.853129	-121.780515	0.002	47
PS38	perennial stream	R3UB	40.845952	-121.831505	0.221	487
PS39	perennial stream	R3UB	40.845625	-121.829304	0.076	207
PS40	perennial stream	R3UB	40.845697	-121.828495	0.081	251
PS41	perennial stream	R3UB	40.845591	-121.827736	0.026	98
PS42	perennial stream	R3UB	40.845616	-121.827171	0.043	159
PS43	perennial stream	R3UB	40.844984	-121.826160	0.132	582
PS44	perennial stream	R3UB	40.844033	-121.824461	0.111	605
PS45	perennial stream	R3UB	40.843496	-121.823571	0.013	31
PS46	perennial stream	R3UB	40.842321	-121.822743	0.151	812
PS47	perennial stream	R3UB	40.843215	-121.822945	0.003	61
PS48	perennial stream	R3UB	40.841208	-121.822502	0.004	33
PS49	perennial stream	R3UB	40.840861	-121.822138	0.031	342
PS50	perennial stream	R3UB	40.840545	-121.821538	0.011	82
PS51	perennial stream	R3UB	40.840550	-121.820834	0.015	81
PS52	perennial stream	R3UB	40.835693	-121.820022	0.060	435
PS53	perennial stream	R3UB	40.834810	-121.819333	0.040	431
PS54	perennial stream	R3UB	40.834230	-121.817335	0.015	161
PS55	perennial stream	R3UB	40.834062	-121.817060	0.008	35
PS56	perennial stream	R3UB	40.833728	-121.816652	0.020	218
PS57	perennial stream	R3UB	40.820369	-121.778294	0.278	366
PS58	perennial stream	R3UB	40.814458	-121.820970	0.127	301
PS59	perennial stream	R3UB	40.811899	-121.817195	0.058	253
PS60	perennial stream	R3UB	40.812587	-121.817122	0.006	44
PS61	perennial stream	R3UB	40.812299	-121.816822	0.105	396
PS62	perennial stream	R3UB	40.796770	-121.810586	0.024	102
PS63	perennial stream	R3UB	40.796583	-121.810632	0.006	43
PS64	perennial stream	R3UB	40.796577	-121.810592	0.003	42
PS65	perennial stream	R3UB	40.796208	-121.810647	0.071	249
PS66	perennial stream	R3UB	40.795745	-121.810385	0.036	78
PS67	perennial stream	R3UB	40.795237	-121.810537	0.050	89
PS68	perennial stream	R3UB	40.790099	-121.833763	0.033	183
PS69	perennial stream	R3UB	40.790225	-121.833462	0.013	47
PS70	perennial stream	R3UB	40.790348	-121.833266	0.023	122
PS71	perennial stream	R3UB	40.790409	-121.832957	0.021	95
PS72	perennial stream	R3UB	40.792315	-121.827468	0.023	117

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
PS73	perennial stream	R3UB	40.792203	-121.826799	0.038	201
PS74	perennial stream	R3UB	40.791810	-121.825631	0.113	407
PS75	perennial stream	R3UB	40.791473	-121.824980	0.014	33
PS76	perennial stream	R3UB	40.791205	-121.824384	0.053	288
PS77	perennial stream	R3UB	40.773590	-121.852192	0.123	268
PS78	perennial stream	R3UB	40.773831	-121.849568	0.419	925
PS79	perennial stream	R3UB	40.774359	-121.847796	0.070	152
PS80	perennial stream	R3UB	40.774332	-121.847733	0.005	40
PS81	perennial stream	R3UB	40.775636	-121.846020	0.039	86
PS82	perennial stream	R3UB	40.759626	-121.867440	0.196	426
PS83	perennial stream	R3UB	40.765307	-121.837121	0.090	489
PS84	perennial stream	R3UB	40.758198	-121.867570	0.031	222
PS85	perennial stream	R3UB	40.757982	-121.833624	0.418	338
PS86	perennial stream	R3UB	40.747830	-121.840312	0.039	214
PON1	perennial stream	PUB	40.841583	-121.861610	0.137	--
PON2	perennial stream	PUB	40.812260	-121.845864	0.011	--
PON3	perennial stream	PUB	40.812339	-121.845654	0.033	--
A (Hatchet Creek)	perennial stream	R3UB	40.83388153	-121.783671	0.313	446
A1 (Hatchet Creek)	perennial stream	R3UB	40.82543492	-121.782441	0.314	341
B	intermittent stream	R4SB	40.83330343	-121.782393	0.001	60
C	ephemeral stream	R4SB	40.84286023	-121.807543	0.108	937
C1 (North Fork Cedar Creek)	perennial stream	R3UB	40.79003107	-121.834076	0.022	94
D	perennial stream	R3UB	40.82794635	-121.787638	0.003	40
D1 (North Fork Cedar Creek)	perennial stream	R3UB	40.79027933	-121.832742	0.028	121
E	perennial stream	R3UB	40.82803867	-121.787679	0.001	17
E1	intermittent stream	R4SB	40.78345333	-121.837588	0.008	61
E2	intermittent stream	R4SB	40.78344026	-121.838067	0.017	120
F	perennial stream	R3UB	40.82795794	-121.787653	0.0002	7
F1	intermittent stream	R4SB	40.78337647	-121.838211	0.011	78
G1	intermittent stream	R4SB	40.78341698	-121.83845	0.091	399
G2	intermittent stream	R4SB	40.78322327	-121.841412	0.223	970
H	perennial stream	R3UB	40.8281905	-121.787786	0.004	154
H1	intermittent stream	R4SB	40.78303504	-121.838906	0.003	75
I	perennial stream	R3UB	40.82809804	-121.787192	0.004	93

Aquatic Resource Name	Type	Aquatic Resource Classification			Acres	Linear Feet
		Cowardin	Location			
			Latitude	Longitude		
I1	intermittent stream	R4SB	40.78300564	-121.838841	0.001	46
J	perennial stream	R3UB	40.82804317	-121.786973	0.002	106
J1	intermittent stream	R3UB	40.78125253	-121.831685	0.095	1,037
K	perennial stream	R3UB	40.82803623	-121.786933	0.001	32
K1 (North Fork Little Cow Creek)	perennial stream	R3UB	40.77584467	-121.844045	0.143	519
L	intermittent stream	R4SB	40.82794342	-121.787615	0.001	14
L1	perennial stream	R3UB	40.77483319	-121.844982	0.102	372
M	perennial stream	R4SB	40.82776879	-121.786829	0.020	217
M1 (North Fork Little Cow Creek)	perennial stream	R3UB	40.77455022	-121.847517	0.031	114
N	intermittent stream	R4SB	40.84062839	-121.863574	0.042	307
O (North Fork Montgomery Creek)	perennial stream	R3UB	40.81742637	-121.842789	0.229	664
P1	intermittent stream	R4SB	40.81290446	-121.843947	0.026	192
P2	intermittent stream/culvert	R4SB	40.81312891	-121.844621	0.001	22
P3	intermittent stream	R4SB	40.81313024	-121.844629	0.014	104
Q (South Fork Montgomery Creek)	perennial stream	R3UB	40.80222033	-121.84041	0.405	980
R	perennial stream	R3UB	40.78735153	-121.848454	0.357	2,242
S	perennial stream	R3UB	40.79433757	-121.82953	0.059	321
T1	intermittent stream	R4SB	40.79775118	-121.875107	0.137	597
T2	intermittent stream	R4SB	40.8014536	-121.879136	0.017	75
U	ephemeral stream	R4SB	40.83708622	-121.778328	0.005	105
V	ephemeral stream/culvert	R4SB	40.83708226	-121.778127	0.002	50
W	ephemeral stream	R4SB	40.837079	-121.778076	0.004	102
W1	intermittent stream	R4SB	40.79694424	-121.8105455	0.013	56
X	perennial stream	R3UB	40.77361381	-121.8527186	0.085	309
Y	intermittent stream	R4SB	40.81281922	-121.8484931	0.009	63
Total		--	--	--	**51.900**	**73,183**

Appendix B WETLAND DETERMINATION DATA FORMS

North State Resources, Inc.

Data Point 1
Feature Type Intermittent Stream

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 10/10/17
Applicant/Owner: Avangrid State: CA
Investigator(s): Gabe Youngblood, John Holford Section, Township, Range Sec. 10, T35N, R1E
Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Concave Slope % 5
Subregion (LRR): MLRA 22B Lat: 40.902296° Long: -121.857121° Datum: NAD 83
Soil Map Unit Name: Goulder gravelly sandy loam, 15 to 30 percent slopes NWI Classification: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 8'
Feature Designation: Perennial _____ Intermittent ✓ Ephemeral _____ Blue-line on USGS Quad _____ Substrate Rock
Natural Drainage ✓ Artificial Drainage _____ Navigable Water _____

Remarks DP documents OHWM of an intermittent stream.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)
Total number of dominant species across all strata: _____ (B)
Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks No vegetation scoured channel.

Data Point 1

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soil pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- ✓ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Sediment and drift deposits indicate frequent flooding.

North State Resources, Inc.

Data Point: 2
Feature Type: Fresh Emergent Wetland

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/11/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): John Holford | Section, Township, Range: Sec. 14, T35N, R1E
Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope %: 0
Subregion (LRR): MLRA 22B | Lat: 40.890468° | Long: -121.834325° | Datum: NAD 83
Soil Map Unit Name: Obie-Mounthat complex, 5 to 15 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents a fresh emergent wetland within riparian habitat associated with Little Hatchet Creek.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30)			
1. Salix lasiolepis	20	Y	FACW
2. Alnus incana	5	N	FACW
3. Acer circinatum	5	N	FAC
4.			
50%= 15 20%= 6 Total Cover:	30		
Sapling/Shrub Stratum (Plot Size: 15)			
1. Salix lasiolepis	5	Y	FACW
2.			
3.			
4.			
50%= 2.5 20%= 1 Total Cover:	5		
Herb Stratum (Plot Size: 5)			
1. Ludwigia palustris	75	Y	OBL
2. Unkown grass	5	N	Unk
3. Scirpus microcarpus	5	N	OBL
4. Epilobium ciliatum	1	N	FACW
5.			
6.			
7.			
8.			
50%= 43 20%= 17.2 Total Cover:	86		
Woody/Vine Stratum (Plot Size: 30)			
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 3 (A)
Total number of dominant species across all strata: 3 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present.

Data Point 2

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	7.5YR 2.5/3	100					SL	mucky

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓ / N

Remarks

High organic matter, decomposing smell (not hydrogen sulfide). Soils meet the definition of indicator F1.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 1 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Approximately 1 inch of standing water provides wetland hydrology.

North State Resources, Inc.

Data Point: 3

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type: Upland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/11/17

Applicant/Owner: Avangrid | State: CA

Investigator(s): John Holford | Section, Township, Range: Sec. 14, T35N, R1E

Landform (hillslope, terrace, etc.): Toe of hillslope | Local relief (concave, convex, none): convex | Slope %: 1

Subregion (LRR): MLRA 22B | Lat: 40.890502° | Long: -121.834364° | Datum: NAD83

Soil Map Unit Name: Obie-Mounthat complex, 5 to 15 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP2 fresh emergent wetland.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30)			
1. Acer circinatum	15	Y	FAC
2. Calocedrus decurrens	10	Y	UPL
3. Pseudotsuga menziesii	10	Y	FACU
4.			
50%= 35 20%= 7 Total Cover:	35		
Sapling/Shrub Stratum (Plot Size: 15)	% Cover	Species?	Status
1. Ceanothus integerrimus	10	Y	UPL
2. Cornus nuttallii	1	N	FACU
3.			
4.			
50%= 6 20%= 3 Total Cover:	11		
Herb Stratum (Plot Size: 5)	% Cover	Species?	Status
1. Pteridium aquilinum	10	Y	FACU
2. Carex sp.	3	N	FACU
3. Symphoricarpos albus	1	N	FACU
4.			
5.			
6.			
7.			
8.			
50%= 7 20%= 2 Total Cover:	14		
Woody/Vine Stratum (Plot Size: 30)	% Cover	Species?	Status
1. Rubus parviflora	3	Y	FACU
2.			
50%= 20%= Total Cover:	3		

% Bare Ground in Herb Stratum 86 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)

Total number of dominant species across all strata: 6 (B)

Percent of dominant species that are OBL, FACW, or FAC: 17 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Carex sp. assumed to be FACU or drier. Dominant hydrophytic vegetation is not present.

Data Point 3

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/2	100					SL	charred bio material from fire
4-18	7.5YR 3/4	100					SL	

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soil.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology.

North State Resources, Inc.

Data Point: 4

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type: Riparian Wetland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/11/17

Applicant/Owner: Avangrid | State: CA

Investigator(s): John Holford | Section, Township, Range: Sec. 14, T35N, R1E

Landform (hillslope, terrace, etc.): Toe of hillslope | Local relief (concave, convex, none): concave | Slope %: 1

Subregion (LRR): MLRA 22B | Lat: 40.890069° | Long: -121.834209° | Datum: NAD83

Soil Map Unit Name: Obie-Mounthat complex, 5 to 15 percent slopes | NWI Classification: PSSC

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents riparian wetland adjacent to Little Hatchet Creek.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus incana	15	Y	FACW
2. Salix lasiolepis	15	Y	FACW
3. Acer circinatum	5	N	FAC
4.			
50%= 17.5 20%= 7 Total Cover:	35		

Sapling/Shrub Stratum (Plot Size: 15)	% Cover	Species?	Status
1. Salix lasiolepis	5	Y	FACW
2. Acer circinatum	5	Y	FACW
3. Cornus nuttallii	1	N	FACU
4.			
50%= 6.5 20%= 2.2 Total Cover:	11		

Herb Stratum (Plot Size: 5)	% Cover	Species?	Status
1. Carex sp.	65	Y	FACW
2. Platanthera dilatata	1	N	FACW
3.			
4.			
5.			
6.			
7.			
8.			
50%= 66 20%= 13.2 Total Cover:	66		

Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 34 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 5 (A)

Total number of dominant species across all strata: 5 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Carex sp. assumed to be FAC or wetter. Dominant hydrophytic vegetation is present.

Data Point 4

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 2/2	100					SL	mucky

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

High in organic matter. Soil meets the requirements of indicator F1 Loamy Mucky Mineral.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Saturation present throughout entire depth of soil sample. The water table was not observed.

North State Resources, Inc.

Data Point: 5
Feature Type: Upland

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/11/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): John Holford | Section, Township, Range: Sec. 14, T35N, R1E
Landform (hillslope, terrace, etc.): Hillslope | Local relief (concave, convex, none): Convex | Slope %: 2
Subregion (LRR): MLRA 22B | Lat: 40.890079° | Long: -121.834289° | Datum: NAD83
Soil Map Unit Name: Obie-Mounthat complex, 5 to 15 percent slopes | NWI Classification: Upland

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP4 riparian wetland.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30)			
1. Pseudotsuga menziesii	25	Y	FACU
2. Calocedrus decurrens	25	Y	UPL
3. Alnus incana	5	N	FACW
4.			
50%= 27.5 20%= 11 Total Cover:	55		
Sapling/Shrub Stratum (Plot Size: 15)	% Cover	Species?	Status
1. Acer circinatum	10	Y	FAC
2. Cornus nuttallii	3	N	FACU
3.			
4.			
50%= 6.5 20%= 2.6 Total Cover:	13		
Herb Stratum (Plot Size: 5)	% Cover	Species?	Status
1. Pteridium aquilinum	5	Y	FACU
2. Trillium albidum	1	N	FACU
3. Elymus glacus	1	N	FACU
4.			
5.			
6.			
7.			
8.			
50%= 3.5 20%= 1.4 Total Cover:	7		
Woody/Vine Stratum (Plot Size: 30)	% Cover	Species?	Status
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 93 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)
Total number of dominant species across all strata: 4 (B)
Percent of dominant species that are OBL, FACW, or FAC: 25 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominant hydrophytic vegetation is not present.

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/4	100					SL	
12-18	7.5YR 5/6	100					SL	

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soils.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology.

North State Resources, Inc.

Data Point 6
Feature Type Perennial Stream

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 10/11/17
Applicant/Owner: Avangrid State: CA
Investigator(s): John Holford Section, Township, Range Sec. 14, T35N, R1E
Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Concave Slope % 10
Subregion (LRR): MLRA 22B Lat: 40.888505° Long: -121.831906° Datum: NAD83
Soil Map Unit Name: Obie-Mounthat complex, 5 to 15 percent slopes NWI Classification: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 6'
Feature Designation: Perennial ✓ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad ✓ Substrate Cobble
Natural Drainage ✓ Artificial Drainage _____ Navigable Water _____

Remarks DP documents OHWM of Little Hatchet Creek.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)
Total number of dominant species across all strata: _____ (B)
Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks No veg scoured channel.

Data Point 6

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 1 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Surface water provides hydrology.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: DP7
Feature Type: Wetland Seep/Spring

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/11/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): John Holford | Section, Township, Range: Sec. 24, T35N, R1E
Landform (hillslope, terrace, etc.): Hillslope | Local relief (concave, convex, none): None | Slope %: 5
Subregion (LRR): MLRA 22B | Lat: 40.880789° | Long: -121.821713° | Datum: NAD83
Soil Map Unit Name: Windy and McCarthy very stony sandy loams, 30 to 50 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☑/☐ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☐/☒
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Normal circumstances not present- seep located on gravel logging road. Significant grading and compaction.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: _____)			
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)			
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: 5)			
1. Mimulus guttatus	20	Y	OBL
2. Juncus xiphioides	10	Y	OBL
3. Trifolium repens	10	Y	FAC
4. Juncus bufonius	10	Y	FACW
5. Hypericum perforatum	3	N	FACU
6. Elymus glaucus	1	N	FACU
7. Castilleja campestris	1	N	FACW
8.			
50%=28 20%=11 Total Cover:	55		
Woody/Vine Stratum (Plot Size: _____)			
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 45 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 4 (A)
Total number of dominant species across all strata: 4 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present.

Data Point DP7

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/2	100					SL	
3-6	10GY 5/1	95	7.5YR 5/8	5	C	M	SL	

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- ✓ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: gravel (road bed) Depth (Inches) 6 Hydric Soil Present? ✓ /

Remarks

Soils meet the requirements of indicator F2 loamy gleyed matrix.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes ✓ No _____ Depth (inches) 0-6 *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Saturation at the soil surface provides wetland hydrology.

North State Resources, Inc.

Data Point: 8
Feature Type: Upland

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/11/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): John Holford | Section, Township, Range: Sec. 24, T35N, R1E
Landform (hillslope, terrace, etc.): Hillslope | Local relief (concave, convex, none): None | Slope %: 50
Subregion (LRR): MLRA 22B | Lat: 40.880774° | Long: -121.821738° | Datum: NAD83
Soil Map Unit Name: Windy and McCarthy very stony sandy loams, 30 to 50 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP7 wetland seep/spring.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30)			
1. Pseudotsuga menziesii	30	Y	FACU
2.			
3.			
4.			
50%= 15 20%= 6 Total Cover:	30		
Sapling/Shrub Stratum (Plot Size: 15)	% Cover	Species?	Status
1. Paxistima myrsinites	20	Y	FACU
2. Notholithocarpus densiflorus	5	N	UPL
3. Calocedrus decurrens	5	N	UPL
4.			
50%= 15 20%= 6 Total Cover:	30		
Herb Stratum (Plot Size: 5)	% Cover	Species?	Status
1. Epilobium sp.	5	Y	FACU
2. Trillium sp.	1	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
50%= 3 20%= 1.2 Total Cover:	6		
Woody/Vine Stratum (Plot Size: 30)	% Cover	Species?	Status
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 45 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 0 (A)
Total number of dominant species across all strata: 3 (B)
Percent of dominant species that are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Epilobium sp. assumed FACU or drier due to presence of other hydrophytic vegetation. All species of Trillium are FACU. Dominant hydrophytic vegetation is not present.

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	5YR 5/3	100					SL	

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soils.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology.

North State Resources, Inc.

Data Point 9
Feature Type Ephemeral Stream

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 10/10/17
Applicant/Owner: Avangrid State: CA
Investigator(s): Gabe Youngblood, John Holford Section, Township, Range Sec. 22, T35N, R1E
Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Convex Slope % 5
Subregion (LRR): MLRA 22B Lat: 40.873445° Long: -121.846261° Datum: NAD 83
Soil Map Unit Name: Goulder gravelly sandy loam, 15 to 30 percent slopes NWI Classification: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped _____ Stream Width 2'
Feature Designation: Perennial _____ Intermittent _____ Ephemeral ✓ Blue-line on USGS Quad _____ Substrate Rock
Natural Drainage ✓ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents the headwaters of an ephemeral stream.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)
Total number of dominant species across all strata: _____ (B)
Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:	Multiply by	
OBL Species	x 1 =	0
FACW Species	x 2 =	0
FAC Species	x 3 =	0
FACU Species	x 4 =	0
UPL Species	x 5 =	0
Column Totals 0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

No vegetation scoured channel.

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? / X

Remarks

Scoured channel no soil pit.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Drift deposits indicate frequent flooding.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 10
Feature Type: Fresh Emergent Wetland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/24/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 32, T35N, R3E
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Concave | Slope %: 1
Subregion (LRR): MLRA 22B | Lat: 40.853245° | Long: -121.780950° | Datum: NAD83
Soil Map Unit Name: Gardens-Jacksback complex, 0 to 2 percent slopes | NWI Classification: PEMC1
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 6'
Feature Designation: Perennial ✓ Intermittent ____ Ephemeral ____ Blue-line on USGS Quad ✓ Substrate Soil & Vegetated
Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks

DP documents OHWM of a perennial stream with emergent vegetation.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Glyceria striata	80	Y	OBL
2. Unknown herb	5	N	UNK
3. Ludwigia palustris	1	N	OBL
4.			
5.			
6.			
7.			
8.			
50%=43 20%=17.2 Total Cover:	86		
Woody/Vine Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum 14 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)
Total number of dominant species across all strata: 1 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation
____ Dominance Test is >50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominate hydrophytic vegetation is present.

Data Point 10

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR3/1	90	10YR 4/6	10	C	PL	Loam	Gravelly Sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓ / N

Remarks

Soils meet the requirements for indicator F6 Redox Dark Surface.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 6 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Surface water provides wetland hydrology.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 11
Feature Type: Riparian Wetland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/24/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): John Holson | Section, Township, Range: Sec. 32, T35N, R3E
Landform (hillslope, terrace, etc.): Stream terrace | Local relief (concave, convex, none): None | Slope %: 0
Subregion (LRR): MLRA 22B | Lat: 40.853179° | Long: -121.780916° | Datum: NAD83
Soil Map Unit Name: Gardens-Jacksback complex, 0 to 2 percent slopes | NWI Classification: PEMC1
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents riparian wetland associated with Carberry Creek where it flows through a meadow.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1. Salix lasiolepis	40	Y	FACW
2. Alnus Incanca	20	Y	FACW
3.			
4.			
50%=30 20%=12 Total Cover:	60		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Juncus effusus	35	Y	FACW
2. Carex sp.	15	Y	FAC
3. Epilobium ciliatum	10	N	FACW
4. Drymocallis glandulosa	2	N	FAC
5. Alopecurus pratensis	2	N	FAC
6. Poa pratensis	1	N	FAC
7.			
8.			
50%=32.5 20%=13 Total Cover:	65		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 35 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 4 (A)
Total number of dominant species across all strata: 4 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation present. Carex sp. assumed FAC or wetter.

Data Point 11

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	2.5YR 2.5/1	100					Loam	Clay + roots/organic matter
3-10	2.5YR 2.5/1	90	5YR 4/4	10	C	M	Loam	Clay, some cobble
10-16	7.5YR 2.5/1	100					Loam	Sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

Soils meet the requirements for indicator F6 Redox Dark Surface.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- ✓ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes ✓ No _____ Depth (inches) 10 *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Saturation at 10 inches provides wetland hydrology.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 12
Feature Type: Upland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/24/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): John Holson | Section, Township, Range: Sec. 32, T35N, R3E
Landform (hillslope, terrace, etc.): Stream terrace | Local relief (concave, convex, none): None | Slope %: 0
Subregion (LRR): MLRA 22B | Lat: 40.853133° | Long: -121.780904° | Datum: NAD83
Soil Map Unit Name: Gardens-Jacksback complex, 0 to 2 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP 10 fresh emergent wetland/perennial stream and DP 11 riparian wetland.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: _____)			
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)			
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: 5')			
1. Juncus balticus	40	Y	FACW
2. Carex sp.	40	Y	FAC--
3. Poa pratensis	10	N	FAC
4. Alopecurus pratensis	5	N	FAC
5. Holcus lanatus	5	N	FAC
6. Phalaris sp.	5	N	UNK
7.			
8.			
50%= 52.5 20%= 21 Total Cover:	105		
Woody/Vine Stratum (Plot Size: _____)			
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)
Total number of dominant species across all strata: 2 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation present. Carex sp. assumed FAC or wetter due to presence of other hydrophytic species.

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/1	100					Loam	Roots/organic matter
2-6	7.5YR 2.5/1	100					Loam	
6-16	7.5YR 2.5/1	100					Loam	Clay

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soil were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc.

Data Point: 13
Feature Type: Wetland Meadow

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/24/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): John Holson | Section, Township, Range: Sec. 29, T35N, R3E
Landform (hillslope, terrace, etc.): Stream terrace | Local relief (concave, convex, none): None | Slope %: 0
Subregion (LRR): MLRA 22B | Lat: 40.853651° | Long: -121.782083° | Datum: NAD83
Soil Map Unit Name: Gardens-Jacksback complex, 0 to 2 percent slopes | NWI Classification: PEMC1
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents wetland meadow adjacent to Carberry Creek.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15')	**% Cover**	**Species?**	**Status**
1. Salix lasiolepis	10	Y	FACW
2.			
3.			
4.			
50%= 5 20%= 2 Total Cover:	10		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Juncus effusus	75	Y	FACW
2. Mentha spicata	15	Y	FACW
3. Carex sp.	10	N	FAC
4. Holcus lanatus	3	N	FAC
5. Drymocallis glandulosa	2	N	FAC
6. Veronica americana	1	N	OBL
7.			
8.			
50%= 53 20%= 13.2 Total Cover:	106		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 3 (A)
Total number of dominant species across all strata: 3 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation present. Carex sp. assumed FAC or wetter.

Data Point 13

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	7.5YR 3/2	100					Loam	Clay, some cobble
6-10	7.5YR 2.5/1	100	5YR 4/4	10	C	M	Clay	some cobble

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

Soils had a hydrogen sulfide odor and meet the requirements for indicator A4 Hydrogen Sulfide.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) 4

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Water table at 4 inches provides wetland hydrology.

North State Resources, Inc.

Data Point 14

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Upland

Project/Site: Fountain Wind City/County: Shasta County Date: 10/24/17

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 29, T35N, R3E

Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none) Convex Slope % 2

Subregion (LRR): MLRA 22B Lat: 40.853612° Long: -121.782094° Datum: NAD83

Soil Map Unit Name: Gardens-Jacksback complex, 0 to 2 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents uplands in previously placed fill associated with a road adjacent to a wet meadow.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: _____)			
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: 5')	% Cover	Species?	Status
1. Holcus lanatus	30	Y	FAC
2. Acmispon americanus	20	Y	FACU
3. Achillea millefolium	20	Y	FACU
4. Alopecurus pratensis	10	N	FAC
5. Poa pratensis	10	N	FAC
6. Rumex acetosella	5	N	FACU
7. Plantago lanceolata	5	N	FACU
8.			
50%=_____ 20%=_____ Total Cover:	100		
Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)

Total number of dominant species across all strata: 3 (B)

Percent of dominant species that are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominant hydrophytic vegetation is not present.

Data Point 14

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	7.5YR 3/4	100					Loam	Gravelly

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soils were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No N Depth (inches) _____ Wetland Hydrology? Y / N

Water Table Present? Yes ✓ No _____ Depth (inches) 14

Saturation Present? Yes ✓ No _____ Depth (inches) 6 *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Saturation at 6 inches provides wetland hydrology.

North State Resources, Inc.

Data Point 15
Feature Type Non-vegetated Ditch

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 10/24/17
Applicant/Owner: Avangrid State: CA
Investigator(s): Gabe Youngblood Section, Township, Range Sec. 32, T35N, R3E
Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Concave Slope % 2
Subregion (LRR): MLRA 22B Lat: 40.853041° Long: -121.781886° Datum: NAD83
Soil Map Unit Name: Gardens-Jacksback complex, 0 to 2 percent slopes NWI Classification: None
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 1'
Feature Designation: Perennial _____ Intermittent _____ Ephemeral ✓ Blue-line on USGS Quad _____ Substrate Rock
Natural Drainage _____ Artificial Drainage ✓ Navigable Water _____

Remarks

DP documents OHWM of a non-vegetated ditch on the uphill side of a dirt road.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 14 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)
Total number of dominant species across all strata: _____ (B)
Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Veg not evaluated other waters feature.

Data Point 15

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

_____ Histosol (A1)
_____ Histic Epipedon (A2)
_____ Black Histic (A3)
_____ Hydrogen Sulfide (A4)
_____ Depleted Below Dark Surface (A11)
_____ Thick Dark Surface (A12)
_____ Sandy Mucky Mineral (S1)
_____ Sandy Gleyed Matrix (S4)
_____ Sandy Redox (S5)
_____ Stripped Matrix (S6)
_____ Loamy Mucky Mineral (except MLRA 1) (F1)
_____ Loamy Gleyed Matrix (F2)
_____ Depleted Matrix (F3)
_____ Redox Dark Surface (F6)
_____ Depleted Dark Surface (F7)
_____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

_____ 2 cm Muck (A10)
_____ Red Parent Materials (TF21)
_____ Very Shallow Dark Surface (TF12)
_____ Vegetated Sand/Gravel Bars
_____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

Soils not evaluated other waters feature.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

_____ Surface Water (A1)
_____ High Water Table (A2)
_____ Saturation (A3)
_____ Water Marks (B1)
_____ Sediment Deposits (B2)
✓ Drift Deposits (B3)
_____ Algal Mat or Crust (B4)
_____ Iron Deposits (B5)
_____ Surface Soil Cracks (B6)
_____ Inundation Visible on Aerial Imagery (B7)
_____ Sparsely Vegetated Concave Surface (B8)
_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Salt Crust (B11)
_____ Aquatic Invertebrates (B13)
_____ Hydrogen Sulfide Odor (C1)
_____ Oxidized Rhizospheres (C3)
_____ Presence of Reduced Iron (C4)
_____ Recent Iron Reduction in Tilled Soils (C6)
_____ Stunted or Stressed Plants (D1) (LRR A)
_____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
✓ Drainage Patterns (B10)
_____ Dry-Season Water Table (C2)
_____ Saturation Visible on Aerial Imagery (C9)
_____ Geomorphic Position (D2)
_____ Shallow Aquitard (D3)
_____ FAC-Neutral Test (D5)
_____ Raised Ant Mounds (D6) (LRR A)
_____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N
Water Table Present? Yes _____ No X Depth (inches) _____
Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Drift deposits indicate frequent flooding

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 16
Feature Type: Ephemeral Stream

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/16/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 33, T35N, R1E
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Concave | Slope %: 2
Subregion (LRR): MLRA 22B | Lat: 40.841929° | Long: -121.862647° | Datum: NAD83
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 5'
Feature Designation: Perennial ____ Intermittent ____ Ephemeral ✓ Blue-line on USGS Quad ____ Substrate Soil & Rock
Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks

DP documents OHWM of an ephemeral stream.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: ____)			
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: ____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Herb Stratum (Plot Size: ____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=____ 20%=____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: ____)	% Cover	Species?	Status
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: ____ (A)
Total number of dominant species across all strata: ____ (B)
Percent of dominant species that are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation
____ Dominance Test is >50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

No veg scoured channel.

Data Point 16

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Drift deposits indicate frequent flooding.

North State Resources, Inc.

Data Point 17
Feature Type Non-vegetated ditch

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 10/16/17
Applicant/Owner: Avangrid State: CA
Investigator(s): Gabe Youngblood Section, Township, Range Sec. 34, T35N, R1E
Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Concave Slope % 2
Subregion (LRR): MLRA 22B Lat: 40.841929° Long: -121.862114° Datum: NAD83
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes NWI Classification: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 3'
Feature Designation: Perennial _____ Intermittent _____ Ephemeral ✓ Blue-line on USGS Quad _____ Substrate Rock
Natural Drainage ✓ Artificial Drainage _____ Navigable Water _____

Remarks DP documents OHWM of a NVD.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)
Total number of dominant species across all strata: _____ (B)
Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks No veg scoured channel.

Data Point 17

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- ✓ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Sediment deposits indicate frequent flooding.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 18
Feature Type: Wetland meadow

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/16/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 34, T35N, R1E
Landform (hillslope, terrace, etc.): Hillslope | Local relief (concave, convex, none): Convex | Slope %: 1
Subregion (LRR): MLRA 22B | Lat: 40.841924° | Long: -121.861772° | Datum: NAD83
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes | NWI Classification: PEM1Ch

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents wetland meadow.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Herb Stratum (Plot Size: 5')	% Cover	Species?	Status
1. Juncus balticus	45	Y	FACW
2. Carex sp. (NIF)	40	Y	FAC-ish
3. Deschampsia danthonioides	3	N	FACW
4. Unkown grass	2	N	UNK
5.			
6.			
7.			
8.			
50%=45 20%=18 Total Cover:	90		

Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust 10

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)
Total number of dominant species across all strata: 2 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominant hydrophytic vegetation present. Carex sp. assumed FAC or wetter.

Data Point 18

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/2	100					Loam	Sandy
6-12	10YR 2/2	80	5YR 3/4	20	C	PL	Loam	Sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: N/A Depth (Inches) N/A Hydric Soil Present? ✓ / N

Remarks

Soils meet the requirement for indicator F6 Redox Dark Surface.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- ✓ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- ✓ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Algal crust indicates long duration saturation. Saturation is visible on Google Earth imagery from 7/8/12.

North State Resources, Inc.

Data Point 19
Feature Type Upland

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 10/16/17
Applicant/Owner: Avangrid State: CA
Investigator(s): Gabe Youngblood Section, Township, Range Sec. 34, T35N, R1E
Landform (hillslope, terrace, etc.) Hillslope (Nearly Level) Local relief (concave, convex, none) Convex Slope % 0
Subregion (LRR): MLRA 22B Lat: 40.841931° Long: -121.861811° Datum: NAD83
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes NWI Classification: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to Data Point 18 wetland meadow.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus kelloggii	40	Y	UPL
2.			
3.			
4.			
50%= 20 20%= 8 Total Cover:	40		

Sapling/Shrub Stratum (Plot Size: 15')	% Cover	Species?	Status
1. Rubus armeniacus	80	Y	FAC
2. Salix scouleriana	5	N	FAC
3.			
4.			
50%= 42.5 20%= 17 Total Cover:	85		

Herb Stratum (Plot Size: 5')	% Cover	Species?	Status
1. Hypericum perforatum	1	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%= .5 20%= .2 Total Cover:	1		

Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 99 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)
Total number of dominant species across all strata: 3 (B)
Percent of dominant species that are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominate hydrophytic vegetation is not present.

Data Point 19

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 2.5/3	100					Loam	Sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: N/A Depth (Inches) N/A Hydric Soil Present? N

Remarks

No indicators of hydric soils were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 20
Feature Type: Fresh Emergent Wetland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/16/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 34, T35N, R1E
Landform (hillslope, terrace, etc.): Depression | Local relief (concave, convex, none): Concave | Slope %: 1
Subregion (LRR): MLRA 22B | Lat: 40.841448° | Long: -121.861591° | Datum: NAD83
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes | NWI Classification: PABFh

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents fresh emergent wetland in a seasonal pond.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Glyceria striata	40	Y	OBL
2. Nuphar polysepala	40	Y	OBL
3. Schoenoplectus acutus	5	N	OBL
4. Muhlenbergia filiformis	5	N	FACW
5.			
6.			
7.			
8.			
50%=45 20%=18 Total Cover:	90		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust 10

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)
Total number of dominant species across all strata: 2 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominate hydrophytic vegetation present.

Data Point 20

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 2/1	100					Muck	

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- ✓ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: N/A Depth (Inches) N/A Hydric Soil Present? ✓ /

Remarks

Soils meet the requirement for indicator A1 Histosol.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) 6

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Saturation and high water table provide wetland hydrology.

North State Resources, Inc.

Data Point 21

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Pond

Project/Site: Fountain Wind City/County: Shasta County Date: 10/16/17

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 34, T35N, R1E

Landform (hillslope, terrace, etc.) Depression Local relief (concave, convex, none) Concave Slope % 1

Subregion (LRR): MLRA 22B Lat: 40.841443° Long: -121.861622° Datum: NAD83

Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes NWI Classification: PABFh

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents unvegetated portion of a seasonal pond.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)

Total number of dominant species across all strata: _____ (B)

Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Portion of seasonal pond with no vegetation.

Data Point 21

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/3	100					Loam	Sandy, very rocky
6-12	10YR 2/1	80	7.5YR 3/4	10	C	PL	Loam	Clay
			10YR 6/1	10	D	M	Loam	Clay

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ✓ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: N/A Depth (Inches) N/A Hydric Soil Present? ✓ /

Remarks

Soils meet the requirement for indicator F6 Redox Dark Surface and indicator F7 Depleted Dark Surface.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes ✓ No _____ Depth (inches) 6 inches *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Saturation provides wetland hydrology. Inundation visible on Google Earth imagery from 7/8/12

North State Resources, Inc.

Data Point 22

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Upland

Project/Site: Fountain Wind City/County: Shasta County Date: 10/16/17

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 34, T35N, R1E

Landform (hillslope, terrace, etc.) roadbank Local relief (concave, convex, none) Convex Slope % 20

Subregion (LRR): MLRA 22B Lat: 40.841428° Long: -121.861648° Datum: NAD83

Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to Data Point 20 and 21. Data point is located on the road shoulder. The road acts as a dam causing water to pond seasonally.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%= 20 20%= 8 Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15')	**% Cover**	**Species?**	**Status**
1. Rubus armeniacus	80	Y	FAC
2. Quercus Kelloggii	10	N	UPL
3. Calocedrus decurrens	10	N	UPL
4.			
50%= 42.5 20%= 17 Total Cover:	100		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%= 20%= Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)

Total number of dominant species across all strata: 1 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:	Multiply by	
OBL Species	x 1 =	0
FACW Species	x 2 =	0
FAC Species	x 3 =	0
FACU Species	x 4 =	0
UPL Species	x 5 =	0
Column Totals 0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominate facultative vegetation is present.

Data Point 22

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/3	100					Loam	Sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: N/A Depth (Inches) N/A Hydric Soil Present? N

Remarks

No indicators of hydric soils were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc.

Data Point 23

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Riparian Wetland

Project/Site: Fountain Wind City/County: Shasta County Date: 10/16/17

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 34, T35N, R1E

Landform (hillslope, terrace, etc.) Depression Local relief (concave, convex, none) Concave Slope % 1

Subregion (LRR): MLRA 22B Lat: 40.841404° Long: -121.861956° Datum: NAD83

Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes NWI Classification: PEM1C

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents a riparian wetland.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30')			
1. Pinus ponderosa	3	Y	FACU
2.			
3.			
4.			
50%= 1.5 20%= 0.6 Total Cover:	3		
Sapling/Shrub Stratum (Plot Size: 15')	% Cover	Species?	Status
1. Rubus armeniacus	70	Y	FAC
2. Salix scouleriana	20	Y	FAC
3. Rosa californica	4	N	FAC
4.			
50%= 47 20%= 18.8 Total Cover:	94		
Herb Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)

Total number of dominant species across all strata: 3 (B)

Percent of dominant species that are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominate hydrophytic vegetation present.

Data Point 23

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-21	7.5YR 3/1	95	7.5YR3/4	5	C	PL	Loam	Sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: N/A Depth (Inches) N/A Hydric Soil Present? ✓ / I

Remarks

Soils meet the requirements for indicator F6 Redox Dark Surface.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Oxidized rhizospheres indicate long duration saturation.

North State Resources, Inc.

Data Point: 24

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type: Upland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/16/17

Applicant/Owner: Avangrid | State: CA

Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 34, T35N, R1E

Landform (hillslope, terrace, etc.): Hillslope | Local relief (concave, convex, none): Convex | Slope %: 10

Subregion (LRR): MLRA 22B | Lat: 40.841477° | Long: -121.861999° | Datum: NAD83

Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to Data Point 23 Riparian Wetland.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus ponderosa	10	Y	FACU
2. Salix scouleriana	10	Y	FAC
3. Cornus nuttallii	5	N	FACU
4. Quercus Kelloggii	2	N	UPL
50%= 13.5 20%= 5.4 Total Cover:	27		
Sapling/Shrub Stratum (Plot Size: 15')	**% Cover**	**Species?**	**Status**
1. Rubus armeniacus	70	Y	FAC
2. Ceanothus integerrimus	5	N	UPL
3.			
4.			
50%= 37.5 20%= 15 Total Cover:	75		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%= _____ 20%= _____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%= _____ 20%= _____ Total Cover:	0		

% Bare Ground in Herb Stratum 100 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)

Total number of dominant species across all strata: 3 (B)

Percent of dominant species that are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominate facultative vegetation is present.

Data Point 24

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 3/1	100					Loam	Sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: N/A Depth (Inches) N/A Hydric Soil Present? N

Remarks

No indicators of hydric soils were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc.

Data Point 25
Feature Type Intermittent Stream

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 10/23/17
Applicant/Owner: Avangrid State: CA
Investigator(s): Gabe Youngblood Section, Township, Range Sec. 36, T35N, R1E
Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Concave Slope % 2
Subregion (LRR): MLRA 22B Lat: 40.840698° Long: -121.807661° Datum: NAD83
Soil Map Unit Name: Gasper-Scarface complex, moist, 15 to 30 percent slopes NWI Classification: R4SBC
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 2'
Feature Designation: Perennial ____ Intermittent ✓ Ephemeral ____ Blue-line on USGS Quad ✓ Substrate Soil & Gravel
Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks DP documents OHWM of an intermittent stream.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Herb Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=____ 20%=____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: ____ (A)
Total number of dominant species across all strata: ____ (B)
Percent of dominant species that are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation
____ Dominance Test is >50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks No veg scoured channel.

Data Point 25

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Drift deposits indicate frequent flooding.

North State Resources, Inc.

Data Point 26

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Upland

Project/Site: Fountain Wind City/County: Shasta County Date: 10/23/17

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 1, T34N, R1E

Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none) Convex Slope % 1

Subregion (LRR): MLRA 22B Lat: Long: Datum:

Soil Map Unit Name: Gasper-Scarface complex, moist, 15 to 30 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents an upland area dominated by Carex sp.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1. Carex sp. (NIF)	60	Y	FAC
2. Carex sp. (NIF)	20	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
50%=40 20%=16 Total Cover:	80		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)

Total number of dominant species across all strata: 2 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? ☑/☐

Remarks

Carex sp. assumed FAC. Dominant facultative vegetation present.

Data Point 26

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	7.5YR 2.5/2	100					Loam	Gravely

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soil were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 27
Feature Type: Sesonal Wetland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/17/17
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 3, T34N, R1E
Landform (hillslope, terrace, etc.): Depression | Local relief (concave, convex, none): Concave | Slope %: 1
Subregion (LRR): MLRA 22B | Lat: 40.831029° | Long: -121.847797° | Datum: NAD83
Soil Map Unit Name: Toomes very rocky loam, 0 to 50 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents a seasonal wetland.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Herb Stratum (Plot Size: 5')	% Cover	Species?	Status
1. Eleocharis acicularis	50	Y	OBL
2. Deschampsia danthonioides	20	Y	FACW
3. Juncus balticus	7	N	FAC
4. Bromus hordeaceus	2	N	FACU
5. Navarretia sp.	1	N	FAC--
6.			
7.			
8.			
50%=40 20%=16 Total Cover:	80		

Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust 20

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)
Total number of dominant species across all strata: 2 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present. Navarretia sp. assumed FAC due to presence of dominant hydrophytic species.

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 5/1	80	5YR 3/4	20	C	PL	Loam	Clay
8-12	10YR 3/1	100					Loam	Clay

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: N/A Depth (Inches) N/A Hydric Soil Present? ✓ /

Remarks

Soils meet the requirements for indicator F3 Depleted Matrix.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- ✓ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Algal crust indicates long duration inundation and oxidized rhizospheres indicate long duration saturation.

North State Resources, Inc.

Data Point 28

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Upland

Project/Site: Fountain Wind City/County: Shasta County Date: 10/17/17

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 3, T34N, R1E

Landform (hillslope, terrace, etc.) Road cut Local relief (concave, convex, none) Convex Slope % 5

Subregion (LRR): MLRA 22B Lat: 40.831032° Long: -121.847810° Datum: NAD83

Soil Map Unit Name: Toomes very rocky loam, 0 to 50 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP27 seasonal wetland.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus ponderosa	5	Y	UPL
2.			
3.			
4.			
50%= 2.5 20%= 1 Total Cover:	5		
Sapling/Shrub Stratum (Plot Size: 15')	**% Cover**	**Species?**	**Status**
1. Arctostaphylos patula	25	Y	UPL
2. Quercus garryana	10	Y	FACU
3.			
4.			
50%= 17.5 20%= 7 Total Cover:	35		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Elymus caput-medusae	35	Y	UPL
2. Bromus tectorum	5	N	UPL
3. Epilobium sp.	5	N	UNK
4. Unk sp.	5	N	UNK
5.			
6.			
7.			
8.			
50%= 45 20%= 18 Total Cover:	50		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 0 (A)

Total number of dominant species across all strata: 4 (B)

Percent of dominant species that are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet

Total % Cover of:	Multiply by	
OBL Species	x 1 =	0
FACW Species	x 2 =	0
FAC Species	x 3 =	0
FACU Species	x 4 =	0
UPL Species	x 5 =	0
Column Totals 0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominate hydrophytic vegetation is not present.

Data Point 28

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	100					Loam	Clay

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: bedrock Depth (Inches) 8 Hydric Soil Present? N

Remarks

No indicators of hydric soils were observed. Paralithic bedrock encountered at 8 inches.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc.

Data Point 29

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Intermittent Stream

Project/Site: Fountain Wind City/County: Shasta County Date: 10/17/17

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 3, T34N, R1E

Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Concave Slope % 5

Subregion (LRR): MLRA 22B Lat: 40.831304° Long: -121.847573° Datum: NAD83

Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 2'

Feature Designation: Perennial _____ Intermittent ✓ Ephemeral _____ Blue-line on USGS Quad _____ Substrate Soil & Rock

Natural Drainage ✓ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents OHWM of an intermittent stream.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)

Total number of dominant species across all strata: _____ (B)

Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

No veg scoured channel.

Data Point 29

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Drift deposits indicate frequent flooding.

North State Resources, Inc. now Stantec

Data Point 30

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Wetland Meadow

Project/Site: Fountain Wind City/County: Shasta County Date: 10/24/17

Applicant/Owner: Avangrid State: California

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 8, T34N, R2E

Landform (hillslope, terrace, etc.) Shallow depression on terrace Local relief (concave, convex, none) Concave Slope % 0

Subregion (LRR): MLRA 22B Lat: 40.824316° Long: -121.779911° Datum: NAD83

Soil Map Unit Name: Gasper-Scarface complex, moist, 30 to 50 percent slopes NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents a wetland meadow in a shallow depression along the stream terrace for Hatchet Creek.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Carex utriculata	100	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	100		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 50

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)

Total number of dominant species across all strata: 1 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present. Biotic crust present in sparsely vegetated portions of feature.

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	7.5YR 2.5/2	100					Loam	Sandy
6-12	10YR 4/2	80	5YR4/6	20	C	PL	Loam	Sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓

Remarks

Soils meet the requirements for indicator F3 Depleted Matrix.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- ✓ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No ✗ Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No ✗ Depth (inches) _____

Saturation Present? Yes _____ No ✗ Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Algal crust indicates long duration inundation. Oxidized rhizospheres indicate long duration saturation.

North State Resources, Inc. now Stantec

Data Point 31

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Upland

Project/Site: Fountain Wind City/County: Shasta County Date: 10/24/17

Applicant/Owner: Avangrid State: California

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 8, T34N, R2E

Landform (hillslope, terrace, etc.) Stream terrace Local relief (concave, convex, none) Concave Slope % 0

Subregion (LRR): MLRA 22B Lat: 40.824304° Long: -121.779913° Datum: NAD83

Soil Map Unit Name: Gasper-Scarface complex, moist, 30 to 50 percent slopes NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to Data Point 30 wet meadow.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Herb Stratum (Plot Size: 5')	% Cover	Species?	Status
1. Juncus sp.	60	Y	FAC-
2. Achillea millefolium	10	N	FACU
3. Drymocallis glandulosa	10	N	FAC
4. Unk grass	10	N	?
5.			
6.			
7.			
8.			
50%=45 20%=18 Total Cover:	90		

Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)

Total number of dominant species across all strata: 1 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Juncus sp. assumed FAC or wetter due to species that are documented within the project as being FACW or OBL.

Data Point 31

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 2.5/2	100					Loam	Sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soils were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc. now Stantec

Data Point: 32

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type: Riparian Wetland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/25/17

Applicant/Owner: Avangrid | State: California

Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 8, T34N, R2E

Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Concave | Slope %: 3

Subregion (LRR): MLRA 22B | Lat: 40.820561° | Long: -121.778456° | Datum: NAD83

Soil Map Unit Name: Jacksback loam, 2 to 9 percent slopes | NWI Classification: R3USC

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width: Variable

Feature Designation: Perennial ✓ Intermittent ____ Ephemeral ____ Blue-line on USGS Quad ✓ Substrate: Bolder, cobbel, gravel, and sand

Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks DP documents riparian wetlands along Hatchet Creek.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus contorta	10	Y	FAC
2.			
3.			
4.			
50%= 5 20%= 2 Total Cover:	10		
Sapling/Shrub Stratum (Plot Size: 15')	**% Cover**	**Species?**	**Status**
1. Alnus incana	60	Y	FACW
2. Abies concolor	10	N	UPL
3. Spiraea douglasii	2	N	FACW
4. Acer circinatum (2%)/Populus tremuloides (2%)	4	N	FAC/FACU
50%= 38 20%= 15.2 Total Cover:	76		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Glyceria striata	10	Y	OBL
2. Stachys ajugoides	2	N	OBL
3. Heracleum maximum	2	N	FAC
4. Galium aparine	2	N	FACU
5. Scirpus microcarpus	2	N	OBL
6.			
7.			
8.			
50%= 9 20%= 3.6 Total Cover:	18		
Woody/Vine Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 82 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 3 (A)

Total number of dominant species across all strata: 3 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:	Multiply by	
OBL Species	x 1 =	0
FACW Species	x 2 =	0
FAC Species	x 3 =	0
FACU Species	x 4 =	0
UPL Species	x 5 =	0
Column Totals 0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation

____ Dominance Test is >50%

____ Prevalence Index is ≤ 3.0[1]

____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

____ Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks Dominant hydrophytic vegetation is present.

Data Point 32

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100					Sand	Silty
6-12	10YR 4/2	60	7.5YR4/6	40	C	PL	Sand	Silty

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- ✓ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓

Remarks

Soils meet the requirements for indicator S5 Sandy Redox.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- ✓ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No ✓ Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No ✓ Depth (inches) _____

Saturation Present? Yes _____ No ✓ Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Drift deposits indicate frequent flooding. Oxidized rhizospheres indicates long duration saturation.

North State Resources, Inc. now Stantec

Data Point: 33

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type: Upland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 10/25/17

Applicant/Owner: Avangrid | State: California

Investigator(s): John Holson | Section, Township, Range: Sec. 8, T34N, R2E

Landform (hillslope, terrace, etc.): Shallow Depression | Local relief (concave, convex, none): Concave | Slope %: 0

Subregion (LRR): MLRA 22B | Lat: 40.820556° | Long: -121.778522° | Datum: NAD83

Soil Map Unit Name: Jacksback loam, 2 to 9 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks Upland pair to DP32 riparian wetland.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus tremuloides	30	Y	FACU
2. Abies concolor	20	Y	UPL
3. Pseudotsuga menziesii	20	Y	FACU
4.			
50%= 35 20%= 14 Total Cover:	70		

Sapling/Shrub Stratum (Plot Size: 15')	% Cover	Species?	Status
1. Abies concolor	15	Y	UPL
2. Alnus incana	3	N	FACW
3. Acer circinatum	2	N	FACU
4.			
50%= 10 20%= 4 Total Cover:	20		

Herb Stratum (Plot Size: 5')	% Cover	Species?	Status
1. Elymus glaucus	1	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%= .5 20%= .2 Total Cover:	1		

Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 99 % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 0 (A)

Total number of dominant species across all strata: 5 (B)

Percent of dominant species that are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet

Total % Cover of:	Multiply by	
OBL Species	x 1 =	0
FACW Species	x 2 =	0
FAC Species	x 3 =	0
FACU Species	x 4 =	0
UPL Species	x 5 =	0
Column Totals 0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks Hydrophytic vegetation in not dominant.

Data Point 33

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 2.5/3	100					Loam	Sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soils were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc. now Stantec

Data Point 34

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Seasonal wetland

Project/Site: Fountain Wind City/County: Shasta County Date: 10/25/17

Applicant/Owner: Avangrid State: California

Investigator(s): John Holson Section, Township, Range Sec. 12, T34N, R1E

Landform (hillslope, terrace, etc.) Depresion Local relief (concave, convex, none) Concave Slope % 0

Subregion (LRR): MLRA 22B Lat: 40.815248° Long: -121.804622° Datum: NAD83

Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes NWI Classification: PEM1C

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents an area in a wet meadow that appears to pond seasonally.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Eleocharis bella	40	Y	FACW
2. Eleocharis acicularis	35	Y	OBL
3. Carex utriculata	2	N	OBL
4. Ranunculus flammula	2	N	FACW
5. Rumex crispus	1	N	FAC
6. Uknown grass sp.	1	N	?
7.			
8.			
50%=40.5 20%=16.2 Total Cover:	81		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 19 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)

Total number of dominant species across all strata: 2 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present.

Data Point 34

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	5YR 2/1	100					Loam	Clay
6-16	10YR 4/2	60	7.5YR4/6	40	C	PL	Clay	

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

Soils meet the requirements for indicator F3 Depleted Matrix.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- ✓ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Drift deposits indicate frequent flooding. Oxidized rhizospheres indicates long duration saturation.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 35
Feature Type: Wetland Meadow

Project/Site: Fountain Wind | City/County: Shasta County | Date: 8/29/18
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood, Alison Loveless | Section, Township, Range: Sec. 12, T34N, R1E
Landform (hillslope, terrace, etc.): Valley | Local relief (concave, convex, none): None | Slope %: 0
Subregion (LRR): MLRA 22B | Lat: 40.815335° | Long: -121.804718° | Datum: NAD 83
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☐/☒
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks DP documents large wetland meadow at the headwaters of a tributary to the North Fork of Montgomery Creek.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: _____)			
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)			
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: 10 ft)			
1. Helenium bigelovii	17	Y	FACW
2. Muhlenbergia filiformis	15	Y	FACW
3. Platanthera dilatata (10)/Phleum pratense (10)	20	Y	FACW/FAC
4. Prunella vulgaris	10	Y	FACU
5. Poa palustris	8	N	FAC
6. Symphyotrichum spathulatum (5)/Trifolium pratense (5)	10	N/N	FAC/FACU
7. Epilobium ciliatum (3)/Stachys ajugoides (2)	5	N/N	FACW/OBL
8. Danthonia californica (1)/Carex sp. (1)	2	N/N	FAC/FAC
50%=43.5 20%=17.4 Total Cover:	87		
Woody/Vine Stratum (Plot Size: _____)			
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 96 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 4 (A)
Total number of dominant species across all strata: 5 (B)
Percent of dominant species that are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index Worksheet

Total % Cover of:	Multiply by	
OBL Species	x 1 =	0
FACW Species	x 2 =	0
FAC Species	x 3 =	0
FACU Species	x 4 =	0
UPL Species	x 5 =	0
Column Totals 0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks Dominant hydrophytic vegetation is present. Carex assumed FAC.

Data Point 35

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 4/2	90	7.5YR 3/6	10	C	PL	SL	Sandy loam
10-16	10YR 2/1	10		2	C	PL	LC	Loamy clay

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: Rock Depth (Inches) 10 Hydric Soil Present? ✓ /

Remarks

Soil meets the requirements for indicator F3 Depleted Matrix.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Oxidized rhizosphers indicate long duration saturation.

North State Resources, Inc.

Data Point: 36
Feature Type: Upland

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind | City/County: Shasta County | Date: 8/29/18
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood, Alison Loveless | Section, Township, Range: Sec. 12, T34N, R1E
Landform (hillslope, terrace, etc.): Valley | Local relief (concave, convex, none): None | Slope %: 0
Subregion (LRR): MLRA 22B | Lat: 40.815378° | Long: -121.804743° | Datum: NAD 83
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☐/☒
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to Data Point 35 wet meadow.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: _____)			
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)			
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: 10 ft)			
1. Plantago lanceolata	10	Y	FACU
2. Cynosurus echinatus	5	Y	UPL
3. Acmispon americanus	5	Y	FACU
4. Trifolium pratense	5	Y	FACU
5. Carex sp.	5	Y	FAC--
6. Symphyotrichum spathulatum	2	N	FAC
7. Poa palustris	1	N	FAC
8. Phleum pratense	1	N	FAC
50%=17 20%=6.8 Total Cover:	34		
Woody/Vine Stratum (Plot Size: _____)			
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 96 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)
Total number of dominant species across all strata: 5 (B)
Percent of dominant species that are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is not present. Carex assumed FAC.

Data Point 36

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soil pit edge of compacted dirt road.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y /X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc. now Stantec

Data Point 37
Feature Type Non-vegetated ditch

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 11/14/17
Applicant/Owner: Avangrid State: California
Investigator(s): Gabe Youngblood Section, Township, Range Sec. 17, T34N, R1E
Landform (hillslope, terrace, etc.) Ditch Local relief (concave, convex, none) Convex Slope % 2
Subregion (LRR): MLRA 22B Lat: 40.806354° Long: -121.880599° Datum: NAD83
Soil Map Unit Name: Cohasset stony loam, 0 to 30 percent slopes NWI Classification: R5UBFx
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 4'
Feature Designation: Perennial ✓ Intermittent ✓ Ephemeral ____ Blue-line on USGS Quad ____ Substrate Rock and soil
Natural Drainage ____ Artificial Drainage ✓ Navigable Water ____

Remarks

DP documents an irrigation ditch that does not support hydrophytic vegetation.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Herb Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=____ 20%=____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: ____ (A)
Total number of dominant species across all strata: ____ (B)
Percent of dominant species that are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation
____ Dominance Test is >50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

No veg scoured channel.

Data Point 37

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- ✓ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No N Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No N Depth (inches) _____

Saturation Present? Yes _____ No N Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Sediment and drift deposits indicate frequent flooding.

North State Resources, Inc. now Stantec

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 38
Feature Type: Vegetated ditch

Project/Site: Fountain Wind | City/County: Shasta County | Date: 11/14/17
Applicant/Owner: Avangrid | State: California
Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 17, T34N, R1E
Landform (hillslope, terrace, etc.): Ditch | Local relief (concave, convex, none): Convex | Slope %: 2
Subregion (LRR): MLRA 22B | Lat: 40.806106° | Long: -121.880605° | Datum: NAD83
Soil Map Unit Name: Cohasset stony loam, 0 to 30 percent slopes | NWI Classification: R5UBFx

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 5'
Feature Designation: Perennial ____ Intermittent ✓ Ephemeral ____ Blue-line on USGS Quad ✓ Substrate soil and gravel
Natural Drainage ____ Artificial Drainage ✓ Navigable Water ____

Remarks

DP documents an irrigation ditch that supports hydrophytic vegetation.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: ____)			
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: ____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Herb Stratum (Plot Size: 5')	% Cover	Species?	Status
1. Scirpus microcarpus	40	Y	OBL
2. Symphyotrichum spathulatum	10	N	FAC
3. Epilobium ciliatum	5	N	FACW
4. Prunella vulgaris	2	N	FACU
5. Heracleum maximum	2	N	FAC
6. Ludwigia palustris	1	N	OBL
7.			
8.			
50%=30 20%=12 Total Cover:	60		
Woody/Vine Stratum (Plot Size: ____)	% Cover	Species?	Status
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)
Total number of dominant species across all strata: 1 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present.

Data Point 38

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	7.5YR 3/2	98	5YR 3/4	2	C	PL	Loam	gravelly

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: bedrock Depth (Inches) 10 Hydric Soil Present? ✓ / N

Remarks

Soil meets the requirements for indicator F6 Redox Dark Surface.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 2 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Surface water provides wetland hydrology.

North State Resources, Inc. now Stantec

Data Point 39

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Upland

Project/Site: Fountain Wind City/County: Shasta County Date: 11/14/17

Applicant/Owner: Avangrid State: California

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 17, T34N, R1E

Landform (hillslope, terrace, etc.) Ditch Local relief (concave, convex, none) Convex Slope % 2

Subregion (LRR): MLRA 22B Lat: 40.806105° Long: -121.880566° Datum: NAD83

Soil Map Unit Name: Cohasset stony loam, 0 to 30 percent slopes NWI Classification: R5UBFx

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP38 vegetated ditch.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus ponderosa	20	Y	FACU
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	20		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1. Salix lasiolepis	5	Y	FACW
2. Ceanothus integerrimus	2	Y	UPL
3.			
4.			
50%= 3.5 20%= 1.4 Total Cover:	7		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1. Pteridium aquilinum	5	Y	FACU
2. Elymus glaucus	3	Y	FACU
3. Hypericum perforatum	1	N	FACU
4. Acmispon americanus	1	N	FACU
5.			
6.			
7.			
8.			
50%= 5 20%= 2 Total Cover:	10		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)

Total number of dominant species across all strata: 5 (B)

Percent of dominant species that are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominant hydrophytic vegetation is not present.

Data Point 39

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	7.5YR 3/2	100					Loam	sandy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soils were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc. now Stantec

Data Point 40

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Riparian Wetland

Project/Site: Fountain Wind City/County: Shasta County Date: 11/6/17

Applicant/Owner: Avangrid State: California

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 13, T34N, R1E

Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none) Convex Slope % 5

Subregion (LRR): MLRA 22B Lat: 40.795593° Long: -121.810125° Datum: NAD83

Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes NWI Classification: PSSC

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents a riparian wetland on a slope adjacent to the North Fork of Montgomery Creek.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15')	**% Cover**	**Species?**	**Status**
1. Alnus incana	40	Y	FACW
2. Spiraea douglasii	5	N	FACW
3. Acer circinatum	5	N	FAC
4. Calocedrus decurrens	5	N	UPL
50%= 22.5 20%= 11 Total Cover:	55		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Athyrium filix-femina	8	Y	FAC
2. Carex sp.	5	Y	FAC
3. Senecio triangularis	2	N	FACW
4.			
5.			
6.			
7.			
8.			
50%= 7.5 20%= 3 Total Cover:	15		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 85 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 3 (A)

Total number of dominant species across all strata: 3 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present. Carex assumed facultative as it occurs in both wetland and adjacent uplands.

Data Point 40

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 2.5/2	100					Loam	Muck
								High organic content with greasy
								feel when rubbed between fingers

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: Rock Depth (Inches) 12 Hydric Soil Present? ✓ /

Remarks

Soils meet the requirements for indicator F1 Loamy Mucky Mineral.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) 8

Saturation Present? Yes ✓ No _____ Depth (inches) 6 *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Saturation and high water table provide wetland hydrology.

North State Resources, Inc. now Stantec

Data Point 41

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Upland

Project/Site: Fountain Wind City/County: Shasta County Date: 11/6/17

Applicant/Owner: Avangrid State: California

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 13, T34N, R1E

Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none) Convex Slope % 5

Subregion (LRR): MLRA 22B Lat: 40.795574° Long: -121.810151° Datum: NAD 83

Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP40 riparian wetland adjacent to the North Fork of Montgomery Creek.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Pseudotsuga menziesii	40	Y	FACU
2. Abies concolor	30	Y	UPL
3. Calocedrus decurrens	10	N	UPL
4.			
50%= 40 20%= 16 Total Cover:	80		
Sapling/Shrub Stratum (Plot Size: 15')	**% Cover**	**Species?**	**Status**
1. Calocedrus decurrens	10	Y	UPL
2.			
3.			
4.			
50%= 5 20%= 2 Total Cover:	10		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Carex sp.	10	Y	FAC
2. Pteridium aquilinum	5	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
50%= 7.5 20%= 3 Total Cover:	15		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 85 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)

Total number of dominant species across all strata: 5 (B)

Percent of dominant species that are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index Worksheet

Total % Cover of:	Multiply by	
OBL Species	x 1 =	0
FACW Species	x 2 =	0
FAC Species	x 3 =	0
FACU Species	x 4 =	0
UPL Species	x 5 =	0
Column Totals 0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominant hydrophytic vegetation is not present. Carex assumed facultative as it occurs in both wetland and adjacent uplands.

Data Point 41

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	2.5YR 3/4	100					Loam	Gravelly

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soils were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc. now Stantec

Data Point 42

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Perennial Stream

Project/Site: Fountain Wind City/County: Shasta County Date: 11/7/17

Applicant/Owner: Avangrid State: California

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 23, T34N, R1E

Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Convex Slope % 2

Subregion (LRR): MLRA 22B Lat: 40.790275° Long: -121.833337° Datum: NAD83

Soil Map Unit Name: Lyonsville-Jiggs complex, deep, 10 to 50 percent slopes NWI Classification: R5UB

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 8'

Feature Designation: Perennial ✓ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad ✓ Substrate Cobble, gravel, sand

Natural Drainage ✓ Artificial Drainage _____ Navigable Water _____

Remarks DP documents ordinary high water mark of Cedar Creek.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)

Total number of dominant species across all strata: _____ (B)

Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks No veg scoured channel.

Data Point 42

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 2 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Surface water provides wetland hydrology.

North State Resources, Inc.

Data Point 43

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Riparian wetland

Project/Site: Fountain Wind City/County: Shasta County Date: 8/28/18

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood, Alison Loveless Section, Township, Range Sec. 23, T34N, R1E

Landform (hillslope, terrace, etc.) Floodplain Local relief (concave, convex, none) Concave Slope % 3

Subregion (LRR): MLRA 22B Lat: 40.790273° Long: -121.833322° Datum: NAD 83

Soil Map Unit Name: Lyonsville-Jiggs complex, deep, 10 to 50 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☑/☐ soil ☑/☐ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ____ Ordinary High Water Mark Mapped ✓ Stream Width Variable

Feature Designation: Perennial ✓ Intermittent ____ Ephemeral ____ Blue-line on USGS Quad ____ Substrate Vegetated

Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks

DP documents riparian wetland associated with Cedar Creek. Vegetation and soils were disturbed from the recent replacement of the culvert with a bridge.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Herb Stratum (Plot Size: 5)	**% Cover**	**Species?**	**Status**
1. Juncus sp. (NIF)	2	Y	FAC+
2. Grass NIF (Glyceria?)	2	Y	FAC+
3.			
4.			
5.			
6.			
7.			
8.			
50%=2 20%=.8 Total Cover:	4		
Woody/Vine Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum 96 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)

Total number of dominant species across all strata: 1 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

____ Prevalence Index is ≤ 3.0[1]

____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

____ Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? ☑/☐

Remarks

Vegetation was disturbed during recent bridge installation. Sparse re-sprouting species appear to be hydrophytic vegetation.

Data Point 43

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	7.5YR 4/1	90	5YR 3/6	10	C	M	LS	Loamy sand
10+	Rock							

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: Rock Depth (Inches) 10 Hydric Soil Present? ✓ / N

Remarks

Soils disturbed during bridge installation, but meet requirements for indicator F3 Depleted Matrix.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- ✓ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes ✓ No _____ Depth (inches) 4 *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Saturation at 4 inches provides wetland hydrology.

North State Resources, Inc.

Data Point 44

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Upland

Project/Site: Fountain Wind City/County: Shasta County Date: 8/28/18

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood, Alison Loveless Section, Township, Range Sec. 23, T34N, R1E

Landform (hillslope, terrace, etc.) Floodplain Local relief (concave, convex, none) Concave Slope % 3

Subregion (LRR): MLRA 22B Lat: 40.790260° Long: -121.833322° Datum: NAD 83

Soil Map Unit Name: Lyonsville-Jiggs complex, deep, 10 to 50 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☑/☐ soil ☑/☐ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☐/☒

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP43 riparian wetland.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: 5)	**% Cover**	**Species?**	**Status**
1. Pteridium aquilinum	1	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=.5 20%=.2 Total Cover:	1		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 96 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)

Total number of dominant species across all strata: 1 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Vegetation was disturbed during recent bridge installation. Upland point is on a newly installed gravel pad.

Data Point 44

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? Y / N

Remarks

No soil pit. Upland point is on a newly installed gravel pad.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc. now Stantec

Data Point 45
Feature Type Wetland Seep/Spring

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 11/7/17
Applicant/Owner: Avangrid State: California
Investigator(s): Gabe Youngblood Section, Township, Range Sec. 23, T34N, R1E
Landform (hillslope, terrace, etc.) depresion Local relief (concave, convex, none) Concave Slope % 2
Subregion (LRR): MLRA 22B Lat: 40.791752° Long: -121.819750° Datum: NAD83
Soil Map Unit Name: Cohasset stony loam, 0 to 30 percent slopes NWI Classification: None
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents a wetland seep/spring in a shallow depression along a road cut.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1. Juncus balticus	30	Y	FACW
2. Carex sp.	20	Y	FAC
3. Prunella vulgaris	20	Y	FACU
4. Epilobium ciliatum	10	N	FACW
5. Stachys ajugoides	5	N	OBL
6. Galium triflorum	5	N	FACU
7. Trifolium repens	5	N	FAC
8. Juncus nevadensis(3%)/Sceptridium multifidum(2%)	5	N	FACW/FAC
50%=50 20%=20 Total Cover:	100		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)
Total number of dominant species across all strata: 3 (B)
Percent of dominant species that are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present. Carex sp. assumed facultative.

Data Point 45

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 5/2	78	10YR 6/1	20	D	M	Loam	Gravelly
			10YR 3/4	2	C	PL		
5-8	10YR 4/2	98	10 YR 5/6	2	C	PL	Loam	Gravelly

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: Rock Depth (Inches) 8 Hydric Soil Present? ✓ /

Remarks

Soils meet the requirements for indicator F3 Depleted Matrix.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- ✓ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Hydrology is indicated by geomorphic position, drainage patterns, and veg meeting the FAC-neutral test.

North State Resources, Inc. now Stantec

Data Point 46

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Upland

Project/Site: Fountain Wind City/County: Shasta County Date: 11/7/17

Applicant/Owner: Avangrid State: California

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 23, T34N, R1E

Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none) Convex Slope % 5

Subregion (LRR): MLRA 22B Lat: 40.791769° Long: -121.819793° Datum: NAD 83

Soil Map Unit Name: Cohasset stony loam, 0 to 30 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP45 wetland seep/spring along a road cut.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1. Calocedrus decurrens	5	Y	UPL
2. Abies concolor	5	Y	UPL
3.			
4.			
50%= 5 20%= 2 Total Cover:	10		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1. Pteridium aquilinum	5	Y	FACU
2. Lotus sp.	5	Y	FACU
3. Elymus glaucus	2	N	FACU
4.			
5.			
6.			
7.			
8.			
50%= 6 20%= 2.4 Total Cover:	12		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 85 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 0 (A)

Total number of dominant species across all strata: 4 (B)

Percent of dominant species that are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominant hydrophytic vegetation is not present. Lotus assumed facultative upland due to presence of other upland species.

Data Point 46

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/3	100					Loam	Gravelly

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soils were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc. now Stantec

Data Point 47

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Ephemeral stream

Project/Site: Fountain Wind City/County: Shasta County Date: 11/7/17

Applicant/Owner: Avangrid State: California

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 23, T34N, R1E

Landform (hillslope, terrace, etc.) Draianage Local relief (concave, convex, none) Concave Slope % 10

Subregion (LRR): MLRA 22B Lat: 40.791707° Long: -121.822774° Datum: NAD83

Soil Map Unit Name: Cohasset stony loam, 0 to 30 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 3-5'

Feature Designation: Perennial ____ Intermittent ____ Ephemeral ✓ Blue-line on USGS Quad ____ Substrate Rock and Soil

Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks

DP document OHWM of an ephemeral stream.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Herb Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=____ 20%=____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: ____ (A)

Total number of dominant species across all strata: ____ (B)

Percent of dominant species that are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation

____ Dominance Test is >50%

____ Prevalence Index is ≤ 3.0[1]

____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

____ Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

No Veg scoured channel.

Data Point 47

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? N

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No N Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No N Depth (inches) _____

Saturation Present? Yes _____ No N Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Drift deposits indicate frequent flooding.

North State Resources, Inc. now Stantec

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 48
Feature Type: Intermittent Stream

Project/Site: Fountain Wind | City/County: Shasta County | Date: 11/17/17
Applicant/Owner: Avangrid | State: California
Investigator(s): Gabe youngblood | Section, Township, Range: Sec. 27, T34N, R1E
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Concave | Slope %: 3
Subregion (LRR): MLRA 22B | Lat: 40.778821° | Long: -121.842353° | Datum: NAD83
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes | NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 2'
Feature Designation: Perennial _____ Intermittent ✓ Ephemeral _____ Blue-line on USGS Quad _____ Substrate Gravel & Rock
Natural Drainage ✓ Artificial Drainage _____ Navigable Water _____

Remarks DP Documents the OHWM of an intermittent stream.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)
Total number of dominant species across all strata: _____ (B)
Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks No vegetation present scoured channel.

Data Point 48

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 2 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Surface water from snow melt and ground water provides wetland hydrology.

North State Resources, Inc. now Stantec

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 49
Feature Type: Ephemeral Stream

Project/Site: Fountain Wind | City/County: Shasta County | Date: 11/17/17
Applicant/Owner: Avangrid | State: California
Investigator(s): Gabe youngblood | Section, Township, Range: Sec. 27, T34N, R1E
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Concave | Slope %: 3
Subregion (LRR): MLRA 22B | Lat: 40.778837° | Long: -121.841812° | Datum: NAD83
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes | NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 4'
Feature Designation: Perennial _____ Intermittent _____ Ephemeral ✓ Blue-line on USGS Quad _____ Substrate Gravel
Natural Drainage ✓ Artificial Drainage _____ Navigable Water _____

Remarks DP documents the OHWM of an ephemeral stream.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)
Total number of dominant species across all strata: _____ (B)
Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks No vegetation present scoured channel.

Data Point 49

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 1 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Surface water from snow melt provides wetland hydrology.

North State Resources, Inc. now Stantec

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 50
Feature Type: Non-Vegetated Ditch

Project/Site: Fountain Wind | City/County: Shasta County | Date: 11/17/17
Applicant/Owner: Avangrid | State: California
Investigator(s): Gabe youngblood | Section, Township, Range: Sec. 27, T34N, R1E
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Concave | Slope %: 2
Subregion (LRR): MLRA 22B | Lat: 40.778781° | Long: -121.841876° | Datum: NAD83
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes | NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 3'
Feature Designation: Perennial _____ Intermittent _____ Ephemeral ✓ Blue-line on USGS Quad _____ Substrate Soil and gravel
Natural Drainage _____ Artificial Drainage ✓ Navigable Water _____

Remarks

DP Documents the a non-vegetated ditch which conveys water along the side of a road from the ephemeral stream documented by DP49 to the intermittent stream documented by DP48.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Herb Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		

Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)
Total number of dominant species across all strata: _____ (B)
Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

No vegetation present scoured channel.

Data Point 50

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /X

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 1 Wetland Hydrology? Y / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Surface water from snow melt provides wetland hydrology.

North State Resources, Inc. now Stantec

Data Point: 51
Feature Type: Riparian wetland

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind | City/County: Shasta County | Date: 11/28/17
Applicant/Owner: Avangrid | State: California
Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 33, T34N, R1E
Landform (hillslope, terrace, etc.): Depression | Local relief (concave, convex, none): Concave | Slope %: 1
Subregion (LRR): MLRA 22B | Lat: 40.761519° | Long: -121.870985° | Datum: NAD83
Soil Map Unit Name: Cohasset stony loam, 30 to 50 percent slopes | NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents a riparian wetland in a slight depression.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus latifolia	40	Y	FACW
2.			
3.			
4.			
50%= 20 20%= 8 Total Cover:	40		
Sapling/Shrub Stratum (Plot Size: 15' radius)	**% Cover**	**Species?**	**Status**
1. Abies concolor	3	Y	UPL
2. Rubus leucodermis	3	Y	FACU
3.			
4.			
50%= 3 20%= 1.2 Total Cover:	6		
Herb Stratum (Plot Size: 5' Radius)	**% Cover**	**Species?**	**Status**
1. Panicum acuminatum	3	Y	FAC
2. Sceptridium multifidum	2	Y	FAC
3. Smilax californica	2	Y	UPL
4.			
5.			
6.			
7.			
8.			
50%= 3.5 20%= 1.4 Total Cover:	7		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 93 % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 3 (A)
Total number of dominant species across all strata: 6 (B)
Percent of dominant species that are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species	40	x 2 =	80
FAC Species	6	x 3 =	18
FACU Species	3	x 4 =	12
UPL Species	5	x 5 =	25
Column Totals	54 (A)		135 (B)

Prevalence Index = B/A = 2.50

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
✓ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Hydrophytic vegetation is present within the feature.

Data Point 51

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	7.5YR 4/2	80	7.5YR 4/6	20	C	PL	Loam	Clay

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

_____ Histosol (A1)
_____ Histic Epipedon (A2)
_____ Black Histic (A3)
_____ Hydrogen Sulfide (A4)
_____ Depleted Below Dark Surface (A11)
_____ Thick Dark Surface (A12)
_____ Sandy Mucky Mineral (S1)
_____ Sandy Gleyed Matrix (S4)
_____ Sandy Redox (S5)
_____ Stripped Matrix (S6)
_____ Loamy Mucky Mineral (except MLRA 1) (F1)
_____ Loamy Gleyed Matrix (F2)
✓ Depleted Matrix (F3)
_____ Redox Dark Surface (F6)
_____ Depleted Dark Surface (F7)
_____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

_____ 2 cm Muck (A10)
_____ Red Parent Materials (TF21)
_____ Very Shallow Dark Surface (TF12)
_____ Vegetated Sand/Gravel Bars
_____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: None Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

Soils meet the requirements for indicator F3 Depleted Matrix.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

_____ Surface Water (A1)
_____ High Water Table (A2)
_____ Saturation (A3)
_____ Water Marks (B1)
_____ Sediment Deposits (B2)
_____ Drift Deposits (B3)
_____ Algal Mat or Crust (B4)
_____ Iron Deposits (B5)
_____ Surface Soil Cracks (B6)
_____ Inundation Visible on Aerial Imagery (B7)
_____ Sparsely Vegetated Concave Surface (B8)
_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Salt Crust (B11)
_____ Aquatic Invertebrates (B13)
_____ Hydrogen Sulfide Odor (C1)
✓ Oxidized Rhizospheres (C3)
_____ Presence of Reduced Iron (C4)
_____ Recent Iron Reduction in Tilled Soils (C6)
_____ Stunted or Stressed Plants (D1) (LRR A)
_____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Drainage Patterns (B10)
_____ Dry-Season Water Table (C2)
_____ Saturation Visible on Aerial Imagery (C9)
✓ Geomorphic Position (D2)
_____ Shallow Aquitard (D3)
_____ FAC-Neutral Test (D5)
_____ Raised Ant Mounds (D6) (LRR A)
_____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N
Water Table Present? Yes _____ No X Depth (inches) _____
Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Oxidized rhizospheres indicate long duration saturation.

North State Resources, Inc. now Stantec

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 52
Feature Type: Upland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 11/28/17
Applicant/Owner: Avangrid | State: California
Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 33, T34N, R1E
Landform (hillslope, terrace, etc.): Hillslope | Local relief (concave, convex, none): convex | Slope %: 1
Subregion (LRR): MLRA 22B | Lat: 40.761554° | Long: -121.870946° | Datum: NAD83
Soil Map Unit Name: Cohasset stony loam, 30 to 50 percent slopes | NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP 51 riparian wetland.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30')			
1. Calocedrus decurrens	30	Y	UPL
2. Pinus ponderosa	5	N	FACU
3. Acer macrophyllum	5	N	FACU
4.			
50%= 20 20%= 8 Total Cover:	40		
Sapling/Shrub Stratum (Plot Size: 15')	% Cover	Species?	Status
1. Acer macrophyllum	40	Y	UPL
2. Abies concolor	15	Y	FACU
3. Rubus leucodermis	10	N	FACU
4. Calocedrus decurrens	2	N	UPL
50%= 33.5 20%= 13.4 Total Cover:	67		
Herb Stratum (Plot Size: 5')	% Cover	Species?	Status
1. Sceptridium multifidum	5	Y	FAC
2. Smilax californica	3	Y	UPL
3. Carex brainerdii	2	Y	UPL
4.			
5.			
6.			
7.			
8.			
50%= 5 20%= 2 Total Cover:	10		
Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%= _____ 20%= _____ Total Cover:	0		

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)
Total number of dominant species across all strata: 6 (B)
Percent of dominant species that are OBL, FACW, or FAC: 17 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominate hydrophytic vegetation is not present.

Data Point 52

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	7.5YR 2.5/2	100					Loam	

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: None Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soil were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc. now Stantec

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 53
Feature Type: Wetland Seep/Spring

Project/Site: Fountain Wind | City/County: Shasta County | Date: 11/28/17
Applicant/Owner: Avangrid | State: California
Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 33, T34N, R1E
Landform (hillslope, terrace, etc.): Hillslope | Local relief (concave, convex, none): Convex | Slope %: 30
Subregion (LRR): MLRA 22B | Lat: 40.758415° | Long: -121.867163° | Datum: NAD83
Soil Map Unit Name: Lyonsville-Jiggs soils, 50 to 70 percent slopes | NWI Classification: PSSC

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents a wetland seep spring near the toe of a hillslope.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30' radius)			
1. Alnus rhombifolia	35	Y	FACW
2. Taxus brevifolia	20	Y	FACU
3.			
4.			
50%= 22.5 20%= 11 Total Cover:	55		
Sapling/Shrub Stratum (Plot Size: 15' radius)	% Cover	Species?	Status
1. Acer circinatum	30	Y	FAC
2.			
3.			
4.			
50%= 15 20%= 6 Total Cover:	30		
Herb Stratum (Plot Size: 5' Radius)	% Cover	Species?	Status
1. Maianthemum racemosum	30	Y	FAC
2. Athyrium filix-femina	5	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
50%= 17.5 20%= 7 Total Cover:	35		
Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%= _____ 20%= _____ Total Cover:	0		

% Bare Ground in Herb Stratum 65 % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 3 (A)
Total number of dominant species across all strata: 4 (B)
Percent of dominant species that are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present.

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 2/1	100					Muck	Loamy

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: 8 Depth (Inches) rock Hydric Soil Present? ✓ /

Remarks

Soils meet the requirements for indicator F1 Loamy Mucky Mineral.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) 8

Saturation Present? Yes ✓ No _____ Depth (inches) 4 *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Saturation at 4 inches and a water table at 8 inches provides hydrology.

North State Resources, Inc. now Stantec

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 54
Feature Type: Upland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 11/28/17
Applicant/Owner: Avangrid | State: California
Investigator(s): Gabe Youngblood | Section, Township, Range: Sec. 33, T34N, R1E
Landform (hillslope, terrace, etc.): Hillslope | Local relief (concave, convex, none): convex | Slope %: 1
Subregion (LRR): MLRA 22B | Lat: 40.758391° | Long: -121.867118° | Datum: NAD83
Soil Map Unit Name: Cohasset stony loam, 30 to 50 percent slopes | NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP 53 wetland seep/spring.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30')			
1. Alnus rhombifolia	15	Y	FACW
2. Calocedrus decurrens	15	Y	UPL
3. Taxus brevifolia	5	N	FACU
4.			
50%= 17.5 20%= 7 Total Cover:	35		
Sapling/Shrub Stratum (Plot Size: 15')	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%= 33.5 20%= 13.4 Total Cover:	0		
Herb Stratum (Plot Size: 5')	% Cover	Species?	Status
1. Maianthemum racemosum	30	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%= 15 20%= 6 Total Cover:	30		
Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%= _____ 20%= _____ Total Cover:	0		

% Bare Ground in Herb Stratum 70 % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)
Total number of dominant species across all strata: 3 (B)
Percent of dominant species that are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominate hydrophytic vegetation is present.

Data Point 54

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/1	100					Peat	Corse organic
6-16	10 YR 2/2	100					Loam	Sandy gravely

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: None Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soil were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc. now Stantec

Data Point 55

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Riparian wetland

Project/Site: Fountain Wind City/County: Shasta County Date: 11/28/17

Applicant/Owner: Avangrid State: California

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 33, T34N, R1E

Landform (hillslope, terrace, etc.) Depression Local relief (concave, convex, none) Concave Slope % 1

Subregion (LRR): MLRA 22B Lat: 40.759497° Long: 40.759497° Datum: NAD83

Soil Map Unit Name: Cohasset stony loam, 30 to 50 percent slopes NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width _____

Feature Designation: Perennial ✓ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad ✓ Substrate cobble, gravel, sand

Natural Drainage ✓ Artificial Drainage _____ Navigable Water _____

Remarks DP documents a riparian wetland within the OHWM of Little Cow Creek.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30')			
1. Acer macrophyllum	20	Y	FACU
2. Alnus rhombifolia	5	Y	FACW
3.			
4.			
50%= 12.5 20%= 5 Total Cover:	25		
Sapling/Shrub Stratum (Plot Size: 15')	% Cover	Species?	Status
1. Acer macrophyllum	25	Y	FACU
2. Alnus rhombifolia	10	Y	FACW
3. Acer circinatum	10	Y	FAC
4. Abies concolor (3)/Pseudotsuga menziesii (2)	5	N	UPL/FACU
50%= 25 20%= 10 Total Cover:	50		
Herb Stratum (Plot Size: 5')	% Cover	Species?	Status
1. Heracleum maximum	1	Y	FAC
2. UNK grass	1	Y	?
3.			
4.			
5.			
6.			
7.			
8.			
50%= 1 20%= .4 Total Cover:	2		
Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 98 % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 4 (A)

Total number of dominant species across all strata: 7 (B)

Percent of dominant species that are OBL, FACW, or FAC: 57 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks Dominant hydrophytic vegetation is present within the floodplain of Little Cow Creek. Main channel is scoured with no vegetation.

Data Point 55

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

_____ Histosol (A1)
_____ Histic Epipedon (A2)
_____ Black Histic (A3)
_____ Hydrogen Sulfide (A4)
_____ Depleted Below Dark Surface (A11)
_____ Thick Dark Surface (A12)
_____ Sandy Mucky Mineral (S1)
_____ Sandy Gleyed Matrix (S4)
_____ Sandy Redox (S5)
_____ Stripped Matrix (S6)
_____ Loamy Mucky Mineral (except MLRA 1) (F1)
_____ Loamy Gleyed Matrix (F2)
_____ Depleted Matrix (F3)
_____ Redox Dark Surface (F6)
_____ Depleted Dark Surface (F7)
_____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

_____ 2 cm Muck (A10)
_____ Red Parent Materials (TF21)
_____ Very Shallow Dark Surface (TF12)
✓ Vegetated Sand/Gravel Bars
_____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

No soil pit vegetated sand/gravel bar.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

_____ Surface Water (A1)
_____ High Water Table (A2)
_____ Saturation (A3)
_____ Water Marks (B1)
_____ Sediment Deposits (B2)
✓ Drift Deposits (B3)
_____ Algal Mat or Crust (B4)
_____ Iron Deposits (B5)
_____ Surface Soil Cracks (B6)
_____ Inundation Visible on Aerial Imagery (B7)
_____ Sparsely Vegetated Concave Surface (B8)
_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Salt Crust (B11)
_____ Aquatic Invertebrates (B13)
_____ Hydrogen Sulfide Odor (C1)
_____ Oxidized Rhizospheres (C3)
_____ Presence of Reduced Iron (C4)
_____ Recent Iron Reduction in Tilled Soils (C6)
_____ Stunted or Stressed Plants (D1) (LRR A)
_____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Drainage Patterns (B10)
_____ Dry-Season Water Table (C2)
_____ Saturation Visible on Aerial Imagery (C9)
✓ Geomorphic Position (D2)
_____ Shallow Aquitard (D3)
_____ FAC-Neutral Test (D5)
_____ Raised Ant Mounds (D6) (LRR A)
_____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N
Water Table Present? Yes _____ No _____ Depth (inches) _____
Saturation Present? Yes _____ No _____ Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Drift deposits indicate frequent flooding. Water was present in the scoured channel but not on the vegetated floodplain.

North State Resources, Inc. now Stantec

Data Point 56

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Upland

Project/Site: Fountain Wind City/County: Shasta County Date: 11/28/17

Applicant/Owner: Avangrid State: California

Investigator(s): Gabe Youngblood Section, Township, Range Sec. 33, T34N, R1E

Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none) convex Slope % 20

Subregion (LRR): MLRA 22B Lat: 40.759456° Long: -121.867278° Datum: NAD83

Soil Map Unit Name: Lyonsville-Jiggs soils, 50 to 70 percent slopes NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP 55 wetland seep/spring.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15')	**% Cover**	**Species?**	**Status**
1. Corylus cornuta	15	Y	FACU
2. Acer macrophyllum	5	N	FACU
3. Acer circinatum	5	N	FAC
4. Pseudotsuga menziesii (3)/Abies concolor (2)	5	N	FACU/FAC
50%=15 20%=6 Total Cover:	30		
Herb Stratum (Plot Size: 5')	**% Cover**	**Species?**	**Status**
1. Rubus parviflorus	20	Y	FACU
2. Agrostis pallens	10	Y	UPL
3. Galium triflorum	1	N	FACU
4.			
5.			
6.			
7.			
8.			
50%=15.5 20%=6.2 Total Cover:	31		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 69 % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 0 (A)

Total number of dominant species across all strata: 3 (B)

Percent of dominant species that are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominate hydrophytic vegetation is not present.

Data Point 56

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	100					Loam	Gravelly

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: None Depth (Inches) _____ Hydric Soil Present? N

Remarks

No indicators of hydric soil were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? Y / N X

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 57
Feature Type: Riparian Wetland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 8/13/18
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood, Alison Loveless | Section, Township, Range: Sec. 1, T34N, R1E
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Convex | Slope %: 5
Subregion (LRR): MLRA 22B | Lat: -121.816888° | Long: 40.833953° | Datum: NAD 83
Soil Map Unit Name: Gasper-Scarface complex, moist, 15 to 30 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☑/☐ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 10'
Feature Designation: Perennial ✓ Intermittent ____ Ephemeral ____ Blue-line on USGS Quad ____ Substrate Vegetated
Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks

DP documents riparian wetlands within a perennial stream.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: ____)			
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15)			
1. Salix scouleriana	40	Y	FAC
2. Salix lasiandra	40	Y	FACW
3. Alnus incana	10	N	FACW
4. Cornus sericea	5	N	FACW
50%=47.5 20%=19 Total Cover:	95		
Herb Stratum (Plot Size: 5)			
1. Glyceria striata	3	Y	OBL
2. Viola glabella	2	Y	FACW
3. Symphyotrichum spathulatum	2	Y	FAC
4. Lilium pardalinum	2	Y	FACW
5. Galium aparine	1	N	FACU
6.			
7.			
8.			
50%=5 20%=2 Total Cover:	10		
Woody/Vine Stratum (Plot Size: ____)			
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 6 (A)
Total number of dominant species across all strata: 6 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present.

Data Point 57

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- ✓ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

Scoured channel no soil pit, vegetated sand gravel bar.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 1 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Water present in channel. Drift deposits at data point indicate frequent flooding.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 58
Feature Type: Upland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 8/13/18
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood, Alison Loveless | Section, Township, Range: Sec. 1, T34N, R1E
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Convex | Slope %: 5
Subregion (LRR): MLRA 22B | Lat: 40.833976° | Long: -121.816855° | Datum: NAD 83
Soil Map Unit Name: Gasper-Scarface complex, moist, 15 to 30 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☑/☐ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 10'
Feature Designation: Perennial ✓ Intermittent ____ Ephemeral ____ Blue-line on USGS Quad ____ Substrate Vegetated
Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks

Upland pair point.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Calocedrus decurrens	30	Y	UPL
2. Salix scouleriana	30	Y	FAC
3. Salix lasiandra	10	N	FACW
4.			
50%= 35 20%= 14 Total Cover:	70		

Sapling/Shrub Stratum (Plot Size: ____)	% Cover	Species?	Status
1. Ribes roezlii	5	Y	UPL
2.			
3.			
4.			
50%= 2.5 20%= 1 Total Cover:	5		

Herb Stratum (Plot Size: 5)	% Cover	Species?	Status
1. Pteridium aquilinum	15	Y	FACU
2. Lysimachia latifolia	10	Y	FACU
3. Galium aparine	2	N	FACU
4.			
5.			
6.			
7.			
8.			
50%= 13.5 20%= 5.4 Total Cover:	27		

Woody/Vine Stratum (Plot Size: ____)	% Cover	Species?	Status
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 73 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)
Total number of dominant species across all strata: 5 (B)
Percent of dominant species that are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation
____ Dominance Test is >50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is not present.

Data Point 58

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2							O	Leaf litter/roots
7-12	7.5YR 2.5/3	100					SL	Sandy loam

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- ✓ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: n/a Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

No indicators of hydric soil were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc.

Data Point 59
Feature Type Wetland Seep/Spring

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 8/13/18
Applicant/Owner: Avangrid State: CA
Investigator(s): Gabe Youngblood, Alison Loveless Section, Township, Range Sec. 1, T34N, R1E
Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none) Convex Slope % 5
Subregion (LRR): MLRA 22B Lat: 40.837787° Long: -121.818807° Datum: NAD 83
Soil Map Unit Name: Gasper-Scarface complex, moist, 30 to 50 percent slopes NWI Classification: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents riparian wetlands within a perennial stream.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Herb Stratum (Plot Size: 5)	**% Cover**	**Species?**	**Status**
1. Muhlenbergia filiformis	20	Y	FACW
2. Carex sp.	10	Y	FAC
3. Leucanthemum vulgare	2	N	FACU
4. Holcus lanatus	2	N	FAC
5. Equisetum arvense	2	N	FAC
6. Prunella vulgaris	2	N	FACU
7. Epilobium sp.	1	N	FAC
8. Verbena lasiostachys	1	N	FAC
50%=20 20%=8 Total Cover:	40		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 60 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)
Total number of dominant species across all strata: 2 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present. Carex sp. and Epilobium sp. are assumed FAC due to presence of other hydrophytic vegetation..

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5YR 2.5/2	100					SL	Sandy Loam high organic
2-8	10YR 2/1	80	7.5YR 3/3	20	C	M	C	Clay
8-12	10YR 3/1	70	10YR 5/4	30	C	M	C	Clay

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

_____ Histosol (A1)
_____ Histic Epipedon (A2)
_____ Black Histic (A3)
_____ Hydrogen Sulfide (A4)
_____ Depleted Below Dark Surface (A11)
_____ Thick Dark Surface (A12)
_____ Sandy Mucky Mineral (S1)
_____ Sandy Gleyed Matrix (S4)
_____ Sandy Redox (S5)
_____ Stripped Matrix (S6)
_____ Loamy Mucky Mineral (except MLRA 1) (F1)
_____ Loamy Gleyed Matrix (F2)
_____ Depleted Matrix (F3)
✓ Redox Dark Surface (F6)
_____ Depleted Dark Surface (F7)
_____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

_____ 2 cm Muck (A10)
_____ Red Parent Materials (TF21)
_____ Very Shallow Dark Surface (TF12)
_____ Vegetated Sand/Gravel Bars
_____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

Soils meet the requirements of indicator F6 Redox Dark Surface.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

_____ Surface Water (A1)
_____ High Water Table (A2)
_____ Saturation (A3)
_____ Water Marks (B1)
_____ Sediment Deposits (B2)
_____ Drift Deposits (B3)
_____ Algal Mat or Crust (B4)
_____ Iron Deposits (B5)
_____ Surface Soil Cracks (B6)
_____ Inundation Visible on Aerial Imagery (B7)
_____ Sparsely Vegetated Concave Surface (B8)
_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Salt Crust (B11)
_____ Aquatic Invertebrates (B13)
_____ Hydrogen Sulfide Odor (C1)
✓ Oxidized Rhizospheres (C3)
_____ Presence of Reduced Iron (C4)
_____ Recent Iron Reduction in Tilled Soils (C6)
_____ Stunted or Stressed Plants (D1) (LRR A)
_____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Drainage Patterns (B10)
_____ Dry-Season Water Table (C2)
_____ Saturation Visible on Aerial Imagery (C9)
_____ Geomorphic Position (D2)
_____ Shallow Aquitard (D3)
_____ FAC-Neutral Test (D5)
_____ Raised Ant Mounds (D6) (LRR A)
_____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N
Water Table Present? Yes _____ No X Depth (inches) _____
Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Oxidized rhizospheres indicate long duration saturation.

North State Resources, Inc.

Data Point: 60

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type: Upland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 8/13/18

Applicant/Owner: Avangrid | State: CA

Investigator(s): Gabe Youngblood, Alison Loveless | Section, Township, Range: Sec. 1, T34N, R1E

Landform (hillslope, terrace, etc.): Hillslope | Local relief (concave, convex, none): Convex | Slope %: 5

Subregion (LRR): MLRA 22B | Lat: 40.837806° | Long: -121.818803° | Datum: NAD 83

Soil Map Unit Name: Gasper-Scarface complex, moist, 30 to 50 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Data point documents upland condition on the edge of a meadow.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: 30)			
1. Pseudotsuga menziesii	5	Y	FACU
2. Pinus ponderosa	5	Y	FACU
3.			
4.			
50%= 5 20%= 2 Total Cover:	10		
Sapling/Shrub Stratum (Plot Size: 15)	% Cover	Species?	Status
1. Arctostaphylos patula	5	Y	UPL
2. Salix scouleriana	2	Y	FAC
3. Ceanothus integerrimus	2	Y	UPL
4. Rubus armeniacus	1	N	FAC
50%= 5 20%= 2 Total Cover:	10		
Herb Stratum (Plot Size: 5)	% Cover	Species?	Status
1. Leucanthemum vulgare	15	Y	FACU
2. Symphyotrichum spathulatum	5	Y	FAC
3. Sidalcea gigantea	5	Y	UPL
4. Prunella vulgaris	4	N	FACU
5. Holcus lanatus	2	N	FAC
6. Hypericum perforatum	2	N	FACU
7. Carex sp.	1	N	FAC
8. Elymus glaucus	1	N	FACU
50%= 17.5 20%= 7 Total Cover:	35		
Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%= 20%= Total Cover:	0		

% Bare Ground in Herb Stratum 65 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)

Total number of dominant species across all strata: 8 (B)

Percent of dominant species that are OBL, FACW, or FAC: 25 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is not present. Carex sp. assumed to be FAC due to presence of other FAC species.

Data Point 60

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100					SL	Sandy loam
4-6	7.5YR 3/2	80	10YR 3/4	20	C	PL	SL	Sandy loam
6-7	10YR 2/1	100					L	Loam
7-12	7.5YR 3/1	95	10YR 3/4	5	C	PL	CL	Clay loam

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

_____ Histosol (A1)
_____ Histic Epipedon (A2)
_____ Black Histic (A3)
_____ Hydrogen Sulfide (A4)
_____ Depleted Below Dark Surface (A11)
_____ Thick Dark Surface (A12)
_____ Sandy Mucky Mineral (S1)
_____ Sandy Gleyed Matrix (S4)
_____ Sandy Redox (S5)
_____ Stripped Matrix (S6)
_____ Loamy Mucky Mineral (except MLRA 1) (F1)
_____ Loamy Gleyed Matrix (F2)
_____ Depleted Matrix (F3)
_____ Redox Dark Surface (F6)
✓ Depleted Dark Surface (F7)
_____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

_____ 2 cm Muck (A10)
_____ Red Parent Materials (TF21)
_____ Very Shallow Dark Surface (TF12)
_____ Vegetated Sand/Gravel Bars
_____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: n/a Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

Soils meet the requirements of indicator F6 Redox Dark Surface.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

_____ Surface Water (A1)
_____ High Water Table (A2)
_____ Saturation (A3)
_____ Water Marks (B1)
_____ Sediment Deposits (B2)
_____ Drift Deposits (B3)
_____ Algal Mat or Crust (B4)
_____ Iron Deposits (B5)
_____ Surface Soil Cracks (B6)
_____ Inundation Visible on Aerial Imagery (B7)
_____ Sparsely Vegetated Concave Surface (B8)
_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Salt Crust (B11)
_____ Aquatic Invertebrates (B13)
_____ Hydrogen Sulfide Odor (C1)
✓ Oxidized Rhizospheres (C3)
_____ Presence of Reduced Iron (C4)
_____ Recent Iron Reduction in Tilled Soils (C6)
_____ Stunted or Stressed Plants (D1) (LRR A)
_____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Drainage Patterns (B10)
_____ Dry-Season Water Table (C2)
_____ Saturation Visible on Aerial Imagery (C9)
_____ Geomorphic Position (D2)
_____ Shallow Aquitard (D3)
_____ FAC-Neutral Test (D5)
_____ Raised Ant Mounds (D6) (LRR A)
_____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N
Water Table Present? Yes _____ No X Depth (inches) _____
Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Oxidized rhizospheres begin at 4 inches and indicate long duration saturation.

North State Resources, Inc.

Data Point 61
Feature Type Fresh emergent wetland

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 8/15/18
Applicant/Owner: Avangrid State: CA
Investigator(s): Gabe Youngblood, Alison Loveless Section, Township, Range Sec. 36, T35N, R1E
Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Concave Slope % 1
Subregion (LRR): MLRA 22B Lat: 40.840497° Long: -121.821042° Datum: NAD 83
Soil Map Unit Name: Gasper-Scarface complex, moist, 15 to 30 percent slopes NWI Classification: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ____ Ordinary High Water Mark Mapped ✓ Stream Width Variable
Feature Designation: Perennial ✓ Intermittent ____ Ephemeral ____ Blue-line on USGS Quad ____ Substrate Vegetated
Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks

Data point documents a perennial stream with wetland vegetation throughout the channel.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Herb Stratum (Plot Size: 5)	**% Cover**	**Species?**	**Status**
1. Veronica americana	20	Y	OBL
2. Equisetum arvense	5	N	FAC
3. Scirpus microcarpus	5	N	OBL
4.			
5.			
6.			
7.			
8.			
50%=15 20%=6 Total Cover:	30		
Woody/Vine Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum 70 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)
Total number of dominant species across all strata: 1 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present.

Data Point 61

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/1	100					MS	Mucky sand

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- ✓ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- ✓ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: Rock Depth (Inches) 2 Hydric Soil Present? ✓ / N

Remarks

Soil consists of root mat with fine organic (muck) and sand. Meets indicator S1 Sandy Mucky Mineral.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 1 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Surface water provides wetland hydrology.

North State Resources, Inc.

Data Point 62

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Riparian Wetland

Project/Site: Fountain Wind City/County: Shasta County Date: 8/15/18

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood, Alison Loveless Section, Township, Range Sec. 36, T35N, R1E

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none) Concave Slope % 3

Subregion (LRR): MLRA 22B Lat: 40.840466° Long: -121.821029° Datum: NAD 83

Soil Map Unit Name: Gasper-Scarface complex, moist, 15 to 30 percent slopes NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____

Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____

Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Data point documents riparian wetland adjacent to a perennial stream.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: 15 ft)	**% Cover**	**Species?**	**Status**
1. Salix lasiandra	20	Y	FACW
2. Salix scouleriana	20	Y	FAC
3. Alnus incana	15	Y	FACW
4.			
50%= 27.5 20%= 11 Total Cover:	55		
Herb Stratum (Plot Size: 5 ft)	**% Cover**	**Species?**	**Status**
1. Viola glabella	10	Y	FACW
2. Stachys ajugoides	10	Y	OBL
3. Equisetum arvense	5	N	FAC
4. Achillea millefolium	5	N	FACU
5. Scirpus microcarpus	2	N	OBL
6.			
7.			
8.			
50%= 15.5 20%= 6.4 Total Cover:	32		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 68 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 5 (A)

Total number of dominant species across all strata: 5 (B)

Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

✓ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present.

Data Point 62

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-4	10YR 2/1	100					P	Peat
4-12	7.5YR 2.5/3	58	7.5YR 3/4	30	C	M	SL	Sandy loam
			7.5YR 5/8	10	C	PL		
			10YR 6/2	2	D	M		

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- ✓ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: Rock Depth (Inches) 2 Hydric Soil Present? ✓ /

Remarks

Four inch layer of coarsely decomposed organic layer over mineral soil. Oxidized rhizoshpheres indicate aquic conditions

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) n/a Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) n/a

Saturation Present? Yes _____ No X Depth (inches) n/a *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Oxidized rhizospheres indicate long duration saturation.

North State Resources, Inc.

Data Point 63
Feature Type Upland

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 8/15/18
Applicant/Owner: Avangrid State: CA
Investigator(s): Gabe Youngblood, Alison Loveless Section, Township, Range Sec. 36, T35N, R1E
Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none) Convex Slope % 5
Subregion (LRR): MLRA 22B Lat: 40.840437° Long: -121.821010° Datum: NAD 83
Soil Map Unit Name: Gasper-Scarface complex, moist, 15 to 30 percent slopes NWI Classification: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Data point documents uplands adjacent to riparian wetland.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix scouleriana	10	Y	FAC
2. Pinus ponderosa	10	Y	FACU
3.			
4.			
50%= _____ 20%= _____ Total Cover:	20		
Sapling/Shrub Stratum (Plot Size: 15)	**% Cover**	**Species?**	**Status**
1. Salix scouleriana	40	Y	FAC
2. Alnus incana	10	N	FACW
3. Ribes roezlii (2)/ Ribes nevadense (2)	4	N	UPL/FAC
4. Ceanothus integerrimus (2)/ Pseudotsuga menziesii(2)	4	N	UPL/FACU
50%= 27 20%= 11.6 Total Cover:	58		
Herb Stratum (Plot Size: 5)	**% Cover**	**Species?**	**Status**
1. Lysimachia latifolia	8	Y	FACW
2. Equisetum arvense	5	Y	FAC
3. Juncus balticus	2	N	FACW
4. Cynoglossum occidentale	2	N	UPL
5. Stachys ajugoides	1	N	OBL
6. Achillea millefolium	1	N	FACU
7. Leucanthemum vulgare	1	N	FACU
8.			
50%= 10 20%= 4 Total Cover:	20		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%= _____ 20%= _____ Total Cover:	0		

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 4 (A)
Total number of dominant species across all strata: 5 (B)
Percent of dominant species that are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present.

Data Point 63

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 2/1	100					P	Peat
1-12	7.5YR 3/4	100					GL	Gravelly loam
12-16	7.5YR 3/3	70	7.5YR 4/6	30	C	M	GCL	Gravelly clay loam

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

_____ Histosol (A1)
_____ Histic Epipedon (A2)
_____ Black Histic (A3)
_____ Hydrogen Sulfide (A4)
_____ Depleted Below Dark Surface (A11)
_____ Thick Dark Surface (A12)
_____ Sandy Mucky Mineral (S1)
_____ Sandy Gleyed Matrix (S4)
_____ Sandy Redox (S5)
_____ Stripped Matrix (S6)
_____ Loamy Mucky Mineral (except MLRA 1) (F1)
_____ Loamy Gleyed Matrix (F2)
_____ Depleted Matrix (F3)
_____ Redox Dark Surface (F6)
_____ Depleted Dark Surface (F7)
_____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

_____ 2 cm Muck (A10)
_____ Red Parent Materials (TF21)
_____ Very Shallow Dark Surface (TF12)
_____ Vegetated Sand/Gravel Bars
_____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? Y / N

Remarks

No indicators of hydric soils were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

_____ Surface Water (A1)
_____ High Water Table (A2)
_____ Saturation (A3)
_____ Water Marks (B1)
_____ Sediment Deposits (B2)
_____ Drift Deposits (B3)
_____ Algal Mat or Crust (B4)
_____ Iron Deposits (B5)
_____ Surface Soil Cracks (B6)
_____ Inundation Visible on Aerial Imagery (B7)
_____ Sparsely Vegetated Concave Surface (B8)
_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Salt Crust (B11)
_____ Aquatic Invertebrates (B13)
_____ Hydrogen Sulfide Odor (C1)
_____ Oxidized Rhizospheres (C3)
_____ Presence of Reduced Iron (C4)
_____ Recent Iron Reduction in Tilled Soils (C6)
_____ Stunted or Stressed Plants (D1) (LRR A)
_____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

_____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
_____ Drainage Patterns (B10)
_____ Dry-Season Water Table (C2)
_____ Saturation Visible on Aerial Imagery (C9)
_____ Geomorphic Position (D2)
_____ Shallow Aquitard (D3)
_____ FAC-Neutral Test (D5)
_____ Raised Ant Mounds (D6) (LRR A)
_____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) n/a Wetland Hydrology? Y / N

Water Table Present? Yes _____ No X Depth (inches) n/a

Saturation Present? Yes _____ No X Depth (inches) n/a *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 64
Feature Type: Vegetated ditch

Project/Site: Fountain Wind | City/County: Shasta County | Date: 8/30/18
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood, Alison Loveless | Section, Township, Range: Sec. 25, T35N, R1E
Landform (hillslope, terrace, etc.): Drainage ditch | Local relief (concave, convex, none): Concave | Slope %: 2
Subregion (LRR): MLRA 22B | Lat: 40.865026° | Long: -121.821162° | Datum: NAD 83
Soil Map Unit Name: Goulder gravelly sandy loam, 15 to 30 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☑/☐ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑ ☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ____ Ordinary High Water Mark Mapped ✓ Stream Width 2
Feature Designation: Perennial ✓ Intermittent ____ Ephemeral ____ Blue-line on USGS Quad ____ Substrate vegetated
Natural Drainage ____ Artificial Drainage ✓ Navigable Water ____

Remarks

Data point documents a vegetated ditch.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: ____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		

Herb Stratum (Plot Size: 5 ft)	% Cover	Species?	Status
1. Carex amplifolia	60	Y	OBL
2. Carex sp.	5	N	FAC--
3. Holcus lanatus	5	N	FAC
4. Deschampsia cespitosa	5	N	FACW
5. Rumex occidentalis	3	N	OBL
6. Galium trifidum	1	N	FACW
7. Veronica americana	1	N	OBL
8.			
50%=40 20%=16 Total Cover:	80		

Woody/Vine Stratum (Plot Size: ____)	% Cover	Species?	Status
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 5 (A)
Total number of dominant species across all strata: 5 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present. Carex sp. assumed to be FAC due to presence of other hydrophytic vegetation.

Data Point 64

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 2.5/2	100					GCL	Gravely clay loam

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- ✓ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /

Remarks

Soils were inundated during survey. Considered Hydric as they support dominate obligate plants and wetland hydrology.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 1 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Surface water provides wetland hydrology.

North State Resources, Inc.

Data Point: 65
Feature Type: Upland

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind | City/County: Shasta County | Date: 8/30/18
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood, Alison Loveless | Section, Township, Range: Sec. 25, T35N, R1E
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Convex | Slope %: 5
Subregion (LRR): MLRA 22B | Lat: 40.865027° | Long: -121.821220° | Datum: NAD 83
Soil Map Unit Name: Goulder gravelly sandy loam, 15 to 30 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☑/☐ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☑/☐ Hydric soil? ☑/☐ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☑/☐ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width _____
Feature Designation: Perennial _____ Intermittent ✓ Ephemeral _____ Blue-line on USGS Quad _____ Substrate Vegetated
Natural Drainage _____ Artificial Drainage ✓ Navigable Water _____

Remarks

Upland pair to DP64 which documents a vegetated ditch.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Herb Stratum (Plot Size: 5)	% Cover	Species?	Status
1. Festuca arundinacea	60	Y	FAC
2. Poa pratensis	5	N	FAC
3. Juncus sp.	5	N	FAC-
4.		N	
5.		N	
6.		N	
7.		N	
8.			
50%=40 20%=16 Total Cover:	70		

Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 1 (A)
Total number of dominant species across all strata: 1 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present. Juncus sp. assumed FAC or wetter due to species that are documented within the project as being FACW or OBL.

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5YR 2.5/3	100					GCL	Gravelly clay loam

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? ✓ /

Remarks

No indicators of hydric soil were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) n/a Wetland Hydrology? Y / N

Water Table Present? Yes _____ No X Depth (inches) n/a

Saturation Present? Yes _____ No X Depth (inches) n/a *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc.

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Data Point: 66
Feature Type: Seasonal wetland

Project/Site: Fountain Wind | City/County: Shasta County | Date: 8/30/18
Applicant/Owner: Avangrid | State: CA
Investigator(s): Gabe Youngblood, Alison Loveless | Section, Township, Range: Sec. 30, T35N, R2E
Landform (hillslope, terrace, etc.): Hillslope | Local relief (concave, convex, none): Convex | Slope %: 15
Subregion (LRR): MLRA 22B | Lat: 40.855492° | Long: -121.796321° | Datum: NAD 83
Soil Map Unit Name: Stukel complex, 15 to 30 percent slopes | NWI Classification: N/A

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ____ Ordinary High Water Mark Mapped ✓ Stream Width: Variable
Feature Designation: Perennial ✓ Intermittent ____ Ephemeral ____ Blue-line on USGS Quad ____ Substrate: Vegetated
Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks

Data point documents a seasonal wetland on a hillslope with shallow soils over bedrock.

Vegetation (Use Scientific Names)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot Size: ____)			
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: ____)			
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Herb Stratum (Plot Size: 5)			
1. Triteleia hyacinthina	20	Y	FAC
2. Navarretia intertexta	18	Y	FACW
3. Mimulus guttatus	5	N	OBL
4. Perideridia sp.	3	N	UNK
5. Brodiaea sp.	2	N	UNK
6. Juncus sp. (dwarf sp.)	2	N	UNK
7. Epilobium campestre	1	N	OBL
8.			
50%=15 20%=6 Total Cover:	51		
Woody/Vine Stratum (Plot Size: ____)			
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum 49 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 2 (A)
Total number of dominant species across all strata: 2 (B)
Percent of dominant species that are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☑/☐

Remarks

Dominant hydrophytic vegetation is present.

Data Point 66

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/1	100					MS	Mucky sand

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- ✓ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: Bedrock Depth (Inches) 4 Hydric Soil Present? ✓ / N

Remarks

Problematic shallow soil over bedrock is seasonally saturated and supports hydrophytic plants.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- ✓ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- ✓ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- ✓ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- ✓ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) n/a Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) n/a

Saturation Present? Yes _____ No X Depth (inches) n/a *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Saturation visible on some Google Earth imagery.

Remarks

Salt (white) staining on rocks and soil surface indicate saturation and seepage.

North State Resources, Inc.

Data Point 67
Feature Type Upland

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Project/Site: Fountain Wind City/County: Shasta County Date: 8/30/18
Applicant/Owner: Avangrid State: CA
Investigator(s): Gabe Youngblood, Alison Loveless Section, Township, Range Sec. 30, T35N, R2E
Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none) Convex Slope % 15
Subregion (LRR): MLRA 22B Lat: 40.855504° Long: -121.796347° Datum: NAD 83
Soil Map Unit Name: Stukel complex, 15 to 30 percent slopes NWI Classification: N/A
Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*
Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐
Are vegetation ☐/☒ soil ☑/☐ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐/☒ Hydric soil? ☐/☒ Wetland hydrology? ☐/☒ Is sampled area a wetland? ☐/☒ Other waters? ☐/☒

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank _____ Scour _____ Ordinary High Water Mark Mapped _____ Stream Width _____
Feature Designation: Perennial _____ Intermittent _____ Ephemeral _____ Blue-line on USGS Quad _____ Substrate _____
Natural Drainage _____ Artificial Drainage _____ Navigable Water _____

Remarks

Upland pair to DP66 which documents a seasonal wetland.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1. Arctostaphylos patula	45	Y	UPL
2. Quercus garryana	40	Y	FACU
3. Ceanothus integarmus	5	N	UPL
4.			
50%= 45 20%= 18 Total Cover:	90		
Herb Stratum (Plot Size: 5)	**% Cover**	**Species?**	**Status**
1. Galium aparine	2	2	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%= 1 20%= .4 Total Cover:	2		
Woody/Vine Stratum (Plot Size: _____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum 98 % Cover of Biotic Crust 0

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: 0 (A)
Total number of dominant species across all strata: 3 (B)
Percent of dominant species that are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species		x 1 =	0
FACW Species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation
_____ Dominance Test is >50%
_____ Prevalence Index is ≤ 3.0[1]
_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
_____ Wetland Non-Vascular Plants[1]
_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☒

Remarks

Dominant hydrophytic vegetation is not present.

Data Point 67

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 2/2	100					L	Loam

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: Bedrock Depth (Inches) 8 Hydric Soil Present? Y /X

Remarks

No indicators of hydric soil were observed.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- _____ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- _____ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) n/a Wetland Hydrology? Y /X

Water Table Present? Yes _____ No X Depth (inches) n/a

Saturation Present? Yes _____ No X Depth (inches) n/a *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

No indicators of wetland hydrology were observed.

North State Resources, Inc. now Stantec

Data Point 68

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Intermittent Stream

Project/Site: Fountain Wind City/County: Shasta County Date: 8/15/18

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood, Alison Loveless Section, Township, Range Sec. 26, T35N, R1E

Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Concave Slope % 5

Subregion (LRR): MLRA 22B Lat: 40.856761° Long: -121.836736° Datum: NAD 83

Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes NWI Classification: R4SBC

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width 2

Feature Designation: Perennial _____ Intermittent ✓ Ephemeral _____ Blue-line on USGS Quad _____ Substrate soil

Natural Drainage ✓ Artificial Drainage _____ Navigable Water _____

Remarks

DP documents a small intermittent stream.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Sapling/Shrub Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
50%=_____ 20%=_____ Total Cover:	0		

Herb Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=_____ 20%=_____ Total Cover:	0		

Woody/Vine Stratum (Plot Size: _____)	% Cover	Species?	Status
1.			
2.			
50%=_____ 20%=_____ Total Cover:	0		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: _____ (A)

Total number of dominant species across all strata: _____ (B)

Percent of dominant species that are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	_____	x 1 =	0
FACW Species	_____	x 2 =	0
FAC Species	_____	x 3 =	0
FACU Species	_____	x 4 =	0
UPL Species	_____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators

_____ Rapid Test for Hydrophytic Vegetation

_____ Dominance Test is >50%

_____ Prevalence Index is ≤ 3.0[1]

_____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

_____ Wetland Non-Vascular Plants[1]

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☐

Remarks

No veg scoured channel

Data Point 68

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /

Remarks

No soils pit scoured channel

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- _____ Surface Water (A1)
- _____ High Water Table (A2)
- _____ Saturation (A3)
- _____ Water Marks (B1)
- _____ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes _____ No X Depth (inches) _____ Wetland Hydrology? ✓ / N

Water Table Present? Yes _____ No X Depth (inches) _____

Saturation Present? Yes _____ No X Depth (inches) _____ *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Drift deposits indicate frequent flooding.

North State Resources, Inc. now Stantec

Data Point 69

Wetland Determination Data Form–Western Mountains, Valleys, & Coast Region

Feature Type Perennial Stream

Project/Site: Fountain Wind City/County: Shasta County Date: 8/30/18

Applicant/Owner: Avangrid State: CA

Investigator(s): Gabe Youngblood, Alison Loveless Section, Township, Range Sec. 26, T35N, R1E

Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none) Concave Slope % 5

Subregion (LRR): MLRA 22B Lat: 40.861379° Long: -121.837220° Datum: NAD 83

Soil Map Unit Name: Nanny gravelly sandy loam, 0 to 8 percent slopes NWI Classification: R3UBH

Are climatic/hydrologic conditions on the site typical for this time of year? ☑/☐ *(If no, explain in Remarks.)*

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ significantly disturbed? Are normal circumstances present? ☑/☐

Are vegetation ☐/☒ soil ☐/☒ or hydrology ☐/☒ naturally problematic? *(If needed, explain in Remarks.)*

Note: On this e-form, the checkmark (left choice) means yes, the X (right choice) means no.

Summary of Findings (Attach site map showing sampling point locations, transects, important features, etc.)

Hydrophytic vegetation? ☐ ☒ Hydric soil? ☐/☒ Wetland hydrology? ☑/☐ Is sampled area a wetland? ☐/☒ Other waters? ☑/☐

Evaluation of features designated "Other Waters of the United States"

Indicators: Defined bed and bank ✓ Scour ✓ Ordinary High Water Mark Mapped ✓ Stream Width Variable

Feature Designation: Perennial ✓ Intermittent ____ Ephemeral ____ Blue-line on USGS Quad ____ Substrate Cobble

Natural Drainage ✓ Artificial Drainage ____ Navigable Water ____

Remarks

DP documents Hatchet Creek.

Vegetation (Use Scientific Names)

Tree Stratum (Plot Size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Sapling/Shrub Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
50%=____ 20%=____ Total Cover:	0		
Herb Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
50%=____ 20%=____ Total Cover:	0		
Woody/Vine Stratum (Plot Size: ____)	**% Cover**	**Species?**	**Status**
1.			
2.			
50%=____ 20%=____ Total Cover:	0		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test Worksheet

Number of dominant species that are OBL, FACW, or FAC: ____ (A)

Total number of dominant species across all strata: ____ (B)

Percent of dominant species that are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index Worksheet

Total % Cover of:		Multiply by	
OBL Species	____	x 1 =	0
FACW Species	____	x 2 =	0
FAC Species	____	x 3 =	0
FACU Species	____	x 4 =	0
UPL Species	____	x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators

____ Rapid Test for Hydrophytic Vegetation

____ Dominance Test is >50%

____ Prevalence Index is ≤ 3.0[1]

____ Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

____ Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]*Indicators of hydric soil and wetland hydrology must be present.*

Hydrophytic Vegetation Present? ☐/☐

Remarks

No veg scoured channel

Data Point 69

Soils

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Types: C = Concentration D = Depletion RM = Reduced Matrix [2]Location: PL = Pore Lining M = Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted)

- _____ Histosol (A1)
- _____ Histic Epipedon (A2)
- _____ Black Histic (A3)
- _____ Hydrogen Sulfide (A4)
- _____ Depleted Below Dark Surface (A11)
- _____ Thick Dark Surface (A12)
- _____ Sandy Mucky Mineral (S1)
- _____ Sandy Gleyed Matrix (S4)
- _____ Sandy Redox (S5)
- _____ Stripped Matrix (S6)
- _____ Loamy Mucky Mineral (except MLRA 1) (F1)
- _____ Loamy Gleyed Matrix (F2)
- _____ Depleted Matrix (F3)
- _____ Redox Dark Surface (F6)
- _____ Depleted Dark Surface (F7)
- _____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]

- _____ 2 cm Muck (A10)
- _____ Red Parent Materials (TF21)
- _____ Very Shallow Dark Surface (TF12)
- _____ Vegetated Sand/Gravel Bars
- _____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present): Type: _____ Depth (Inches) _____ Hydric Soil Present? /

Remarks

No soils pit scoured channel.

Hydrology

Wetland Indicators

Primary Indicators (Minimum of one is required. Check all that apply.)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- _____ Water Marks (B1)
- ✓ Sediment Deposits (B2)
- ✓ Drift Deposits (B3)
- _____ Algal Mat or Crust (B4)
- _____ Iron Deposits (B5)
- _____ Surface Soil Cracks (B6)
- _____ Inundation Visible on Aerial Imagery (B7)
- _____ Sparsely Vegetated Concave Surface (B8)
- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Salt Crust (B11)
- _____ Aquatic Invertebrates (B13)
- _____ Hydrogen Sulfide Odor (C1)
- _____ Oxidized Rhizospheres (C3)
- _____ Presence of Reduced Iron (C4)
- _____ Recent Iron Reduction in Tilled Soils (C6)
- _____ Stunted or Stressed Plants (D1) (LRR A)
- _____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- _____ Water Stained Leaves (B9) except MLRA 1,2,4A, and 4B)
- _____ Drainage Patterns (B10)
- _____ Dry-Season Water Table (C2)
- _____ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- _____ Shallow Aquitard (D3)
- _____ FAC-Neutral Test (D5)
- _____ Raised Ant Mounds (D6) (LRR A)
- _____ Frost-Heave Hummocks (D7)

Field Observations

Surface Water Present? Yes ✓ No _____ Depth (inches) 12 Wetland Hydrology? ✓ / N

Water Table Present? Yes ✓ No _____ Depth (inches) Surface

Saturation Present? Yes ✓ No _____ Depth (inches) Surface *(includes capillary fringe)*

Describe Recorded Data (stream gauge, monitoring well, aerial photos, and previous inspections), if available:

Remarks

Surface water provides wetland hydrology.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, & Coast

Project/Site: Fountain Wind Project | City/County: Burney/Shasta | Sampling Date: 10/14/2019
Applicant/Owner: Fountain Wind, LLC | State: California | Sampling Point: 001 up
Investigator(s): S. Creer|&|S. Cortez|&|B. Cohen | Section, Township, Range: CA21 T34N R2E SN5
Landform (hillslope, terrace, etc): Terrace | Local relief (concave, convex, none): concave | Slope (%): 3
Subregion (LRR): MLRA 22B | Lat: 40.83333943 | Long: 121.782373 | Datum: WGS84
Soil Map Unit Name: Gasper-Scarface complex, moist, 30 to 50 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X
Hydric Soil Present?	Yes		No	X
Wetland Hydrology Present?	Yes		No	X
Is the Sampled Area within a Wetland?	Yes		No	X

Remarks:

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 foot radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus ponderosa* / Yellow pine, Ponderosa pine, Western yel	10	Yes	FACU
2. *Pseudotsuga menziesii* / Douglas fir	10	Yes	FACU
3.			
4.			
	20	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15ft)			
1. *Alnus incana* / Gray alder	40	Yes	FACW
2. *Salix scouleriana* / Scouler willow, Scouler's willow	35	Yes	FAC
3. *Acer macrophyllum* / Bigleaf maple, Big-leaf maple	30	Yes	FACU
4. *Symphoricarpos albus* / Common snowberry	15	No	FACU
5.			
	120	= Total Cover	
Herb Stratum (Plot size: 6 foot radius)			
1. *Elymus glaucus* / Blue wildrye, Blue or western wild-rye	65	Yes	FACU
2. *Equisetum hyemale* / Scouringrush horsetail	13	No	FACW
3. *Woodwardia fimbriata* / Western chain fern, Giant chain fern	7	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85	= Total Cover	
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Statum 5

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 6 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	35	x 3 =	105
FACU species	130	x 4 =	520
UPL species	0	x 5 =	0
Column Totals:	225 (A)		745 (B)

Prevalence Index = B/A = 3.31

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 001 up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	5 YR 3/2	100					Sandy loam	Shovel refusal rocks at 8

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ___ No X

Remarks:

Large rocks present throughout

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): _____

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, & Coast

Project/Site: Fountain Wind Project | City/County: Burney/Shasta | Sampling Date: 10/14/2019
Applicant/Owner: Fountain Wind, LLC | State: California | Sampling Point: 001 wet
Investigator(s): S. Cortez|&|B. Cohen | Section, Township, Range: CA21 T34N R2E SN5
Landform (hillslope, terrace, etc): terrace | Local relief (concave, convex, none): concave | Slope (%): 3
Subregion (LRR): MLRA 22B | Lat: 40.83333298 | Long: -121.782401 | Datum: WGS84
Soil Map Unit Name: Gasper-Scarface complex, moist, 30 to 50 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	
Hydric Soil Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: N/A)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 foot radius)			
1. *Acer circinatum* / Vine maple	30	Yes	FAC
2. *Salix scouleriana* / Scouler willow, Scouler's willow	20	Yes	FAC
3. *Alnus incana* / Gray alder	20	Yes	FACW
4.			
5.			
	70	= Total Cover	
Herb Stratum (Plot size: 6 foot radius)			
1. *Carex utriculata* / Beaked sedge, Southern beaked sedge	70	Yes	OBL
2. *Elymus glaucus* / Blue wildrye, Blue or western wild-rye	20	Yes	FACU
3. *Scirpus microcarpus* / Mountain bog bulrush	5	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95	= Total Cover	
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Statum ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	75	x 1 =	75
FACW species	20	x 2 =	40
FAC species	50	x 3 =	150
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	165 (A)		345 (B)

Prevalence Index = B/A = 2.09

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 001 wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	7.5 YR 4/1	90	5 YR 4/6	10	C	M	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): .5

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, & Coast

Project/Site: Fountain Wind Project | City/County: Burney/Shasta | Sampling Date: 10/15/2019
Applicant/Owner: Fountain Wind, LLC | State: California | Sampling Point: 002 up
Investigator(s): S. Creer|&|S. Cortez | Section, Township, Range: CA21 T34N R2E SN6
Landform (hillslope, terrace, etc): Flattened area on hill slope | Local relief (concave, convex, none): concave | Slope (%): 3
Subregion (LRR): MLRA 22B | Lat: 40.828088 | Long: -121.787942 | Datum: WGS84
Soil Map Unit Name: Nanny stony sandy loam, 0 to 8 percent slopes (NbB) | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	
Hydric Soil Present?	Yes		No	X	**Is the Sampled Area**
Wetland Hydrology Present?	Yes		No	X	**within a Wetland?** Yes ____ No X

Remarks:

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: N/a)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: N/a)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 6 feet radius)			
1. *Hypericum perforatum* / Klamathweed	25	Yes	FACU
2. *Plantago lanceolata* / Ribwort, English plantain	15	Yes	FACU
3. *Achillea millefolium* / Yarrow	10	No	FACU
4. *Anthoxanthum odoratum* / Sweet vernal grass	10	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	60	= Total Cover	
Woody Vine Stratum (Plot size: N/a)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Statum 45

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	60	x 4 =	240
UPL species	0	x 5 =	0
Column Totals:	60 (A)		240 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 002 up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 3/2	100					loam	
6-12	10 YR 5/2	70					Loam	
6-12	10 YR 4/2	30					Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): .1

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): 12

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, & Coast

Project/Site: Fountain Wind Project | City/County: Burney/Shasta | Sampling Date: 10/15/2019
Applicant/Owner: Fountain Wind, LLC | State: California | Sampling Point: 002 wet
Investigator(s): S. Creer|&|S. Cortez | Section, Township, Range: CA21 T34N R2E SN6
Landform (hillslope, terrace, etc): Flattened area on hill slope | Local relief (concave, convex, none): concave | Slope (%): 3
Subregion (LRR): MLRA 22B | Lat: 40.8280169 | Long: -121.787656 | Datum: WGS84
Soil Map Unit Name: Nanny stony sandy loam, 0 to 8 percent slopes (NbB) | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	
Hydric Soil Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: N/a)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: N/a)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 6 feet radius)			
1. *Carex utriculata* / Beaked sedge, Southern beaked sedge	80	Yes	OBL
2. *Juncus effusus* / Common bog rush, Soft or lamp rush	15	No	FACW
3. *Anthoxanthum odoratum* / Sweet vernal grass	10	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	105	= Total Cover	
Woody Vine Stratum (Plot size: N/a)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Statum 0

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	80	x 1 =	80
FACW species	15	x 2 =	30
FAC species	0	x 3 =	0
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	105 (A)		150 (B)

Prevalence Index = B/A = 1.43

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 002 wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	7.5 YR 3/3	100					Silty clay loam	
5-12	10 YR 4/1	58	5 YR 5/8	2	C	M	Silty clay loam	
5-12	10 YR 5/2	40					Silty clay loam	Soft manganese masses at 3%

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Problematic soil; as per chapter 5 of supplement: item #6 seasonally ponded soils. Positive for alpha-alpha Dipyridyl test. Assume Hydric soils due to presence of hydrology and hydrophytic veg.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- X Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): .1

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 12

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, & Coast

Project/Site: Fountain Wind Project | City/County: Burney/Shasta | Sampling Date: 10/15/2019
Applicant/Owner: Fountain Wind, LLC | State: California | Sampling Point: 052 up
Investigator(s): JI Holson|&|B. Cohen | Section, Township, Range: CA21 T34N R1E SN10
Landform (hillslope, terrace, etc): Floodplain | Local relief (concave, convex, none): concave | Slope (%): 1
Subregion (LRR): MLRA 22B | Lat: 40.817215 | Long: -121.841597 | Datum: WGS84
Soil Map Unit Name: Windy and McCarthy very stony sandy loams, 30 to 50 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	____	No	X	
Hydric Soil Present?	Yes	____	No	X	**Is the Sampled Area**
Wetland Hydrology Present?	Yes	____	No	X	**within a Wetland?** Yes ____ No X

Remarks:

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 foot radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pseudotsuga menziesii* / Douglas fir	50	Yes	FACU
2. *Populus tremuloides* / Quaking aspen	40	Yes	FACU
3.			
4.			
	90	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 foot radius)			
1. *Cornus nuttallii* / Mountain dogwood	25	Yes	FACU
2. *Acer circinatum* / Vine maple	15	Yes	FAC
3. *Rubus parviflorus* / Thimbleberry	10	Yes	FACU
4.			
5.			
	50	= Total Cover	
Herb Stratum (Plot size: 6 foot radius)			
1. *Lathyrus latifolius* / Sweet pea, Perennial sweet pea	2	Yes	
2. *Bromus carinatus* / California bromegrass	1	Yes	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	3	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Statum 95

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 7 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 14.3 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	15	x 3 =	45
FACU species	125	x 4 =	500
UPL species	0	x 5 =	0
Column Totals:	140 (A)		545 (B)

Prevalence Index = B/A = 3.89

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 052 up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	5 YR 3/1	100					Loamy sand	
4-16	5 YR 3/3	100					Sand	Small gravel throughout.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes ___ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): _____

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, & Coast

Project/Site: Fountain Wind Project | City/County: Burney/Shasta | Sampling Date: 10/16/2019
Applicant/Owner: Fountain Wind, LLC | State: California | Sampling Point: 053 up
Investigator(s): JI Holson|&|B. Cohen | Section, Township, Range: CA21 T34N R1E SN22
Landform (hillslope, terrace, etc): Hillslope | Local relief (concave, convex, none): convex | Slope (%): 30
Subregion (LRR): MLRA 22B | Lat: 40.78578697 | Long: -121.851966 | Datum: WGS84
Soil Map Unit Name: Windy and McCarthy very stony sandy loams, 30 to 50 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	
Hydric Soil Present?	Yes		No	X	**Is the Sampled Area**
Wetland Hydrology Present?	Yes		No	X	**within a Wetland?** Yes ____ No X

Remarks:

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 foot radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pseudotsuga menziesii* / Douglas fir	45	Yes	FACU
2. *Calocedrus decurrens* / Incense cedar	15	Yes	
3. *Cornus nuttallii* / Mountain dogwood	5	No	FACU
4.			
	65	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 foot radius)			
1. *Acer circinatum* / Vine maple	20	Yes	FAC
2. *Cornus nuttallii* / Mountain dogwood	20	Yes	FACU
3.			
4.			
5.			
	40	= Total Cover	
Herb Stratum (Plot size: N/A)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0	= Total Cover	
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Statum 100

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 25.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	20	x 3 =	60
FACU species	70	x 4 =	280
UPL species	0	x 5 =	0
Column Totals:	90 (A)		340 (B)

Prevalence Index = B/A = 3.78

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 053 up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	7.5 YR 3/3	100					Loam	Cobbles present

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, & Coast

Project/Site: Fountain Wind Project | City/County: Burney/Shasta | Sampling Date: 10/16/2019
Applicant/Owner: Fountain Wind, LLC | State: California | Sampling Point: 053 wet
Investigator(s): JI Holson|&|B. Cohen | Section, Township, Range: CA21 T34N R1E SN22
Landform (hillslope, terrace, etc): Floodplain | Local relief (concave, convex, none): concave | Slope (%): 1
Subregion (LRR): MLRA 22B | Lat: 40.785926 | Long: -121.851976 | Datum: WGS84
Soil Map Unit Name: Windy and McCarthy very stony sandy loams, 30 to 50 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	
Hydric Soil Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 foot radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 foot radius)			
1. *Alnus rhombifolia* / White alder	40	Yes	FACW
2. *Acer circinatum* / Vine maple	20	Yes	FAC
3. *Salix scouleriana* / Scouler willow, Scouler's willow	10	No	FAC
4.			
5.			
	70	= Total Cover	
Herb Stratum (Plot size: 6 foot radius)			
1. *Carex* / Sedge	75	Yes	FAC
2. *Stachys ajugoides* / Hedge nettle	8	No	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	83	= Total Cover	
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Statum 10

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	8	x 1 =	8
FACW species	40	x 2 =	80
FAC species	105	x 3 =	315
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	153 (A)		403 (B)

Prevalence Index = B/A = 2.63

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Carex is not identifiable to species at this time but is assumed to be FAC due to presence of other hydrophytic species.

SOIL

Sampling Point: 053 wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10 YR 3/2	100					Loamy sand	Higher levels of loam in upper layers above

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Soils are problematic and assumed hydric. Sampled area is in vegetated sand and gravel bar within top of bank and redox features may be washed out by Drainage patterns and are oxygenated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 11

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Area is adjacent to ohwm or drainage and within top of bank. Drainage patterns and saturation present.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, & Coast

Project/Site: Fountain Wind Project | City/County: Burney/Shasta | Sampling Date: 10/16/2019
Applicant/Owner: Fountain Wind, LLC | State: California | Sampling Point: 054 up
Investigator(s): C. Singer|&|B. Cohen | Section, Township, Range: CA21 T34N R1E SN23
Landform (hillslope, terrace, etc): Terrace | Local relief (concave, convex, none): concave | Slope (%): 1
Subregion (LRR): MLRA 22B | Lat: 40.792924 | Long: -121.828157 | Datum: WGS84
Soil Map Unit Name: Windy and McCarthy stony sandy loams, 0 to 30 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No	
Hydric Soil Present?	Yes		No	X
Wetland Hydrology Present?	Yes		No	X

Is the Sampled Area within a Wetland? Yes ____ No X

Remarks:

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 foot radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Calocedrus decurrens* / Incense cedar	15	Yes	UPL
2. *Abies* / Fir	5	Yes	UPL
3.			
4.			
	20	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 foot radius)			
1. *Alnus rhombifolia* / White alder	30	Yes	FACW
2. *Acer circinatum* / Vine maple	30	Yes	FAC
3.			
4.			
5.			
	60	= Total Cover	
Herb Stratum (Plot size: 6 foot radius)			
1. *Maianthemum racemosum* / Feathery false lily of the valley	2	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	2	= Total Cover	
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Statum 98

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	30	x 2 =	60
FAC species	32	x 3 =	96
FACU species	0	x 4 =	0
UPL species	20	x 5 =	100
Column Totals:	82 (A)		256 (B)

Prevalence Index = B/A = 3.12

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Abies concolor

SOIL

Sampling Point: 054 up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	7.5 YR 2.5/3	100					Silty loam	Gravel present, more as you go deeper

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, & Coast

Project/Site: Fountain Wind Project | City/County: Burney/Shasta | Sampling Date: 10/17/2019
Applicant/Owner: Fountain Wind, LLC | State: California | Sampling Point: 055 up
Investigator(s): C. Singer|&|B. Cohen | Section, Township, Range: CA21 T34N R1E SN17
Landform (hillslope, terrace, etc): Terrace | Local relief (concave, convex, none): none | Slope (%): 1
Subregion (LRR): MLRA 22B | Lat: 40.79850965 | Long: -121.876521 | Datum: WGS84
Soil Map Unit Name: Cohasset stony loam, 0 to 30 percent slopes | NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	Yes ____ No X
Hydric Soil Present?	Yes ____	No X		
Wetland Hydrology Present?	Yes ____	No X		

Remarks:

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 foot radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer macrophyllum* / Bigleaf maple, Big-leaf maple	65	Yes	FACU
2. *Salix scouleriana* / Scouler willow, Scouler's willow	15	No	FAC
3.			
4.			
	80	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 foot radius)			
1. *Rubus armeniacus* / Himalayan blackberry	15	Yes	FAC
2. *Rubus parviflorus* / Thimbleberry	10	Yes	FACU
3. *Ribes malvaceum* / Chaparral currant	10	Yes	UPL
4.			
5.			
	35	= Total Cover	
Herb Stratum (Plot size: 6 foot radius)			
1. *Pteridium aquilinum* / Western brackenfern	7	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	7	= Total Cover	
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Statum 90

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 20.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	30	x 3 =	90
FACU species	82	x 4 =	328
UPL species	10	x 5 =	50
Column Totals:	122 (A)		468 (B)

Prevalence Index = B/A = 3.84

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 055 up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	7.5 YR 2.5/2	100					Silty loam	Small gravel present

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C PLANT SPECIES OBSERVED

Table C-1. Plant Species Observed

Scientific Name[1]	Common Name	Wetland Indicator Status[2]	Origin
Adoxaceae (Muskroot Family)			
Sambucus nigra ssp. *caerulea*	blue elderberry	FAC	Native
Apiaceae (Umbelliferae) (Carrot Family)			
Angelica californica	California angelica	-	Native
Angelica capitellata	grayswamp whiteheads	FACW	Native
Heracleum maximum	common cow parsnip	FAC	Native
Apocynaceae (Dogbane Family)			
Apocynum androsaemifolium	bitter dogbane	FACU	Native
Aristolochiaceae (Pipevine Family)			
Asarum caudatum	long-tail wild ginger	FACU	Native
Asarum hartwegii	Hartweg's wild ginger	-	Native
Asteraceae (Compositae) (Sunflower Family)			
Achillea millefolium	yarrow	FACU	Native
Artemisia douglasiana	California mugwort	FACW	Native
Cirsium vulgare	bullthistle	FACU	non-native (invasive)
Ericameria nauseosa	rubber rabbitbrush	-	Native
Erigeron annus	annual fleabane	FACU	non-native
Helenium bigelovii	Bigelow's sneezeweed	FACW	Native
Leucanthemum vulgare	ox-eye daisy	FACU	non-native (invasive)
Oreostemma alpigenum	tundra aster	FAC	Native
Senecio triangularis	arrowleaf ragwort	FACW	Native
Sonchus oleraceus	sow thistle	UPL	non-native
Symphyotrichum spathulatum	western mountain aster	FAC	Native
Taraxacum officinale	common dandelion	FACU	Non-native
Uropappus lindleyi	silver puffs	UPL	Native
Athyriaceae (Lady Fern Family)			
Athyrium filix-femina var. cyclosorum	western lady fern	FAC	Native
Berberidaceae (Barberry Family)			
Berberis aquifolium	mountain grape	FACU	Native
Betulaceae (Birch Family)			
Alnus incana ssp. *tenuifolia*	creek alder	FACW	Native
Alnus rhombifolia	white alder	FACW	Native
Corylus cornuta ssp. *californica*	beaked hazelnut	FACU	Native
Blechnaceae (Deer Fern Family)			
Woodwardia fimbriata	western chain fern	-	Native
Boraginaceae (Borage Family)			
Cynoglossum grande	grand hound's tongue	UPL	Native
Cynoglossum occidentale	hound's tongue	-	Native
Eriodictyon californicum	California yerba santa	UPL	Native
Caprifoliaceae (Honeysuckle Family)			
Lonicera conjugialis	purpleflower honeysuckle	FAC	Native
Lonicera hispidula	pink honeysuckle	FACU	Native
Symphoricarpos albus var. laevigatus	snowberry	FACU	Native

Scientific Name[1]	Common Name	Wetland Indicator Status[2]	Origin
Celastraceae (Staff-Tree Family)			
Paxistima myrsinites	Oregon boxwood	FACU	Native
Cornaceae (Dogwood Family)			
Cornus nuttallii	mountain dogwood	FACU	Native
Cornus sericea	American dogwood	FACW	Native
Cupressaceae (Cypress Family)			
Calocedrus decurrens	incense cedar	-	Native
Cyperaceae (Sedge Family)			
Carex amplifolia	ample leaved sedge	OBL	Native
Carex brainerdii	Brainerd's sedge	UPL	Native
Carex utriculata	beaked sedge	OBL	Native
Schoenoplectus acutus	common tule	OBL	Native
Scirpus microcarpus	mountain bog bulrush	OBL	Native
Dennstaedtiaceae (Bracken Family)			
Pteridium aquilinum var. pubescens	western bracken fern	FACU	Native
Equisetaceae (Horsetail Family)			
Equisetum hyemale	common scouring rush	FACW	Native
Ericaceae (Heath Family)			
Arctostaphylos nevadensis	pine mat manzanita	-	Native
Arctostaphylos patula	green leaf manzanita	-	Native
Arctostaphylos viscida	whiteleaf manzanita	-	Native
Rhododendron occidentale	western azalea	FAC	Native
Vaccinium uliginosum ssp. *occidentale*	western blueberry	FACW	Native
Fabaceae (Leguminosae) (Legume Family)			
Acmispon wrangelianus	Chilean trefoil	UPL	Native
Cercis occidentalis	western redbud	UPL	Native
Genista monspessulana	French broom	UPL	non-native (invasive)
Hosackia oblongifolia	narrow leaved lotus	OBL	Native
Lathyrus latifolius	sweet pea	-	non-native
Trifolium dubium	little hop clover	FACU	non-native
Trifolium longipes	long-stalked clover	FAC	Native
Trifolium pratense	red clover	FACU	non-native
Trifolium repens	white clover	FAC	non-native
Fagaceae (Oak Family)			
Chrysolepis sempervirens	Sierra chinquapin	-	Native
Notholithocarpus densiflorus var. echinoides	tanoak shrub	-	Native
Quercus garryana	Oregon oak	FACU	Native
Quercus vacciniifolia	huckleberry oak	UPL	Native
Garryaceae (Silk Tassel Family)			
Garrya fremontii	Fremont's silk tassel	UPL	Native
Grossulariaceae (Goosefoot Family)			
Ribes malvaceum	chaparral currant	-	Native
Ribes nevadense	mountain pink currant	FAC	Native
Ribes roezlii	Sierra gooseberry	-	Native
Ribes sanguineum	flowering currant	FACU	Native

Appendix C Plant Species Observed

Scientific Name[1]	Common Name	Wetland Indicator Status[2]	Origin
Hypericaceae (St. John's Wort Family)			
Hypericum anagalloides	Tinker's penny	OBL	Native
Hypericum perforatum ssp. *perforatum*	Klamathweed	FACU	non-native
Iridaceae (Iris Family)			
Iris macrosiphon	ground iris	UPL	Native
Iris tenuissima	slender iris	UPL	Native
Juncaceae (Rush Family)			
Eleocharis acicularis	needle spikerush	OBL	Native
Eleocharis bella	beautiful spikerush	FACW	Native
Eleocharis macrostachya (*Eleocharis palustrus*)	common spikerush	OBL	Native
Juncus balticus ssp. *ater*	Baltic rush	FACW	Native
Juncus bufonius	toad rush	FACW	Native
Juncus effusus	common bog rush	FACW	Native
Juncus nevadensis	Sierran rush	FACW	Native
Juncus occidentalis	western rush	FACW	Native
Juncus xiphioides	iris-leaved rush	OBL	Native
Lamiaceae (Labiateae) (Mint Family)			
Mentha pulegium	pennyroyal	OBL	non-native (invasive)
Mentha spicata	spearmint	FACW	non-native
Stachys ajugoides	hedge nettle	OBL	Native
Trichostema lanceolatum	vinegar weed	FACU	Native
Liliaceae (Lily Family)			
Lilium pardalinum	California tiger lily	FACW	Native
Malvaceae (Mallow Family)			
Sidalcea gigantea	giant checkerbloom	UPL	Native
Melanthiaceae (False-hellebore Family)			
Veratrum californicum var. californicum	California corn lily	FAC	Native
Trillium albidum	giant white trillium	FACU	Native
Montiaceae (Miner's Lettuce Family)			
Calyptridium umbellatum	pussy toes	-	Native
Myrsinaceae (Myrsine Family)			
Lysimachia latifolia	Pacific starflower	FACW	Native
Nymphaeaceae (Waterlily Family)			
Nuphar polysepala	Rocky Mountain pond-lily	OBL	Native
Oleaceae (Olive Family)			
Fraxinus latifolia	Oregon ash	FACW	Native
Onagraceae (Evening-Primrose Family)			
Chamerion angustifolium	fireweed	UPL	Native
Ludwigia palustris	marsh purslane	OBL	Native
Ophioglossaceae (Adder's-tongue Family)			
Sceptridium multifidum	leather grape-fern	FAC	Native
Orchidaceae (Orchid Family)			
Goodyera oblongifolia	rattlesnake-plantain	FACU	Native
Platanthera dilatata	white-flowered bog-orchid	FACW	Native

Scientific Name[1]	Common Name	Wetland Indicator Status[2]	Origin
Orobanchaceae (Broomrape Family)			
Castilleja campestris	vernal pool paintbrush	FACW	Native
Castilleja lacera	cut leaved owl's clover	UPL	Native
Epilobium brachycarpum	tall annual willowherb	UPL	Native
Epilobium campestre	smooth willowherb	OBL	Native
Epilobium ciliatum	fringed willowherb	FACW	Native
Phrymaceae (Lopseed Family)			
Mimulus guttatus	seep monkey flower	OBL	Native
Pinaceae (Pine Family)			
Abies concolor	white silver fir	-	Native
Pinus contorta	lodgepole pine	FAC	Native
Pinus lambertiana	sugar pine	-	Native
Pinus ponderosa	yellow pine	FACU	Native
Pseudotsuga menziesii var. menziesii	Douglas fir	FACU	Native
Plantaginaceae (Plantain Family)			
Keckiella breviflora	bush beardtongue	UPL	Native
Plantago lanceolata	ribwort	FACU	non-native (invasive)
Veronica americana	American brooklime	OBL	native
Veronica anagallis-aquatica	water speedwell	OBL	non-native (invasive)
Veronica peregrina	purslane speedwell	FACW	native
Polemoniaceae (Phlox Family)			
Navarretia intertexta	needleleaf navarretia	FACW	native
Polygonaceae (Buckwheat Family)			
Rumex acetosella	sheep sorrel	FACU	non-native (invasive)
Rumex crispus	curly dock	FAC	non-native (invasive)
Rumex occidentalis	western dock	FACW	native
Poaceae (Gramineae) (Grass Family)			
Alopecurus pratensis	meadow foxtail	FAC	non-native
Anthoxanthum odoratum	sweet vernal grass	FACU	non-native (invasive)
Bromus carinatus	California bromegrass	-	native
Bromus hordeaceus	soft chess	FACU	non-native (invasive)
Bromus tectorum	downy chess	-	non-native (invasive)
Cynosurus echinatus	dogtail grass	-	non-native (invasive)
Dactylis glomerata	orchardgrass	FACU	non-native (invasive)
Danthonia californica	California oatgrass	FAC	native
Deschampsia cespitosa	tufted hair grass	FACW	native
Elymus caput-medusae	Medusa head	UPL	non-native (invasive)
Elymus glaucus	blue wildrye	FACU	native
Elymus triticoides	beardless wild rye	UPL	native
Festuca arundinacea	tall fescue	FAC	non-native (invasive)
Glyceria striata	ridged manna grass	OBL	native
Holcus lanatus	common velvetgrass	FAC	non-native (invasive)
Panicum acuminatum	western panicgrass	FAC	native
Phalaris aquatica	Harding grass	FACU	non-native (invasive)
Phalaris paradoxa	hood canary grass	FAC	non-native

Appendix C Plant Species Observed

Scientific Name[1]	Common Name	Wetland Indicator Status[2]	Origin
Poa palustris	fowl blue grass	FAC	non-native
Poa pratensis ssp. *pratensis*	Kentucky blue grass	FAC	non-native (invasive)
Poa secunda	nevada blue grass	FACU	native
Stipa miliacea	smilo grass	UPL	non-native
Ranunculaceae (Buttercup Family)			
Aconitum columbianum	Columbian monkshood	FACW	native
Aquilegia formosa	crimson columbine	FAC	native
Ranunculus californicus	California buttercup	FAC	native
Ranunculus flammula	water buttercup	FACW	native
Ranunculus orthorhynchus	straight beaked buttercup	FACW	native
Rhamnaceae (Buckthorn Family)			
Ceanothus cordulatus	mountain whitethorn	UPL	native
Ceanothus integerrimus	deer brush	UPL	native
Ceanothus velutinus	tobacco brush	-	native
Frangula californica	California coffeeberry	-	native
Frangula purshiana	cascara sagrada	FAC	native
Rosaceae (RoseFamily)			
Drymocallis glandulosa	sticky cinquefoil	FAC	native
Heteromeles arbutifolia	toyon	-	native
Holodiscus discolor	oceanspray	FACU	native
Prunus emarginata	bitter cherry	FACU	native
Rosa californica	California wild rose	FAC	native
Rosa gymnocarpa	wood rose	FACU	native
Rubus armeniacus	Himalayan blackberry	FAC	non-native (invasive)
Rubus leucodermis	white bark raspberry	FACU	native
Rubus parviflorus	thimbleberry	FACU	native
Rubus ursinus	California blackberry	FACU	native
Sorbus scopulina	Cascade mountain ash	FACU	native
Spiraea douglasii	Douglas spiraea	FACW	native
Rubiaceae (Bedstraw Family)			
Galium trifidum	three petaled bedstraw	FACW	native
Galium triflorum	sweet scented bedstraw	FACU	native
Ruscaceae (Butcher's-Broom Family)			
Maianthemum racemosum	feathery false lily of the valley	FAC	native
Salicaceae (Willow Family)			
Populus tremuloides	quaking aspen	FACU	native
Salix exigua	narrowleaf willow	FACW	native
Salix lasiandra	Pacific willow	FACW	native
Salix lasiolepis	arroyo willow	FACW	native
Salix scouleriana	Scouler willow	FAC	native
Sapindaceae (Soapberry Family)			
Acer circinatum	vine maple	FAC	native
Acer macrophyllum	bigleaf maple	FACU	native
Saxifragaceae (Saxifrage Family)			
Darmera peltata	Indian rhubarb	OBL	native

Scientific Name[1]	Common Name	Wetland Indicator Status[2]	Origin
Scrophulariaceae (Figwort Family)			
Verbascum blattaria	moth mullein	UPL	non-native
Verbascum thapsus	woolly mullein	FACU	non-native (invasive)
Smilacaceae (Smilax Family)			
Smilax californica	California greenbriar	UPL	native
Taxaceae (Yez Family)			
Taxus brevifolia	Pacific yew	FACU	native
Themidaceae (Brodiaea Family)			
Triteleia hyacinthina	white brodiaea	FAC	native
Urticaceae (Nettle Family)			
Urtica dioica	stinging nettle	FAC	native
Verbenaceae (Verbena Family)			
Verbena lasiostachys	western vervain	FAC	native
Violaceae (Violet Family)			
Viola glabella	stream violet	FACW	native

[1] Taxonomic nomenclature for plant species follows the Jepson eFlora (2019).

[2] Wetland indicator status for plant species followed Lichvar, R. W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. The National Wetland Plant List: 2016 wetland ratings. *Phytoneuron* 2016-30: 1-17.

Appendix D PHOTO LOG

Photo 1. Intermittent stream documented by data point

Photo 2. Fresh emergent wetland adjacent to Little Hatchet Creek.

Photo 3. Little Hatchet Creek, a perennial stream documented by data point 8.

Photo 4. Wetland seep spring along an access road.

Photo 5. Ephemeral stream documented by data point 9.

Photo 6. Fresh emergent wetland within Carberry Creek (data points 10 and 12).

Photo 7. Riparian wetland adjacent to Carberry Creek (data points 11 and 12).

Photo 8. Wetland meadow adjacent to Carberry Creek (data points 13 and 14).

Photo 9. Non-vegetated ditch (data point 15). Orientation: northwest.

Photo 10. Ephemeral stream documented (data point 16). Orientation: east.

Photo 11. Non-vegetated ditch (data point 17). Orientation: southeast

Photo 12. Wetland meadow (data points 18 and 19). Orientation: west.

Photo 13. Fresh emergent wetland in a seasonally inundated pond (data points 20, 21 and 22). Orientation: southwest.

Photo 14. Riparian wetland (data points 23 and 24). Orientation: south

Photo 15. Intermittent stream (data point 25). Orientation: south.

Photo 16. Suspect area documented as an upland (data point 26). Orientation: southwest

Photo 17. Seasonal wetland adjacent to a road (data points 27 and 28). Orientation: southwest.

Photo 18. Intermittent stream (data point 29). Orientation: southwest.

Photo 19. Wetland meadow (data points 30 and 31). Orientation: west.

Photo 20. Riparian wetland within Hatchet Creek (data points 32 and 33).

Photo 21. Seasonal wetland within a wetland meadow (data point 34).

Photo 22. Wetland meadow (data points 35 and 36). Orientation: west.

Photo 23. Non-vegetated ditch (data point 37). Orientation: noth

Photo 24. Vegetated ditch (data points 38 and 39). Orientation: east

Photo 25. Riparian wetlands adjacent to North Fork of Montgomery Creek (data points 40 and 41). Orientation: northwest.

Photo 26. Cedar Creek, a perennial stream (data points 42-44). Adjacent riparian wetlands are recovering from a recent bridge installation. Orientation: southwest.

Photo 27. Wetland seep spring adjacent to a road (data points 45 and 46). Orientation: northwest.

Photo 28. Ephemeral stream (data point 47). Orientation: north.

Photo 29. Intermittent stream (data point 48). Orientation: north.

Photo 30. W-10, W-11. Ephemeral stream (data point 49). Orientation: north.

Photo 31. Non-vegetated ditch (data point 50). Orientation: west.

Photo 32. Riparian wetland (data points 51 and 52). Orientation: northwest.

Photo 33. Wetland seep spring (data points 53 and 54). Orientation: north.

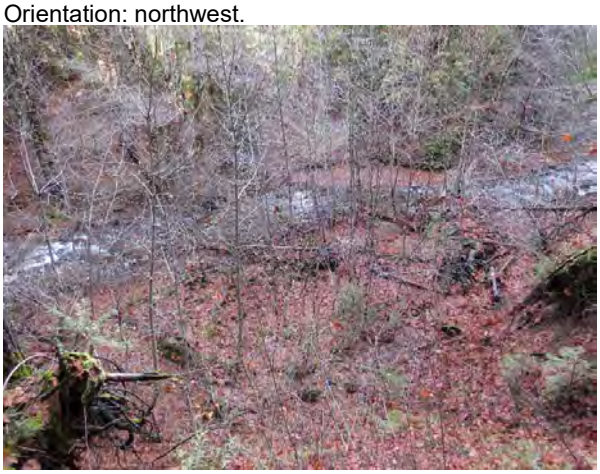

Photo 34. Little Cow Creek and riparian wetlands (data points 55 and 56). Orientation: north.

Photo 35. Riparian wetland (data points 57 and 58). Orientation: west.

Photo 36. Wetland seep spring (data points 59 and 60). Orientation: east.

Photo 37. Fresh emergent wetland in a perennial stream (behind shovel) and riparian wetland (in front of shovel) (data points 61-63). Orientation: north.

Photo 38. Vegetated ditch (data points 64 and 65). Orientation: east.

Photo 39. Water marks on a rock in a seasonal wetland (data points 66 and 67).

Photo 40. Intermittent stream (data point 68). Orientation: southeast.

Photo 41. Hatchet Creek a perennial stream documented (data point 69). Orientation: southwest.

Photo 42. Riparian wetland (wetland [W-] 1).

Photo 43. Wetland meadow (W-2).

Photo 44. Wetland meadow (W-3).

Photo 45. Riparian wetland (W-5 and W-6), and perennial drainage (D-) A1, Hatchet Creek.

Photo 46. Riparian wetland (W-8, W-9), perennial drainage D-1, North Fork of Cedar Creek. Orientation: west

Photo 47. Wetland seep (W-10, W-11).

Photo 48. Riparian wetland (W-50).

Photo 49. Intermittent drainage (D-B).

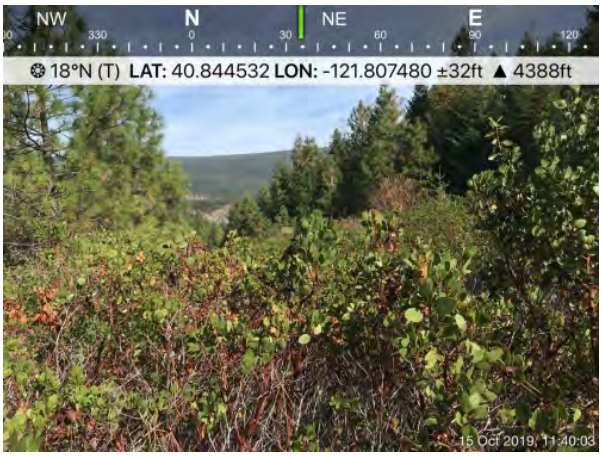

Photo 50. Ephemeral drainage (D-C).

Photo 51. Intermittent drainage (D-D).

Photo 52. Intermittent drainage (D-G1).

Photo 53. Perennial drainage (D-H) in a wetland meadow (W-2).

Photo 54. Perennial drainage (D-J).

Photo 55. Perennial drainage (D-K).

Photo 56. Perennial drainage (D-K1), North Fork Little Cow Creek.

Photo 57. Intermittent drainage (D-L).

Photo 58. Perennial drainage (D-L1).

Photo 59. Perennial drainage (D-O), North Fork of Montgomery Creek.

Photo 60. Intermittent drainage (D-P1).

Photo 61. Perennial drainage (D-Q), South Fork of Montgomery Creek.

Photo 62. Perennial drainage (D-R).

Photo 63. Perennial drainage (D-S). Orientation: north

Appendix E BIOLOGIST RESUMES

John Holson

Project Biologist

For 10 years, John has managed and assisted in the field data collection for a variety of assessments and surveys, including special-status plant surveys, vegetation mapping, wetland delineations, special-status bird surveys, nesting bird surveys, and mitigation monitoring. He has written and managed special-status plant survey reports, wetland delineation reports, special-status bird survey reports, numerous environmental impact reports (EIR) in accordance to CEQA, environmental impact statements (EIS) in accordance to NEPA, biological assessments (BAs), and natural environment studies (NES) in accordance to Caltrans projects.

John has extensive botanical experience throughout California, conducting spring floristic surveys and wetland delineations for the past ten field seasons. He has also done botanical work in several other states in the US West, including Montana, Washington, Nevada, Arizona, and Utah. His experiences with wildlife biology, specifically with birds, also make him a versatile employee. He has been working with birds for the past eight years, including activities such as surveying, banding, and monitoring.

John's project management experience includes overseeing budgets, personnel, coordinating schedules, and communicating with resource agencies, California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM), Regional Water Quality Control Board (RWQCB), and Army Corp of Engineers (Corps).

EDUCATION

BS, Ecology, University of California, Santa Barbara, California, 2004

CERTIFICATIONS & TRAINING

Raptor Handling and Banding Permit, Golden Gate Raptor Observatory, San Francisco, California, 2017

Bald and Golden Eagle Workshop, San Francisco, California, 2015

California Rapid Assessment Method (CRAM) Training, California Wetlands Monitoring Workgroup, Willits, California, 2010

Basic Wetland Delineation, Wetland Training Institute, Sacramento, California, 2009

California Native Plant Society Vegetation Rapid Assessment Workshop, Sierra Nevada Aquatic Research Laboratory, Mammoth Lakes, California, 2007

Jepson Manual Workshop, Santa Barbara Botanical Garden, Santa Barbara, California, 2005

PROJECT EXPERIENCE

HIGH SPEED RAIL

DesertXpress Environmental Services EIR/EIS * | Barstow to Prim, California and Nevada | Lead Botanist/Wetland Ecologist

John conducted botanical surveys in addition to a wetland delineation in and around Las Vegas and Prim, Nevada, as well as Baker and Barstow, California. His duties included identifying local vegetation, assessing soils, and identifying hydrologic indicators. Wetland delineation information compiled was used by the Corps to verify potentially jurisdictional waters of the United States in that region.

Pacheco Pass Corridor EIR/EIS* | San Jose, California, United States | 2009-2017 | Lead Botanist/Wetland Ecologist

John managed and participated in botanical and wetland delineation surveys in support of an EIR/EIS for a new high speed rail proposed from San Jose to Merced, California. His duties included managing a crew of five botanists, plotting daily routes, conducting botanical surveys, as well as every day logistics for the project. John conducted vegetation classification, a botanical inventory, identification of special-status plant species, as well as plant identification and classification based on the wetland indicator status of the plant species. Wetland delineation information compiled was put into a wetland delineation report and used by the Corps to verify potentially jurisdictional waters of the United States in that region. Role: Lead Botanist/Wetland Ecologist | Dates involved: 2009-2017

California High Speed Rail Project Wetland Delineation* | Chowchilla, California, United States | 2013-2017 | Wetland Ecologist

John collected extensive wetland delineation field surveys in support of a delineation of waters of the United States and State for the Central Valley Wye segment of the project, in Merced and Madera Counties. These delineations encompassed a variety of habitats including riparian forest, freshwater marsh, seasonal wetland, and extensive agricultural land. Data collected also involved

** denotes projects completed with other firms*

mapping wetland features using ArcGIS and GPS units, vegetation classification, a botanical inventory, as well as identification and classification based on the wetland indicator status of the plant species. Wetland delineation information compiled was put into a wetland delineation report and used by the Corps to verify potentially jurisdictional waters of the United States in that region. Role: Wetland Ecologist | Dates involved: 2013-2017

RENEWABLE ENERGY

Tehachapi Renewable Transmission Project Biological Consulting Services* | Southern California | Wildlife Biologist

John conducted monitoring and surveys in support of a large-scale transmission line project through several areas of Southern California, specifically Segments 7 and 8. This involved appropriate project training, using the FRED and Sugarsync programs, and becoming familiar with SCE protocols. His duties include construction monitoring for wetlands, nesting birds, and other biological resources.

Tehachapi Renewable Transmission Project (TRTP) Wetland Delineation* | Greater Los Angeles Area and Angeles National Forest, Los Angeles County, California | Wetland Ecologist

John conducted surveys in support of large-scale wetland delineation report for a proposed transmission line through several areas of Southern California, including in the Angeles National Forest. His duties included collecting data to characterize waters of the United States, including wetlands, and adjacent vegetation types per guidance from the Corps. Data was collected and mapped using Tremble Yuma GPS units and plotted on aerial photo-based maps utilizing ARCPAD software.

BOTANICAL SURVEYS

Mokelumne River Plant Surveys* | El Dorado National Forest, California | Lead Botanist

John conducted large-scale vegetation mapping in addition to special-status plant surveys along PG&E roads near the Mokelumne River in El Dorado National Forest. His duties included mapping and reporting any special-status/forest service sensitive species or communities located and led to the observation of several protected species in the area. A subsequent report was prepared using the results of the survey.

North County Corridor EIR/EIS* | Modesto, California, United States | 2011-2017 | Lead Botanist/Wetland Ecologist

John conducted large-scale botanical surveys and wetland delineation in and around Oakhurst, Riverside, and Salida, California. John conducted vegetation classification, a botanical inventory, identification of special-status plant species, as well as plant identification and classification based on the wetland indicator status of the plant species. Wetland delineation information compiled was used by the U.S. Army Corps of Engineers to verify potential jurisdictional waters of the United States. Role: Lead Botanist/Wetland Ecologist | Dates involved: 2011-2017

BIOLOGICAL MONITORING

CP Biological Effectiveness Monitoring* | Sacramento, California | Lead Botanist

John conducted several types of vegetation mapping surveys for the Natomas Basin Conservancy, a primarily agricultural area north of Sacramento. This includes mapping land cover types, surveying for special-status plant species, surveying for noxious weed populations in the area, as well as assessing the change in land cover types over the last five years. Data was used to determine habitat for special-status species including the giant garter snake and Swainson’s hawk.

Caltrans Restoration Project - Service-Approved Biological Monitoring for Red-Legged Frog and California Tiger Salamander* | Livermore, California, United States | 2017 | Wildlife Biologist

John monitored mitigation and restoration efforts near Livermore, California, which included monitoring for disturbance near bodies of water that had known occurrences for California tiger salamander and red-legged frog. This included pre-construction surveys, monitoring all ground disturbance activities, and environmental education concerning the California tiger salamander and red-Legged Frog. Role: Wildlife Biologist | Dates involved: 2017

Palermo Transmission Line Project Habitat Monitoring For Giant Garter Snake* | Marysville, California | Wildlife Biologist

John monitored mitigation and restoration efforts near Marysville, California, which include surveying wetland habitat suitability for Giant Garter Snake. His duties included mapping, sampling, and assessing wetland vegetation in areas restored as giant garter snake habitat.

STUDIES AND EVALUATIONS

Rosamond PV Solar Technical Studies* | Rosamond, California | Lead Botanist/Wetland Ecologist

John conducted botanical surveys in addition to a wetland delineation on the Rosamond PV project site in Kern County, California. John conducted vegetation classification, a botanical inventory, identification of special-status plant species, as well as plan identification and classification based on the wetland indicator status of the plant species. Wetland delineation information compiled was used by the Corps to verify potentially jurisdictional waters of the United States.

APPROVALS AND PERMITTING

Carrizo to Midway Permitting Augmentation* | San Luis Obispo and Kern Counties, California | Wetland Ecologist

John conducted a wetland delineation along a transmission line from the Carrizo Plain to Buttonwillow, California. His duties included identifying local vegetation types, assessing soils, and identifying hydrologic indicators. Wetland delineation information compiled was used by the Corps to verify potentially jurisdictional waters of the United States in that region.

WILDLIFE SURVEYS AND STUDIES

Swainson’s Hawk Surveys and Monitoring - West Feather River Levee Project,* | Feather River, California | Lead

Wildlife Biologist

John conducted protocol level Swainson's Hawk surveys for four year concurrently in support of a large-scale levee improvement project along the Feather River. His duties included construction surveying for Swainson's hawks, monitoring for nesting birds and other biological resources.

Crane Valley Dam, Stockpile Expansion Bio Surveys* | Sierra National Forest, California | Lead Botanist/Wildlife Biologist

John was tasked with providing environmental surveys and documentation to support the additional quarry stockpile areas needed for the Crane Valley Dam Seismic Retrofit Project. Surveys conducted include wetland resources, special-status/forest service sensitive plant species, California spotted owl surveys, and Northern goshawk surveys. This included duties, such as mapping wetlands using Tremble GPS units, walking transects for plant species, and conducting playback surveys for the aforementioned bird species. A subsequent report was prepared using the results of the survey.

CONSTRUCTION MONITORING

Shiloh III Wind Farm Construction Monitoring for Wetlands, California Tiger Salamander* | Solano County, California, United States | 2010-2012 | Wildlife Biologist

John monitored the construction of a wind farm in Solano County, which included monitoring for disturbance near wetlands that had known occurrences for California tiger salamander. This included ensuring that wetlands and their associated buffers were not disturbed, mapping potential wetlands/habitat, and environmental education concerning the salamander. Role: Wildlife Biologist | Dates involved: 2010-2012

ENVIRONMENTAL CONSULTING

Raptor and Songbird Banding* | Northern California | 2008-2015 | Wildlife Biologist

John participated in local bird banding efforts near the Bay Area and Sacramento, California. Birds were trapped using a variety of techniques involving mist nets, dho-gaza nets, and bow nets. Bird bands, both lock and butt varieties, were placed on the bird's leg, after which data was collected and the birds released. Species include numerous songbirds in addition to raptor specific banding which involves bird of prey species.

Gabe Youngblood

Project Biologist

Gabe has 15 years of experience as a professional biologist working throughout northern California. He has conducted protocol-level and targeted surveys, biotic assessments, and construction site monitoring for numerous species of special-status wildlife including benthic invertebrates, fairy shrimp, terrestrial mollusks, valley elderberry longhorn beetle, Shasta salamander, California red -legged frog, giant garter snake, northern goshawk, spotted owl, willow flycatcher, pileated woodpecker, white-headed woodpecker, and forest carnivores. He also has significant experience in conducting botanical surveys, wetland delineations, Forest Inventory Analysis, and fish population surveys. In addition to biological field surveys and monitoring, Gabe has experience with the regulatory requirements of the California Environmental Quality Act, National Environmental Policy Act, and Endangered Species Act; and he has participated in the preparation of natural environment study reports, biological assessments, environmental assessments, initial studies, and environmental impact reports.

EDUCATION

Bachelor of Science, Wildlife Management, Humboldt State University, Arcata, California, 2006

PROJECT EXPERIENCE

ENVIRONMENTAL

Big Hill Carnivore Survey* | California | 2011 | Biologist

Conducted a sensitive forest carnivore survey within Plumas National Forest. Methods involved the use of photographic bait stations to detect sensitive species.

Forest Inventory Analysis* | California | 2008-2011 | Forestry Technician

Conducted sampling of permanent vegetation plots throughout multiple National Forests in California as part of USDA Forest Service Forest Inventory Analysis.

Coleman-South Guy and Anchor Project* | California | 2009 | Biologist

Conducted a delineation of waters of the United States within a 50-foot radius around each of 40 wood poles located along an 8-mile stretch of the Coleman-South 60 kV Line.

Cottonwood–Roseville Optical Ground Wire Project Wetland Delineation* | California | 2012 | Biologist

Performed an assessment of biological and wetland resources for a large transmission line upgrade project extending from Shasta to Placer counties, California. The assessment included a wetland delineation to U.S. Army Corps of Engineers standards in the entire study area, which encompassed 2,700+ acres, extended 140+ miles through 7 counties, and involved hundreds of private landowners.

L402 ILI Upgrade Project | Redding, California | 2015-2016 | Biologist

Evaluated habitat to support special-status species and defined boundaries of waters of the United States. Developed avoidance and minimization measures to avoid impacts on sensitive resources. Conducted pre-construction nesting bird surveys.

L402 Strength Test * | Redding, California | 2016 | Biologist

Performed pre-construction nesting bird surveys and biological constraints assessments. Conducted a delineation of waters of the United States at project locations where wetlands were identified during biological constraints assessments.

Logan Creek Pole Replacement Project* | California | 2012 | Biologist

Conducted a delineation of waters of the United States in a 25-foot radius around 20 wooden utility poles along one-and-a-half miles of 12 kV Line located adjacent to County Road 39.

Mokelumne River Re-Licensing Support, Fishery Surveys * | 2009 | Biologist

Collected aquatic habitat (SWAMP) data and conducted snorkel and backpack electrofishing surveys to assess fish species composition and fish abundance on several tributaries to the Mokelumne River.

Northern Spotted Owl and Barred Owl Surveys* | California | 2010 | Biologist

Conducted protocol-level northern spotted owl surveys and experimental barred owl surveys for seven vegetation management projects located in the Mendocino National Forest.

Region 5 Sensitive Mammals Evaluation* | California | 2007 | Biologist

Prepared an ecological assessment for over 100 rare mammals within National Forest lands throughout California. The assessment included a comprehensive

** denotes projects completed with other firms*

literature review and preparation of a summary of the biology and ecology of each species; culminating in a determination of whether each species should be considered “Sensitive” to National Forest System management actions.

Roseville–Elverta Optical Ground Wire Project* | Roseville, California | 2013 | Biologist

Performed biological surveys, worker awareness training, and environmental monitoring for Western’s Roseville-Elverta Optical Ground Wire project. Environmental issues included vernal pools and other wetlands, nesting raptors, and other nesting birds.

Klamath Northern Spotted Owl Surveys* | California | 2010 | Biologist

Conducted northern spotted owl surveys supporting management activities on the Klamath National Forest. Northern spotted owl surveys were conducted following the protocol-level “nighttime surveys using roads” technique. Follow-up surveys and nest searches were also conducted following the survey protocol.

L-121 Strength Test * | Yuba City, California | 2016 | Biologist

Performed construction monitoring for giant garter snake during gas pipeline inspection and replacement.

Deschutes Road Widening Project – Phase 1* | California | 2016-2017 | Biologist

Conducted a wetland delineation survey, biological reconnaissance survey, and protocol-level valley elderberry longhorn beetle survey. Prepared wetland delineation and natural environmental study reports, and a technical memo explaining why project would have no impacts on valley elderberry longhorn beetle.

Parkville Road at Ash Creek Bridge (06C-0220) Replacement Project* | California | 2015

Conducted a wetland delineation survey and biological reconnaissance survey. Prepared a wetland delineation report and a technical memo explaining why the project would have no impacts on California red-legged frog.

Shasta Dam and Reservoir Enlargement NEPA Documentation and Technical Studies* | California | 2009-2015 | Biologist

Conducted surveys for a variety of technical studies related to the proposed enlargement of Shasta Lake. These studies include survey and manage terrestrial mollusks, amphibians, forest carnivores, botanical resources, wetland resources, and avian species.

Pileated Woodpecker and White-Headed Woodpecker Surveys* | Oregon | 2007 | Biologist

Conducted surveys for pileated woodpecker and white-headed woodpecker as part of the biological resource monitoring of 24,000 acres in the Sun Pass State Forest. The surveys included determination of presence/absence of these species and follow-up surveys to locate nest stands or trees.

PG&E McCloud/Pit Re-Licensing Support* | California | 2007 | Biologist

Conducted protocol surveys for northern spotted owl and Shasta salamander at McCloud Reservoir, Hawkins Bar, Iron Canyon Reservoir, Pit 5, Pit 6, and Pit 7.

Pipeline Pathways Program* | California | 2013-2015 | Biologist

Conducted environmental constraints analyses, San Joaquin Valley Habitat Conservation Plan (SJVHCP) pre-activity surveys, CDFW Master Stream Alteration Agreement Verification Request Forms, preconstruction nesting bird surveys, worker environmental training, and monitoring. Work was conducted in Glenn, Yolo, Stanislaus, San Joaquin, Sutter, Colusa, Shasta, Tehama, Trinity, Fresno, and Amador counties.

Quartz Hill Road Improvement Project* | Redding, California | 2016-2017 | Biologist

Preformed reconnaissance-level biological survey, vegetation and habitat mapping, and a delineation of waters of the United States. Prepared Natural Environmental Study and wetland delineation reports.

Eastside Road at Onley Creek Bridge Replacement Project* | Redding, California | 2016 | Biologist

Preformed reconnaissance-level biological survey, vegetation and habitat mapping, and a delineation of waters of the United States.

On-Call Biological Services Western Area Power Administration | California | 2011-Present | Biologist

Currently conducting biological surveys, preparing impact assessments, and developing biological conservation measures for Western’s Integrated Vegetation Management Program. Tasks also include Migratory Bird Treaty Act compliance surveys for avian species and biological monitoring for giant garter snake, California red-legged frog, and nesting birds.

Orland Sand and Gravel Delineation of Stony Creek Ordinary High Water Mark* | California | 2017

Preformed delineation of the ordinary high water mark of Stony Creek on four privately owned parcels. Prepared ordinary high water mark delineation report.

** denotes projects completed with other firms*

Sheryl Creer M.S.

Biologist, Botanist

Sheryl has over 10 years of experience as a field biologist and botanist in California and specializes in large-scale infrastructure and utilities projects such as electric transmission lines, gas pipelines, wind energy, and groundwater storage and recovery. She conducts rare plant surveys, wetland and drainage delineations, impacts analyses, habitat assessments, maps vegetation, and prepares habitat restoration and mitigation and monitoring plans. Sheryl also has extensive experience in environmental inspection and construction monitoring. She also prepares technical documents and permit applications for various regulatory agencies including the U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), and the United States Fish and Wildlife Service (USFWS).

EDUCATION

B.S., Biology, concentration in Botany, San Francisco State University, San Francisco, California, 2010

M.S., Biology, concentration in Ecology, Evolution, and Conservation, San Francisco State University, San Francisco, California, 2013

MEMBERSHIPS

Member, former Board Member, California Botanical Society

Member, California Native Plant Society, 2009-Present

AWARDS

2013 Department of Biology Distinguished Graduate Student Award, San Francisco State University

PROJECT EXPERIENCE

BOTANICAL SURVEYS

Eldorado-Lugo-Mohave Transmission Line Upgrade Project* | Mojave Desert and Other Locations in California and Nevada, California and Nevada, United States | 2014-2016 | Field Lead

Sheryl coordinated a team of eight botanists for protocol-level rare plant surveys and vegetation mapping along a transmission line corridor spanning 245 miles from Hesperia, California, east to Laughlin, Nevada, and north to Boulder City, Nevada. She coordinated and conducted wetland and drainage delineations along the same corridor. Special-status species mapped during plant surveys included short-joint beavertail cactus (Opuntia basilaris var. brachyclada), spiny-hair blazing star (Mentzelia tricuspis), and Mojave menodora (Menodora spinescens var. mohavensis), among others. Role: Field Lead | Dates involved: 06/2014–06/2016

650 Line Rebuild Project* | Tahoe National Forest and Placer County, California, United States | 2014-2016 | Botanist/Wetland Specialist

Sheryl conducted biological surveys—including wetland delineations, vegetation mapping, and rare plant and noxious weed surveys—for the wood to steel rebuild of approximately 9 miles of electric transmission line in Tahoe National Forest and adjacent areas in Placer County. She prepared the Botanical Resources Survey Report and Preliminary Wetland Delineation Report as well as the drainage delineation and permit application package for a CDFW Lake or Streambed Alteration Agreement (LSAA). Sheryl also developed a post-construction Habitat Restoration Plan that included the restoration of wetlands and riparian zones and monitoring of a population of a special-status plant species, Plumas ivesia (Ivesia sericoleuca). She assisted with pre-construction special-status wildlife species surveys, including pedestrian night surveys for bats, burrow mapping, and pedestrian amphibian surveys. Role: Botanist/Wetland Specialist | Dates involved: 05/2014–08/2016

Pipeline Safety & Reliability Project* | San Diego County, California, United States | 2015 | Botanist

Sheryl conducted protocol-level rare plant surveys, field confirmation of vegetation mapping, and a wetland delineation for the construction of an approximately 50-mile natural gas transmission pipeline in San Diego County. She assisted in identifying and mapping host plants for Quino checkerspot butterfly (Plantago erecta and Castilleja exserta) and Hermes copper butterfly (Rhamnus crocea). Sheryl also authored the Special-Status Plant Species Report and co-authored the Biological Technical Report, the Jurisdictional Delineation Report, and the Biological Resources section of a Proponent's Environmental Assessment (PEA) for the project. Role: Botanist | Cost: unknown | Dates involved: 02/2015–06/2015

ENVIRONMENTAL INSPECTION

Groundwater Storage and Recovery Project* | San Mateo County, California | 2015-2016 | environmental inspector

Sheryl served as an environmental inspector and monitor for the construction and operation of 13 new groundwater well facilities in San Mateo County. The project involved environmental inspection, specialty monitoring, and interpretation of agency-imposed mitigation measures associated with sensitive species and water quality.

** denotes projects completed with other firms*

BIOLOGICAL MONITORING

Line 109 Hydrostatic Testing* | Woodside, California, United States | 2015 | Lead Biological Monitor

Sheryl conducted biological monitoring for the excavation and hydrostatic testing of a natural gas transmission pipeline located within critical habitat for Bay checkerspot butterfly. She prepared environmental compliance training materials and provided training to crew members and supervisors. Sheryl also prepared daily environmental inspection reports. Upon project completion, she assisted with habitat restoration and prepared a post-construction report for the USFWS. Role: Lead Biological Monitor | Dates involved: 07/2015-11/2015

ECOSYSTEM RESTORATION

City of Sunnyvale Primary Water Treatment Facility Upgrade* | Sunnyvale, California | 2017-2018

Sheryl managed the development of a restoration plan for a wetland and riparian mitigation site. She also implemented and monitored compliance with project permit requirements including coordinating nesting bird and burrowing owl surveys and developing and providing worker environmental awareness training.

VEGETATION ASSESSMENTS

Hollister 115 Kilovolt Power Line Reconductoring Project* | San Benito County, California, United States | 2014-2016 | Bontanist

Sheryl conducted 3 years of annual vegetation restoration monitoring and reporting for the reconductoring and replacement of structures along approximately 16 miles of 115 kilovolt power lines. Vegetation monitoring included sampling vegetation within rangeland, chaparral planting monitoring, and wetland monitoring including soils, hydrology, and vegetation. She also prepared annual reports for agency submittal. Role: Botanist | Dates involved: 04/2014-04/2016

North-South Interconnect Project* | San Bernardino and Riverside Counties, California | 2014-2016

Sheryl complied and analyzed revegetation monitoring data collected during post-construction monitoring for the conversion of approximately 76 miles of petroleum pipeline to natural gas, as well as the construction of approximately 1.2 miles of new pipeline in San Bernardino and Riverside counties. She also authored the Year 3 Restoration and Revegetation Annual Report.

PUBLICATIONS

Creer, S. and R. Patterson. Book Review: The Drunken Botanist, by Amy Stewart.. *Madroño*, 2014, pp. 61(1):144-145.

PRESENTATIONS

Sub-Family Reunion: Will the North American Arbutoids be Invited?. *California Botanical Society Symposium*, 2013.

Addressing Paraphyly in Arbutus (Ericaceae). *Northern California Botanists Symposium*, 2014.

** denotes projects completed with other firms*

Brendan Cohen

Biologist/Environmental Scientist

Brendan is a professional biologist and associate environmental planner with experience evaluating biological and environmental impacts in California. He has conducted special-status species surveys, habitat site assessments, wetland delineations, and prepared biological sections for CEQA/NEPA environmental documents. He routinely implements Worker Environmental Awareness Programs (WEAP), conducts preconstruction surveys, and performs biological construction monitoring. He has experience drafting Biological Resource Assessments, Biological Assessments, Jurisdictional Determinations/Wetland Delineations, and Caltrans Natural Environment Studies. Brendan has experience with GPS equipment for arborist surveys, wetland delineations, and other natural resource analyses.

Brendan also drafts CEQA/NEPA environmental documents which includes analyzing impacts to various environmental resources and reviewing and preparing technical studies. Brendan has assisted in the preparation of environmental documents including Initial Studies/Mitigated Negative Declarations (IS/MND) and Environmental Impact Reports/Environmental Assessments (EIR/EA). He has also assisted with preliminary documents and technical studies for Caltrans-funded projects. These include Preliminary Environmental Awareness Reports, Preliminary Environmental Study forms, Section 4(f) analyses, Community Impact Assessments, and Visual Impact Assessments. He has also prepared public noticing documents, responded to public comments, drafted Mitigation Monitoring Programs (MMP), and prepared final document packages.

EDUCATION

Bachelor of Science, Ecology and Evolutionary Biology, University of California, Santa Cruz, California, 2013

CERTIFICATIONS & TRAINING

CPR/First Aid Certification, Sacramento, California, 2017

Rare Pond Species Survey Techniques Workshop. California tiger salamander (CTS), Western Pond Turtle, and California red-legged frog (CRLF). Workshop allowed for the handling of larval CTS and adult CRLF in the presence of a permitted biologist, Santa Rosa, California, 2017

Ringtail Workshop, Yuba City, California, 2017

Amphibian of the Bay Area Workshop, Santa Rosa, California, 2016

CEQA Essentials Workshop, West Sacramento, California, 2016

CEQA Training for Biologists, Rancho Cordova, California, 2016

CNDDB/BIOS/RareFind5 Training, Sacramento, California, 2015

Western Pond Turtle Workshop, Petaluma, California, 2015

Habitat Conservation Planning Workshop, Vacaville, California, 2015

MEMBERSHIPS

Member, Superior California Chapter, California Association of Environmental Professionals

PROJECT EXPERIENCE

ASSESSMENT, PERMITTING AND COMPLIANCE

APHIS-WS Integrated Wildlife Damage Management (IWDM) Program and Agreement Renewal* | Monterey County, California | 2017

The USDA Animal Plant and Health Inspection Service (APHIS) – Wildlife Services (WS) division implements a program in Monterey County to protect human health, agricultural resources, and infrastructure from predators and nuisance wildlife. Analyzed the biological impacts associated with renewal of the cooperative agreement for the IWDM program. Drafted the Initial Study biological resources section.

BNSF Le Grand to Merced Double Track Project* | Merced County, California | 2015 | Biological Monitor

Conducted daily biological construction monitoring for the construction of a new railroad track. Species of concern included San Joaquin kit fox, western pond turtle, giant garter snake (GGS), CTS, burrowing owl, Swainson's hawk and other nesting birds. Implemented buffers for active nests, trained workers using a WEAP and presented daily morning updates to the work crew.

California State Prison, Los Angeles County Wind Energy Generation Project* | Los Angeles County, California | 2016-2017 | Environmental Planner

Drafted an IS/MND evaluating impacts from the development of a wind turbine within the California State

** denotes projects completed with other firms*

Prison, Los Angeles County. Responded to public comments, filed the Notice of Intent and IS/MND with the State Clearing House and Los Angeles County Clerk, and prepared the final document package.

Camanche Tank 9 Replacement* | Ione, California | 2017 | Biologist/Biological Monitor

Conducted a preconstruction sensitive area demarcation, nesting bird survey, WEAT, and compliance monitoring. Duties included demarcating an area for exclusionary fencing to be placed around an elderberry shrub, placing pin flags at potential CTS burrows, and identifying active bird nests prior to construction. Conducted a WEAP for new workers as well as daily monitoring of ground disturbing activities.

Chappell Road Annexation Project* | Hollister, California | 2016 | Biologist

This project included the preparation of an EIR for a Sphere of Influence Annexation on a property in the City of Hollister. Conducted a biological site visit and evaluated the potential for special-status species to occur including burrowing owl, San Joaquin kit fox, San Joaquin whipsnake, and nesting birds. Drafted the biological section of the EIR and prescribed minimization measures for the above species.

City of Elk Grove Routine Channel Maintenance* | Elk Grove, California | 2015-2016 | Biologist and Monitor

Monitored maintenance activities within the City's drainages and creeks under City's Routine Maintenance Agreement and Routine General Permit. Performed daily WEAPs and preconstruction surveys for GGS, Valley Elderberry Longhorn Beetle (VELB), western pond turtle, and nesting migratory birds and raptors.

Community Pipeline Safety Initiative Program* | Multiple Locations, California | 2017-Present | Biologist

Performed preconstruction nesting bird surveys at multiple locations throughout California's Central Valley. Duties included performing reconnaissance level bird surveys following established protocols, and documenting active bird nests.

Corral Bottom Road at Trinity River Bridge Replacement Project* | Trinity County, California | 2017-Present | Environmental Planner

Drafted the Drafted the Visual Impact Assessment (VIA) for a bridge replacement project. Conducted the fieldwork for the VIA which included photographing the project from key viewpoints.

Humboldt Bay Trail South* | Humboldt County, California | 2017 | Environmental Planner

Drafted the VIA for a Class I multi-use trail project. Conducted the fieldwork for the VIA which included photographing the project from key viewpoints.

Old Town Elk Grove Streetscape Project, Phase II* | Elk Grove, California | 2016 | Environmental Planner and Biologist

Drafted an IS/MND evaluating impacts from implementation of a streetscape improvement project in the Old Town Elk Grove Historic District. Prepared the IS/MND, created the MMP and handled public noticing requirements. Responded to public comments and drafted the City's Staff Report and Resolution to present to the City Council for project adoption.

Pacific Connector Gas Pipeline Project* | Environmental Analyst

Assisted in the preparation of technical studies for the creation of a 232-mile long pipeline project. Revised technical studies that support the project's compliance with the Northwest Forest Plan.

Soledad Wind Energy Generation Project 2* | Soledad, California | 2016 | Environmental Planner

The City of Soledad proposed to install a second wind turbine within the City's wastewater treatment plant to provide 100% renewable energy. Drafted an IS/MND, responded to public comments, prepared the MMP, and filed the Notice of Completion.

Swainson's Hawk Conservation Easement Monitoring* | Elk Grove, California | 2015-2016 | Biologist

Visited sites under annual conservation easements for Swainson's hawk foraging habitat with the City of Elk Grove. Verified crop types, biological conditions, and the presence of nearby raptor nests. Drafted annual status reports documenting condition changes and compliance with the easement.

Taylor Boulevard Development* | Pleasant Hill, California | 2016 | Biologist

Conducted a peer review of biological studies and performed a site visit documenting habitat for a residential subdivision project. Evaluated the site for potential occurrences of VELB, burrowing owl, and Alameda whipsnake. Drafted a peer review memo and biological section for the IS/MND.

Eastside Road at Olney Creek Bridge Replacement Project* | Redding, California | 2017 | Environmental Planner

Drafted the IS, MND, and MMP. Resources analyzed in the environmental document include aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology and soils, greenhouse gas emissions, hazardous materials, hydrology, land use, mineral resources, noise, population, public services, recreation, transportation, tribal cultural resources, and utilities.

Hawkins Station Generator Project* | Santa Rosa, California | 2016 | Monitor

Conducted biological monitoring for the placement of a new generator pad at a Cal Water station within Santa Rosa. The project site contained adjacent vernal pools; monitored for potential CTS activity and habitat destruction.

Honeydew Bridge Replacement Project* | Humboldt County, California | 2017-Present | Environmental Planner

Drafted the VIA. Conducted the fieldwork for the VIA which included photographing the project from key viewpoints. Drafted the EIR/EA. Resources analyzed included land use, community impacts, utilities, traffic,

visual/aesthetics, paleontology, hazardous waste, air quality, noise, energy, biological resources, greenhouse gases, and cumulative impacts.

Horseshoe Bend Levee Improvement Project* | Bethel Island, California | 2016 | Biologist and Environmental Planner

Assisted with a habitat site assessment and wetland delineation. Assisted in drafting the Jurisdictional Determination and Biological Assessment. Special-status species evaluated included vernal pool crustaceans, anadromous fish. Assisted BIMID in circulating the IS/MND for public review and responding to public comment.

Live Oak WWTP Plant Solar Project* | Live Oak, California | 2016 | Biologist

Conducted a site visit and evaluated biological impacts for the Live oak wastewater treatment plant to install solar panels on their property. Analyzed potential habitat and impacts to burrowing owl, VELB, GGS, CTS, and nesting birds. Drafted the IS/MND biology section and prescribed minimization measures for the above species.

McKean Road Tank and Pipeline Project* | Santa Clara County, California | 2017 | Biological Monitor

Conducted biological construction monitoring for the construction of a new water tank and pipeline. Species of concern included CTS, CRLF, Least Bell's vireo, western pond turtle, Bay checkerspot butterfly, burrowing owl, Blainville's horned lizard, white-tailed kite, golden-eagle, pallid bat, San Francisco dusky-footed woodrat, Chinook salmon, Steelhead, and special-status plants. Performed daily pre-activity clearance surveys; trained workers using a WEAP; and monitored project's compliance to 1602 Streambed Alteration Agreement, USFWS Biological Opinion, and Santa Clara Valley Habitat Conservation Plan permit.

SPMUD Trunk Sewer Relocation Project* | Rocklin, California | 2017 | Biological Monitor

Performed daily pre-activity surveys, WEAP trained new workers, and monitored the status of birds nesting near the project area.

Sara Cortez

Senior Biologist

As a senior biologist with over 13 years of experience, Sara has been involved in a variety of project including collaborating with the U.S. Army Corps of Engineers (Corps) and Regional Water Quality Control Board (RWQCB) CWA Sections 401 and 404, California Department of Fish and Wildlife (CDFW) California Fish and Game Codes (CFGC) Sections 1600 and 2081, and with U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) for projects requiring federal Endangered Species Act (ESA) authorization.
Sara has acquired experience on a wide variety of projects throughout California. She has a diverse skillset in wetland ecology, botany, aquatic invertebrate biology and water quality analysis. She has experience surveying and monitoring special-status species including; California red-legged frog (Rana draytonii), burrowing owl (Athene cunicularia), California tiger salamander (Ambystoma californiense) and federally listed vernal pool crustaceans.
Sara routinely prepares wetland delineations, habitat suitability assessments, and special-status species investigations and has prepared numerous permit applications. She has also prepared reports and assessments to document compliance with California Environmental Quality Act (CEQA), National Environmental Policy Act (NEPA), Migratory Bird Treaty Act, federal and state Endangered Species Acts (ESA), Clean Water Act (CWA), and California Fish and Game Codes (CFGC).

EDUCATION

Bachelor of Science, Environmental and Resource Sciences, Hydrobiology Emphasis, University of California, Davis, California, 2002

CERTIFICATIONS & TRAINING

California Rapid Assessment Method (CRAM) Practitioner Riparian Systems–Riverine Module, San Francisco Estuary Institute, Moss Landing, California, 2012

California Rapid Assessment Method (CRAM)-Estuarine Module, San Francisco Estuary Institute, Costa Mesa, California, 2012

Wetlands Restoration Ecology, Tiburon Romberg Center for Environmental Studies, San Francisco State University, Tiburon, California, 2011

Biology Sacramento Valley and Lower Foothill Region, Auburn and Walnut Grove, California, 2008

Biology and Management of the California Red-legged Frog (Rana draytonii) Workshop, Livermore, California, 2008

Basic Wetland Delineation Training, U.S. Army Corps of Engineers (Corps), San Diego, California, 2007

Biology and Management of the California Tiger Salamander (Ambystoma californiense) Workshop, Livermore, California, 2007

California Fairy Shrimp (Linderiella occidentalis) Class, Davis, California, 2006

Aquatic Bioassessment Survey Training, Roseville, California, 2006

Aquatic Weed School, Davis, California, 2004

Field Botany Course, Sacramanto, California, 2005

Tricolored Blackbird (Agelaius tricolor) Biology, Conservation, and Survey Techniques Workshop, Folsom, California, 2016

PROJECT EXPERIENCE

WILDLIFE ASSESSMENTS

Vernal Pool Species Study and Analysis* | Sacramento County, California | Deputy Project Manager

As deputy project manager, Sara included the review and compilation of information pertaining to the six listed vernal pool crustaceans in California and southern Oregon. During the course of this project, Sara held position in the USFWS Sacramento Office and given access to USFWS files. She coordinated directly with Holly Herod, the Sacramento Valley Branch Chief, through completion of the project. Following the review and compilation process of the database, the relevant species information was summarized and presented in a report to USFWS for use in their preparation of the five-year status reviews for these six species.

SCAS Terminal B Replacement and Modernization Program "Big Build"* | Sacramanto County, California | Senior Biologist

As senior biologist, Sara conducted biological monitoring both during and prior to active construction of this project. Tasks included pre-construction clearance and monitoring of the project site for presence of sensitive resources including burrowing owl (Athene cunicularia) and Swainson's hawk (Buteo swainsoni). Sara acted as field team leader and organized and facilitated the pre-

construction clearance of project areas for presence of burrowing owls. Biological monitoring continued during the construction activities at the airport as part of the Terminal Modernization Program, which was finalized in October 2012.

Habitat Conservation Plan (HCP)* | Sacramento County, California | Project Coordinator

Sara was involved in this multi-species HCP is being prepared to cover SMUD's covered activities (primarily operations and maintenance activities) in its Service Area (which encompasses Sacramento County and portions of adjacent counties). Species proposed for inclusion in the HCP would include; vernal pool plants and invertebrates, California tiger salamander (Ambystoma californiense), giant garter snake (Thamnophis gigas), Swainson's hawk (Buteo swainsoni), and burrowing owl (Athene cunicularia). As project coordinator of the SMUD HCP, Sara was responsible for preparing and reviewing the document, staff management, contract/schedule management, and Geographic Information System (GIS) data analysis. She was also responsible for regular collaboration and coordination between regulatory agencies (U.S. Fish and Wildlife Service [USFWS] and California Department of Fish and Wildlife [CDFW]) and the SMUD Environmental Management team to meet both the required biological and statutory requirements of the HCP and the needs of SMUD as a utility provider. Sara also attended monthly meetings with SMUD and the regulatory agencies to discuss and determine various approach strategies, reviewed technical documents, discussed species conservation strategies and determine mutually agreeable approaches to the HCP document sections.

WILDLIFE SURVEYS AND STUDIES

On-Call Services, Burrowing Owl Surveys and Monitoring* | Sacramento, California | Senior Biologist

As senior biologist, Sara assisted biologists at SAFCA in performing protocol-level burrowing owl (Athene cunicularia) surveys and implementing passive relocation methods to exclude burrowing owls from canal system levees set to be retrofitted. She conducted emergency biological monitoring for burrowing owl during construction of local levee protection projects. Sara also presented worker awareness training for the burrowing owl.

Campus Parkway Phase I* | Merced County, California | Senior Biologist

As senior biologist, Sara performed site biological field surveys which included nesting raptor, San Joaquin kit fox (Vulpes macrotis mutica), burrowing owl (Athene cunicularia), and nesting songbird surveys. Subsequent summary documents were also created for the project detailing the survey protocols followed and the findings of the surveys.

SMUD Nature Preserve Mitigation Bank* | Sacramento County, California | Biologist

As biologist, Sara conducted large branchiopod and California tiger salamander (Ambystoma californiense) aquatic surveys. The California tiger salamander aquatic surveys were completed to document overwintering larvae in a managed stock pond and included tissue collection for genetic analysis.

TRANSIT

On-Call Biological Support Services—Caltrans, East Counties of District 4* | Multiple Counties, California, United States | 2018 | Senior Biologist/USFWS Liaison

As part this on-call contract for biological support services, Sara coordinated with Caltrans to avoid listed species and their habitats, prepared effects determinations, coordinated technical assistance, reviewed Biological Assessments, prepared Biological Opinions per Section 7 of the Endangered Species Act, and coordinated with Caltrans during the construction phase to confirm regulatory compliance of permitted activities as related to Bay Area federally-threatened and endangered species. Role: Senior Biologist/USFWS Liaison | Dates involved: 01/2017–07/2018

California High Speed Rail, CP4—California High-Speed Rail Authority* | Central Valley, California, United States | 2018-Ongoing | Senior Biologist

Sara is working on various Incidental Take Permit (ITP) Amendments for the CDFW to address changes in the alignment footprint and/or covered activities of the permit and address any potential changes to the associated effects to Covered Species under the take permit. Role: Senior Biologist | Dates involved: 08/2018–present

BRIDGES

San Joaquin River Bridge on Italian Bar Road Replacement Project* | Fresno County, California | Biologist

Sara was involved in a project to replace the Italian Bar Road Bridge crossing the San Joaquin River at the Fresno-Madera county line in the Sierra National Forest. This is a federally funded California Department of Transportation (Caltrans) Local Assistance project. She completed a biological resources site assessment and prepared the U.S. Forest Service (USFS) Special Use Permit Application for the project.

OIL AND GAS PIPELINES

PG&E Line 406/407 Natural gas Pipeline* | Yolo County, Sutter County, Placer County, California | Senior Biologist

As senior biologist, Sara acted as third-party lead field monitor for the California State Lands Commission during construction activities. She managed biological monitoring staff and helped ensure project compliance per the project permits and the Mitigation Monitoring and Reporting Requirements during the first phase of project construction activities which involved the construction of a newly established section of natural gas transmission pipeline in Yolo County.

Pacific Gas and Electric (PG&E) – Line 108 Natural Gas Pipeline Environmental Impact Report (EIR)* | Sacramento County, California | Senior Biologist

As senior biologist, Sara prepared the Draft EIR (DEIR) with respect to plant and wildlife resources potentially affected by the project and acted as lead third party Field Monitor for the California State Lands Commission during construction activities. She managed biological monitoring

staff and helped ensure project compliance per the project permits and the Mitigation Monitoring and Reporting Requirements during project construction activities which included the replacement of 11 miles of natural gas transmission pipeline.

TRANSPORTATION

California High Speed Train System -Merced to Fresno Section Construction Package 1* | Fresno County and Madera County, California | Deputy Project Manager

As deputy project manager, Sara coordinating closely with the client to prepare all pre-construction reports, surveys, and actions to be consistent and in compliance with the environmental permits and the Mitigation Monitoring and Reporting Requirements.

STORMWATER

Constra Costa Clean Water Program* | Constra Costa, California | Senior Biologist

As senior biologist, Sara assisted in the implementation of a 2-year evaluation of organic-based fertilizer technologies as a best management practice to reduce the nutrient and pesticide pollutant load entering surface waters within Contra Costa County. Project work activities included use of aquatic toxicity testing and chemical water quality analysis to evaluate up and downstream water quality in waterways flowing adjacent or through golf courses. She was responsible for performing regular on-site stormwater event sampling and subsequent evaluation of water quality parameters including; dissolved oxygen, nitrogen, phosphorus, and electrical conductivity. The data collected was then analyzed to compare water quality in courses using traditional synthetic fertilizers versus newer organic-based products.

WATER AND SEWER

Linda Creek Sewer Crossing Rehabilitation Project* | Placer County, California | Wildlife Biologist

Sara conducted a biological field survey and wetland delineation for a small sewer replacement project in close proximity to active stream and riparian habitats within in the City of Roseville. She was also responsible for the preparation and coordination of various permit applications including, federal Section 404, 401, and California Department of Fish and Wildlife (CDFW) Sections 1600-1616 permits for sanitary sewer improvement activities. During the construction phase of the project, acted as Project Manager and Lead Monitor. Managed a biological monitoring staff, ensured project compliance per the project permits and the Mitigation Monitoring and Reporting Requirements during project construction activities, and communicated with client to manage the project timeline and construction scheduling changes.

WATER DAMS & RESERVOIRS

Los Vaqueros Reservoir Expansion Project Environmental Impact Statement/Environment Impact Report* | Sacramento, California | Senior Biologist

Sara performed field surveys to quantify the oak tree species within portions of the project area. This survey was conducted in an effort to calculate estimated habitat loss data following the expansion of Los Vaqueros Reservoir. She performed field surveys and assessments of potential habitat mitigation lands considered for the project.

WATER OPEN CHANNELS & AQUEDUCTS

South Bay Aqueduct Maintenance and Rehabilitation Project* | Alameda and Santa Clara Counties, California | Senior Biologist

Sara conducted biological monitoring both during and prior to active construction of this project. She monitored vegetation restoration sites, pre-construction clearance, and monitored the project site for presence of sensitive resources. She also acted as field team lead in organizing and facilitating the multi-year pre-construction clearance effort to passively exclude burrowing owls (Athene cunicularia) from large portions of the project area.

WETLANDS

Broderick Boat Launch Facility Improvements* | Yolo County, California | Senior Biologist

As senior biologist, Sara conducted the biological field survey and wetland delineation and prepared the Biological Assessment (BA) and the biological resources section of the Initial Study/Mitigated Negative Declaration (IS/MND) document. Sara coordinated with resource agencies and prepared the permit applications for federal Section 404, 401, and California Department of Fish and Wildlife (CDFW) Sections 1600-1616 permits for park expansion and improvement activities.

Hot Springs Road Improvement Project* | Alpine County, California | Wildlife Biologist and Project Coordinator

As wildlife biologist and project coordinator, Sara is coordinating in the preparation of technical reports for a Caltrans Department of Transportation (Caltrans) District 10 Local Assistance road widening project in Markleeville. Technical reports include a Natural Environment Study (NES), wetland deliniation, Historic Property Survey Report (HPSR), and Archeological Survey Report (ASR).

Delta Wetlands Project* | Contra Costa and San Joaquin Counties, California | Project Manager and Senior Biologist

Sara conducted extensive field surveys of the approximate 20,000-acre project area to complete biological resource assessments and update the wetland delineation. She coordinated with state and federal agencies to complete updates to the U.S. Fish and Wildlife Service (USFWS) Biological Assessment (BA), National Marine Fisheries Services (NMFS) Biological Assessment (BA), and the Incidental Take Permit Application.

Jackson Valley Quarry Expansion and Reclamation Environmental Impact Report (EIR) and Mitigation Monitoring Program* | Amador County | Senior Biologist

As senior biologist, Sara conducted biological field assessments (including a wetland delineation) and prepared the Wetland Delineation Report and the biological resources section of the EIR. This EIR analyzed potential impacts that would result from the proposed

project activities, which involved the expansion of the existing Jackson Valley Quarry operation to an adjacent parcel.

Payran to Southpoint Multi-Use Pathway Project—GHD, Inc.* | Sonoma County, California, United States | 2017-2018 | Senior Biologist

For this Caltrans District 4 Local Assistance project, Sara conducted field work and prepared a biological resources technological memorandum to document biological constraints and re-verify the extent of previously delineated wetlands for a portion of the SMART Non-motorized Pathways in Petaluma, California. Role: Senior Biologist | Dates involved: 08/2017–07/2018

CONSERVATION AND RESOURCE MANAGEMENT

Initial Study/Mitigated Negative Declaration (IS/MND) Document* | Alameda County, California | Senior Biologist

As senior biologist, Sara helped prepare an IS/MND document for projects in Alameda County for the use of aquatic herbicides in stormwater conveyances to control aquatic weeds. This document was produced to comply with National Pollutant Discharge Elimination System Aquatic Pesticide Permit requirements. She performed regular on-site biological surveys and evaluated potential risk of herbicide exposure to federally and state-listed species in estuarine and wetland habitats. Sara also conducted regular water sampling and analysis as part of on-going monitoring and reporting plans.

SOURCE WATER ASSESSMENT

Laguna de Santa Rosa Ludwigia Control Project* | Sonoma County, California | Senior Biologist

As senior biologist, Sara assisted in the preparation of an Aquatic Pesticide Application Plan to the North Coast Regional Water Quality Control Board (RWQCB) on behalf of California Department of Fish and Wildlife (CDFW) and the Sonoma County Water Agency. Following the issuance of National Pollutant Discharge Elimination System permits, she worked with RWQCB staff to develop a Monitoring and Reporting Plan to be carried out during the first phase of the project. Sara also made bi-weekly field visits to the site to monitor water quality, maintain field equipment (including continuous water quality monitoring instruments), monitor field crew progress, and evaluate the effectiveness of the best management practices. At the end of phase I, she compiled all collected data for summary and inclusion in the Annual Report that was submitted to RWQCB.

ENVIRONMENTAL ASSESSMENT

Payette National Forest: Disease Transmission of Bighorn Sheep Supplemental Draft Environmental Impact Statement (DEIS)* | Washington County, Idaho | Senior Biologist

As senior biologist, Sara assisted in comment review and categorization process of a large Content Analysis Team (CAT) project for the USFS, Payette National Forest. The CAT project catalogued and summarized public comment on the Draft Supplemental Environmental Impact Statement for Bighorn Sheep Viability Analysis and Forest Plan Amendment.

BRIDGES, ROAD

Atlantic/Eureka I-80 Westbound On-ramp Widening Project* | Placer County, California, United States | 2018 | Senior Biologist/Project Coordinator

Sara provided oversight for the preparation of the technical reports, as well as an IS/MND (IS/MND) for CEQA compliance for the project. Technical reports included a Natural Environment Study, wetland delineation, National Marine Fisheries Service (NMFS) Biological Assessment, Historic Property Survey Report, Archaeological Survey Report, and extended phase I archaeological investigation. She also coordinated agency consultation with NMFS to address potential effects to listed fish species. 06/2017–07/2018

BIOLOGICAL MONITORING

Initial Study/Migigated Negative Declaration (IS/MND) Document* | Alameda County, California | Senior Biologist

Sara assisted in the preparation of an IS/MND document for projects in Alameda County for the use of aquatic herbicides in stormwater conveyances to control aquatic weeds. This document was produced to comply with National Pollutant Discharge Elimination System Aquatic Pesticide Permit requirements. Sara performed regular on-site biological surveys and evaluated potential risk of herbicide exposure to federally and state-listed species in estuarine and wetland habitats. Additionally, Sara conducted regular water sampling and analysis as part of on-going monitoring and reporting plans. Bureau of Land Management–Reach 4B San Joaquin River Restoration Project, Merced County, California: Field Team Lead. Sara performed surveys of habitats that would be flooded along Reach 4B of the San Joaquin River if restoration activities proceed as proposed. Biological surveys included; general habitat assessment, preliminary wetland delineation, sensitive vegetation community assessment (including vernal pools), and nesting bird surveys.

Hirschdale Transmission Line Project Initial Study/Mitigated Negative Declaration* | Nevada County, California | Senior Biologist

As senior biologist, Sara conducted biological monitoring during active construction of this project. She coordinated with the daily monitor and site foreman to help ensure that the project and all related activities remained in compliance with project permits. As a third-party monitor, weekly site visits were performed of the project site to monitor for presence of sensitive resources and project compliance with all applicant proposed mitigation measures including Stormwater Pollution Prevention Plan (SWPPP) measures and produced weekly reports summarizing field findings.

VERNAL POOL STUDIES/DESIGN

Yolo Grasslands Park Project* | Yolo County, California | Field Biologist and Project Manager

As field biologist and project manager, Sara initially performed regular collections of hydrology data within vernal pools and conducted California Burrowing Owl Consortium protocol-level surveys for burrowing owls (Athene cunicularia). During subsequent years, she

performed annual plant population assessments (utilizing transect survey methods) to determine distributional data for the two special-status plant species, Solano grass (Tuctoria mucronata) and Colusa grass (Neostapfia colusana), that occur within the vernal pools on the site. She performed quarterly site visits to monitor site progress or potential problems, submitting quarterly and annual reports and maintaining communication with the project client, sub-consultant, and regulatory agencies.

STREAM/RIVER RESTORATION

Reach 4B San Joaquin River Restoration Project* | Merced County, California | Field Team Lead

As field team lead, Sara performed surveys of habitats that would be flooded along Reach 4B of the San Joaquin River if restoration activities proceed as proposed. Biological surveys included; general habitat assessment, preliminary wetland delineation, sensitive vegetation community assessment (including vernal pools), and nesting bird surveys.

CONVEYANCE - OPEN CHANNELS & AQUEDUCTS

North Bay Aqeduct Alternate Intake Project Environemntal Impact Report (EIR)* | Alameda and Santa Clara counties, California | Senior Biologist

Sara prepared the Draft EIR (DEIR) with respect to aquatic resources as well as the terrestrial plant and wildlife resources that could be potentially affected by the project. She also assisted in the habitat impact analysis in ArcGIS as part of the document preparation.

HABITAT EVALUATIONS

San Joaquin Habitat Conservation Plan (HCP) On Call Biological Services* | San Joaquin County, California | Senior Biologist

As senior biologist, Sara conducted preconstruction surveys for a proposed Home Depot in Lathrop. She coordinated with SJCOG staff and project proponents to schedule field visit and verify compliance with San Joaquin Multi-Species HCP measures.

ENVIRONMENTAL IMPACT ASSESSMENTS

Aquatic Permitting for Herbicide Use* | Solano County, California | Senior Biologist

As senior biologist, Sara assisted in the implementation of a Monitoring and Reporting Plan for SCWA to assess environmental impacts of the use of aquatic pesticides for weed control. Work involved a collection of water quality parameters and herbicide levels during active in-water applications of herbicide. She analyzed all collected data and prepared annual reports for SCWA to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) permitting process.

AIRPORTS

Rancho Murieta Airport Resource Study* | Sacramento County, California | Senior Biologist

As senior biologist, Sara conducted biological field surveys including an arborist survey, Valley elderberry longhorn beetle survey (Desmocerus californicus dimorphus), and habitat assessment.She prepared the Resource Management Report and biological section for the Environmental Impact Report (EIR) for the County of Sacramento. These reports evaluated the natural resources within the Rancho Murieta Recreation Area that had the potential to interfere with flight operations at the adjacent Rancho Murieta Airport.

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QUALIFICATIONS

- Experience performing vegetation and wildlife surveys, and familiar with species-specific protocols and USACE wetland delineation process.
- Practiced CEQA author with experience writing the Biological Resources and Hydrology and Water Quality Resources sections of several CEQA documents including several EIRs for transmission projects at the direction of the CPUC.
- Experience in managing and performing construction monitoring on commercial solar and wind development projects, including managing budgets and field staff.
- Familiar with permit conditions associated with CWA Section 401 and 404, Biological Opinions, Incidental Take Permits, and well-versed in ensuring those conditions are met.
- Proficient with handheld GPS, ArcGIS, and Google Earth.

EXPERIENCE

Ecology and Environment, Inc., San Francisco, CA (January 2015 – Present)
Environmental Scientist. Contributed to all phases of environmental review document preparation, including drafting biological resource sections and responding to public comment for CEQA documents. Surveyed existing and prospective solar, wind, and transmission projects for threatened and endangered wildlife species. Managed the biological monitoring for the decommissioning of a wind energy project in the Altamont Pass.

Great Basin Institute, Reno, NV (May 2014 - July 2014)
Vegetation/Habitat Assessment Crew Member. Performed habitat assessment activities, including vegetation sampling and inventories, soil testing, and logging photo points, while working with the Nevada Dept. of Wildlife sage grouse habitat-monitoring project.

Great Basin Institute, US Forest Service, Carson City, NV (May 2013 – November 2013)
Invasive Species Technician. Surveyed US Forest Service lands for invasive species and mapped new infestations. Eradicated invasive plant infestations with chemical, biological, and mechanical methods.

National Audubon Society, Trabuco Canyon, CA (November 2012 – May 2013)
Invasive Species Crew Member. Eradicated invasive plant infestations by mechanical means, performed invasive plant surveys, conducted experimental treatments and collected data.

EDUCATION

SUNY College of Environmental Science and Forestry, Syracuse, NY
Master of Professional Studies, Environmental Science (December 2014)

SUNY College of Environmental Science and Forestry, Syracuse, NY
Bachelor of Science, Natural Resources Management (May 2011)

TRAINING

HAZWOPER 40-Hr Training (April 2015), 8-Hr Refresher (January 2017)
Introduction to Desert Tortoises and Field Techniques, Desert Tortoise Council (November 2015)
FERC Environmental Review and Compliance for Natural Gas Facilities (April 2016)

REFERENCES

Available Upon Request

FOOTHILL ASSOCIATES

ENVIRONMENTAL CONSULTING ● PLANNING ● LANDSCAPE ARCHITECTURE

Cristian Singer

Senior Botanist

Education

Bachelor of Science, Environmental Biology, Humboldt State University, 1996

Certifications

CDFW Scientific Collecting Permit for State Designated Endangered, Threatened, and Rare Plants, No. 07003

California Endangered Species Act, Native Plant Protection Act, Plant Voucher Collecting Permit No. 2081(a)-18-139-V

Experience

Foothill Associates, Botanist

ICF International, Botanist

U.S. Forest Service, Botanist, Susanville, California.

U.S. Forest Service, Botanist, Nevada City, California

U.S. Forest Service, Botanist, Nevada City, California

The Nature Conservancy, Botanist, San Francisco, California

Bureau of Land Management, Botanist, Bakersfield, California

U.S. Geological Survey, Botanist, Barstow, California

Cristian Singer has twenty-three years of experience conducting large-scale vegetation mapping projects, floristic inventories, rare plant surveys and wetland delineations throughout the State of California, southern Oregon, and southern Nevada. Cristian utilizes dichotomous keys to facilitate accurate and timely identification of plant specimens (including grasses, sedges and rushes) in the course of botanical surveys, vegetation community sampling and wetland delineations. He specializes in conducting floristic surveys for special-status plant species in accordance with federal, state and local agency guidelines. He has surveyed hundreds of vegetation community plots in the course of developing base-line data for the development of large-scale vegetation maps. Cristian is a strong project manager and regularly communicates and coordinates with multidisciplinary professionals to complete project goals in a timely manner; effectively manages project timelines and produces accurate cost estimates; prepares and reviews technical reports and documents; maintains a safe and productive working environment; and supervises and trains junior personnel.

Representative Experience

Floristic Surveys— Butte County Meadowfoam. Conducted surveys for and extensive mapping of Butte County Meadowfoam, a state and federally listed endangered plant species, in Butte County, California.

District 1 Biologist—Caltrans; Humboldt, Mendocino, Sierra and Sonoma counties, California. Conducted special-status plant surveys and wetland delineations at various existing bridge locations and proposed culvert improvement sites.

1-80/1-680 Interchange Project PA/ED—Solano County Transportation Authority/Mark Thomas and Company, Solano County, California. Conducted special-status plant surveys within a proposed improvement footprint at the Interstate 80 and Interstate 680 interchange. The work will form the environmental baseline and obtain environmental permits for project planning and implementation.

SR-299 Blue Lake Slide Wetland Delineation and Permitting—Caltrans, Humboldt County, California. Conducted a wetland delineation and functional assessment to meet both Caltrans and the Corps standards. The work will form the environmental baseline and obtain environmental permits for project planning and implementation.

SR 197/US 199 Safe STAA Access Project—Caltrans District 1, Del Norte County, California. Field delineated wetlands and other waters using the routine on-site determination methods detailed in the Corps Wetlands Delineation Manual and the Corps Draft Interim Regional Supplement to the Corps 1987 Manual: Western Mountains, Valleys and Coast Region at the Narrows location on US 199 in the Middle Fork Smith River canyon, one of seven isolated locations where Caltrans is proposing improvements on SR 197 and US 199 to be able to classify the routes as part of the Surface Transportation Assistance Act truck route network. The wetland delineation report was one of several reports prepared to support the environmental impact analysis for the project.

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Environmental Support Services for Transportation Improvement (Contract 03A1317)—Caltrans Districts 1, 2, and 3 (Various Locations in Northern California). Conducted wetland delineations for an additional 10 task orders under this contract.

U.S. 101 Willits Bypass Project Mitigation Planning and Design and Permitting—Caltrans District 1, Mendocino County, California. The Willits Bypass Project is a 5.9-mile long roadway bypass of U.S. Highway 101 (Hwy 101) to the east of the City of Willits, in Mendocino County, California. The complex project realigns Hwy 101 with a four-lane highway around the City of Willits through the Little Lake Valley and reconnects with the existing Hwy 101. The project improves traffic access by relieving traffic congestion associated with the Hwy 101 and State Route 20 (SR-20) interchange, constructing a new 4-lane roadway segment, and making other improvements along the alignment, including new and improved bridges, interchanges, viaducts, retaining walls, and fish passage improvements. The new roadway segment includes twenty-two bridges over existing waterways, riparian corridor, streets, and railroad right-of-ways. The new roadway affects endangered species, waters of the State and United States, requiring a complex suite of permits and onsite mitigation plan.

North County Corridor EIR/EIS for New SR-108—North County Corridor Joint Powers Authority, Stanislaus County and San Joaquin County, California. Conducted a wetland delineation for the proposed SR-108 in San Joaquin and Stanislaus County. Caltrans, as the CEQA/NEPA lead agency, in cooperation with the North County Corridor Transportation Expressway Authority, propose to construct an expressway that would extend approximately 25 miles from SR-99 in the vicinity of Kiernan Avenue/the Salida community, to SR-120 approximately 6 miles east of the City of Oakdale.

Delta Wind Technical Studies—enXco, Solano County, California. Conducted an initial mapping project on a proposed 12,000-acre wind farm in order to facilitate planning efforts to minimize or eliminate potential project-related impacts to special-status plant species and wetlands.

Central California Clean Energy 500 kV Transmission Line Project Proponents Environmental Assessment (PEA)—Pacific Gas & Electric Company (PG&E), Fresno County, Kings County, and Madera County, California. Conducted special-status plant surveys throughout the proposed transmission alignment.

Sunrise Powerlink 2008 Rare Plant Surveys—San Diego Gas & Electric Company (SDG&E)/Arcadis, San Diego County, California. Conducted special-status plant surveys throughout the existing transmission alignment and within the proposed, expanded transmission alignment.

Carrizo to Midway Transmission Line—Pacific Gas & Electric Company (PG&E), Carrizo Plain National Monument, San Luis Obispo County and Kern County, California. Conducted special-status plant surveys and delineated wetlands and other waters of the U.S. within the proposed alignment using the routine on-site determination methods detailed in the U.S. Army Corps of Engineers Wetlands Delineation Manual and the U.S. Army Corps of Engineers Draft Interim Regional Supplement to the Corps of Engineers 1987 Manual: Arid West Region.

Rosamond PV Solar Technical Studies—Sempra Energy Utilities, Kern County, California. Conducted special-status plant surveys and delineated wetlands and other waters of the U.S. within a proposed wind farm using the routine on-site determination methods detailed in the U.S. Army Corps of Engineers Wetlands Delineation Manual and the U.S. Army Corps of Engineers Draft Interim Regional Supplement to the Corps of Engineers 1987 Manual: Arid West Region.

Shiloh 3 Wind Project Biological and Cultural Impact Studies—enXco, Contra Costa County, California. Conducted special-status plant surveys within proposed expansion area associated with existing wind farm.

Gas Line 177A Botanical Survey—Pacific Gas & Electric Company (PG&E), Shasta County, California. Conducted special-status plant surveys along a proposed PG&E gas line.

Hollister Tap 1 and 2 115 kV Reconductor PEA—Pacific Gas & Electric Company (PG&E), Monterey County, San Benito County, California. Conducted special-status plant surveys along existing transmission line. Delineated wetlands and other waters of the U.S. within portions of the alignment using the routine on-site determination methods detailed in the U.S. Army Corps of Engineers Wetlands Delineation Manual and the U.S. Army Corps of Engineers Draft Interim Regional Supplement to the Corps of Engineers 1987 Manual: Arid West Region.

Crane Valley Dam Seismic Modifications Permitting Assistance—Pacific Gas & Electric Company (PG&E), Fresno County, California. Conducted floristic inventories in several meadow and riparian complexes as part of an assessment for potential suitable mitigation areas.

Shingle Springs Substation Overhead Distribution Project Biological Services—PG&E, El Dorado County, California. Conducted botanical surveys for proposed pole replacement and re-conductoring to support recent substation expansion work.

Emergency Response Environmental-Cultural Support—PG&E, Various Locations, California. Conducted botanical surveys. ICF is under contract to perform emergency response and short-notice work when requested by PG&E. The scope of work includes wildlife biology, aquatic, water quality, cultural resources, and miscellaneous technical support for a variety of PG&E gas, electric transmission/distribution, and hydroelectric projects throughout PG&E's service territory.

Vernal Pool Monitoring at Van Vleck Ranch Mitigation Bank—Westervelt Ecological Services, Sacramento County

and Solano County, California. Conducted floristic surveys to document the presence/absence of plant species in constructed versus natural vernal pools. Additionally, conducted floristic surveys for special-status plant species.

Arcata Wetland Vegetation Surveys—Caltrans, Humboldt County, California. Conducted a comprehensive floristic examination of wetland/upland conditions in a mosaic of pastures in order to provide an ecological evaluation for potential wetland creation or mitigation.

Sensitive Plant Management Program—U.S.D.A. Forest Service, Susanville, California. Lead Botanist for team conducting special-status plant surveys and comprehensive floristic surveys throughout the National Forests of California

Region 5 Meadow and Riparian Study—U.S.D.A. Forest Service, Nevada City, California. Role: Lead Botanist for team conducting frequency and green-line sampling within meadows and riparian areas throughout the National Forests of California.

Furnace Creek Vegetation Mapping Project—U.S. Geological Survey, Flagstaff, Arizona. Lead Botanist conducting the location and assessment of wetlands associated with an extensive system of seeps and springs in preparation for production of a detailed vegetation map of the study area and surrounding environs.

Mojave Vegetation Mapping Project—U.S. Geological Survey, Flagstaff, Arizona. Lead Botanist testing preliminary vegetation map of the Mojave Desert region for accuracy.

Mojave Vegetation Mapping Project—U.S. Geological Survey, Flagstaff, Arizona. Primary duties involved conducting botanical field investigations, studies, and surveys such as vegetation sampling throughout the Mojave Desert and surrounding environs.

Yosemite National Park Vegetation Mapping Project—The Nature Conservancy, San Francisco, California. Title/Role: Lead Botanist for team conducting botanical investigations, studies and surveys such as vegetation sampling throughout Yosemite National Park and surrounding environs.

Sensitive Plant Management Program—U.S. Bureau of Land Management (BLM), Bakersfield, California. Primary duties involved conducting field surveys for populations of sensitive, threatened and endangered plant species throughout Carrizo Plain National Monument.

Botanical Surveys for Low Effect HCP Santa Cruz and Monterey—PG&E, Monterey County and Santa Cruz County, California. Conducted floristic surveys and mapped special-status plant species along existing gas lines in order to prepare a vegetation management plan.

Desert Conservation Program Rare Plant Inventories—Clark County, Nevada. Conducted targeted surveys to determine the presence or absence of special-status plant species in order to obtain new locations and ecological information to further refine predictive ecological models.

San Joaquin Valley HCP Map Book Survey II—Pacific Gas & Electric Company (PG&E), Kern County, California. Conducted surveys for special-status plant species.

East Contra Costa County HCP/NCCP Implementation—East Contra Costa County Habitat Conservancy, Contra Costa County, California. Conducted surveys for special-status plant species.

Pacheco Pass Corridor EIR/EIS—California High Speed Rail Authority/Parsons Transportation Group, Merced County, Santa Clara County, California. Conducted special-status plant surveys along proposed high-speed rail alignment.

Tejon Mountain Village Biological Surveys—Dudek & Associates, Kern County, California. Conducted surveys for special-status plant species.

Lower Kyle Canyon Development Project EA—U.S.D.A. Forest Service, Clark County, Nevada. Conducted surveys for plant species utilized by special-status butterflies.

Allison Loveless

Biologist

North State Resources, Inc.

Allison has more than 6 years of biological experience. She has served in roles ranging from consulting field biologist to laboratory biodiversity scientist. Allison has performed pre-construction surveys for nesting birds, biological reviews of project sites, and construction monitoring for giant garter snake, nesting birds, and federally listed vernal pool brachiopods. Allison's employment history also displays broad biological skills. Prior to becoming a biologist for NSR, Allison worked as an Assistant Scientist in the Center for Biodiversity at Temple University, Collection Manager at the Oklahoma State Collection of Vertebrates Museum, Forensic Intern with the Wyoming Wildlife Forensic and Fish Health Laboratory, Biology and Human Anatomy Teaching Assistant, Geographic Information Systems (GIS) assistant with Cal Fire, and Botanical Survey Technician in northern and central California for Sierra Pacific Industries. She has also prepared numerous technical reports, including professional, peer-reviewed publications and environmental constraints reports, and has assisted with revisions to environmental impact reports. Her experience ranges from the study of broad population and ecosystem patterns to within-population species assessments, including native and invasive range identifications and predictions, large-scale analyses of population genetic structure and morphology, forensic genetic analyses of wildlife, and conservation of tropical biodiversity. She has also participated in field trips to tropical regions to collect amphibians and reptiles.

Education

M.S., Zoology, Oklahoma State University, Stillwater, 2014

B.S., Geography/Environmental Studies, University of California, Los Angeles, 2009

Relevant Experience*

Vegetation Management Activities—Western Area Power Administration. Biologist. Conducted surveys for sensitive biological resources, including nesting birds, special-status mammals, and waters of the United States, prior to vegetation management activities at Western Area Power Administration rights-of-way. Also performed biological monitoring for vegetation removal activities.

Deschutes Road Widening Technical Memorandum----Shasta County Department of Public Works. Biologist. Reviewed federal, state, and local databases and site lists for known contamination sites, regulated landfill sites, underground tank sites, hazardous waste generators, and other potential sites of concern prior to project initiation. Generated a technical memorandum of hazards at the project location.

Community Pipeline Safety Initiative----Stantec on behalf of PG&E. Biologist. Performed pre-construction surveys for nesting birds and other sensitive resources. Conducted environmental safety training for project workers. Also performed biological monitoring, ensuring that all federal and state environmental regulations were adhered to. Produced daily reports and photographic logs of work activities associated with any potential impacts to natural resources.

Pit 6 Dam Fish Salvage----PG&E. Biologist. Assisted with locating fish in a dewatered stilling basin below Pit 6 Dam prior to construction activities.

Riverland Drive Widening Project Natural Environment Study----Shasta County Department of Public Works. Biologist. Prepared a natural environment study to evaluate the potential effects of the proposed project on special-status plant and animal species, waters of the United States, and other sensitive biological resources. Tasks included identifying the presence of habitat for special-status species, predicting potential impacts to these species and habitats, and proposing mitigation measures to prevent or reduce significant impacts.

Offsite Roadway Improvements for the River Crossing Marketplace Development Project Biological Resource Assessment----Costco Wholesale Corporation. Biologist. Prepared biological resource assessment evaluating the natural environment and potential impacts and mitigation for sensitive biological resources. Also assisted with field wetland delineation and report preparation.

Pacific Connector Gas Pipeline----Administrative Record Maintenance and

**denotes work with another company*

Forest Service Survey and Manage Persistence Evaluations. Biologist. Used GIS species occurrence and land management data to conduct new persistence evaluations for all survey and manage species that may be affected by PCGP activities. Used these species evaluations to revise survey and manage species persistence discussions.

L-402 Strength Test----CH2M Hill on behalf of PG&E. Biologist. Conducted pre-construction surveys for nesting birds and biological reviews of project sites and provided worker environmental safety training. Also performed construction monitoring for excavation and construction activities, including ensuring that state and federal regulations regarding biological and environmental resources were enforced. Produced daily reports and photograph logs for both construction monitoring and nesting bird surveys, showing construction activities and progress and potential environmental impacts.

L-121 Hydrostatic Test—CH2M Hill on behalf of PG&E. Biologist. Performed construction monitoring for giant garter snake and ensured that state and federal regulations regarding biological and environmental resources were enforced. Produced daily reports on construction progress and potential environmental impacts.

Environmental Constraints Reports (various projects)—ICF on behalf of PG&E. Biologist. Prepared environmental constraints reports evaluating potential impacts on biological resources prior to construction activities. Reports included describing habitats and environmental resources in the project area, determining special-status plant and animal species with potential to be present in the project area, and recommending surveys, permits, and avoidance and minimization measures. *

Upper North Fork Feather River Hydroelectric Project, Draft Environmental Impact Report—State Water Resources Control Board. Biologist. Revised and updated Vegetation, Wildlife, and Sensitive Biological Resources section of 2014 Draft EIR in response to comments from PG&E, Forest Service, California Department of Fish and Wildlife, Plumas County, non-governmental organizations, and individuals.*

Oklahoma Wetland Condition Analysis—Oklahoma State University, Departments of Zoology and Natural Resources Ecology and Management (EPA Grant). Research Assistant. Assisted in developing landscape GIS models for the prediction of wetland conditions in Oklahoma.*

Grey Wolf Genetic Database Project----Wildlife Forensic and Fish Health Laboratory, Wyoming Wildlife Game and Fish Department. Forensic Intern. Collected and analyzed microsatellite and DNA sequence data. The genetic data were used to assemble a grey wolf population database for use as a forensic reference to aid in the prosecution of illegal activities involving wolves. *

Viverridae Project----Oklahoma State University. Assisted with ongoing analyses of the native and invasive range identification and prediction for viverrid species based on recent genetic designations.*

Hispaniolan Frogs----Center for Biodiversity, Temple University. Biodiversity Laboratory Specialist. Assisted with the collection and genetic sequence analyses of endemic Hispaniolan frog species. Responsibilities included the discovery and resolution of unique species. Managed project quality and progress, project budgets, and laboratory assistants. *

C3. 2018 Rare Plant Surveys and Natural Vegetation Community Mapping

RARE PLANT SURVEYS AND NATURAL VEGETATION COMMUNITY MAPPING

Fountain Wind Project
Shasta County, California

Prepared for:

Pacific Wind Development, LLC

Prepared by:

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Western EcoSystems Technology, Inc.
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October 17, 2018

WEST inc.

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Greg Johnson	Ecologist / field surveys
Rande Patterson	Biologist / field surveys

REPORT REFERENCE

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INTRODUCTION

Pacific Wind Development LLC (Pacific Wind) has contracted Western EcoSystems Technology, Inc. (WEST) to provide biological support for the development of the proposed Fountain Wind Project (Project). This memorandum described the methods and results of rare plant surveys conducted at the Project during the 2018 growing season. The primary purpose of these surveys was to determine the presence or absence of rare plant species that may be subject to impacts resulting from Project construction. A description of the natural vegetation communities present within the Project evaluation area and information on invasive plant species are also provided.

SURVEY AREA

The Project is located on privately owned commercial timberlands in central Shasta County, California. The dominant vegetation type in and around the Project is early seral mixed coniferous forest (post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use in this area is commercial timber production, which has resulted in a highly fragmented landscape across much of the area. Dominant overstory species include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*).

The Project is located within the Southern Cascades Ecoregion, near the southern terminus of the Cascade Mountains. A Mediterranean climate dominates the region, characterized by hot, dry summers and cold, wet winters. On average, the area receives about 63 inches (in; 160 centimeters [cm]) of precipitation per year, of which 28 in (71 cm) occur as rainfall and 35 in (89 cm) as snowfall (US Climate Data 2018). A number of perennial and intermittent streams flow primarily west and northwest from the Project into the Pit River and Sacramento River watersheds. Soils range from stony to clay loams that have formed in residuum weathered from volcanic rock (Natural Resources Conservation Service 2018). In August 1992, the Fountain Fire burned approximately 64,000 acres (25,900 hectares) in and around the Project. Post-fire management included salvage logging, site preparation, and planting in the year following the fire. Within five years of the fire, approximately 17 million seedlings were planted in industrial areas previously supporting timber (Zhang et al. 2008). Planted species included ponderosa pine, Douglas fir and white fir at 10-foot (3-m) spacing. Incense cedar (*Calocedrus decurrens*) was planted along stream buffers. In order to reduce competition for (tree) seedling establishment, growth regulator herbicides were applied in many areas where manzanita (*Arctostaphylos* spp.) and California-lilac (*Ceanothus* spp.) had naturally colonized (Zhang et al. 2008). With historic and on-going timber management activities and post-Fountain Fire salvage and reclamation activities, the natural vegetation communities have been periodically altered and/or disturbed, likely having at least some effect on plant species composition, distribution, and diversity in these areas.

For the purpose of conducting rare plant surveys, survey corridors were provided in GIS format by Pacific Wind. The rare plant surveys corridors included areas of potential disturbance during Project construction (Figure 1). The survey corridors varied in size and included buffers of all areas of proposed infrastructure that may be subject to ground disturbance (e.g., newly proposed roads, roads that may be expanded, turbine pads, and underground collection lines). Natural vegetation communities were mapped in a broader evaluation area that encompassed the rare plant survey corridors and additional surrounding lands (Figure 1).

METHODS

Rare Plant Surveys

WEST conducted a query of the California Natural Diversity Database (CNDDB), an inventory of the status and locations of rare plants, rare plant communities, and animals in California managed by the California Department of Fish and Wildlife (CDFW), and searched the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants to compile a targeted list of special status plant species and sensitive natural vegetation communities with potential to occur within the evaluation area. The CNDDB query was limited to an area within a 10-mile radius of the Project and the CNPS search was focused on Shasta County.

A total of 51 rare plants were identified in the CNDDB query and CNPS database review. Based on further review of the habitat requirements of the 51 species and knowledge of the natural vegetation communities known to occur within the evaluation area (based on previous WEST surveys), WEST biologists determined that 36 rare plant species had the highest potential to occur and 15 of the 51 rare plants species were unlikely to occur. Of the 36 species that had the highest potential to occur, only one was federal- or state-listed, the state endangered Boggs Lake hedge-hyssop (*Gratiola heterosepala*). As the reported habitats (e.g., riparian, wet meadow) and flowering/fruiting periods of the 15 species identified as not likely to occur overlapped those of the 36 species with the highest potential to occur, all 51 rare plant species were targeted during the rare plant survey effort (Appendix A). Prior to conducting surveys, WEST reviewed species descriptions, habitat requirements, and photographs of the 51 target species.

Focused surveys to determine presence or absence of target species were conducted during two survey periods: May 21 – 29 and July 30 – August 3, 2018. The two survey periods were selected to capture the range of flowering and fruiting periods for the 51 target species. WEST biologists conducted pedestrian transect surveys within the survey corridors, with special attention given to areas that might provide suitable habitat for rare plant species, in accordance with the 2018 *CDFW Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities*. The survey corridors were uploaded to Global Positioning System units with sub-foot accuracy (Trimble Geo 7x). In addition, surveyors used aerial imagery-based field maps depicting the evaluation area to map natural vegetation communities and invasive plant species and for general navigation.

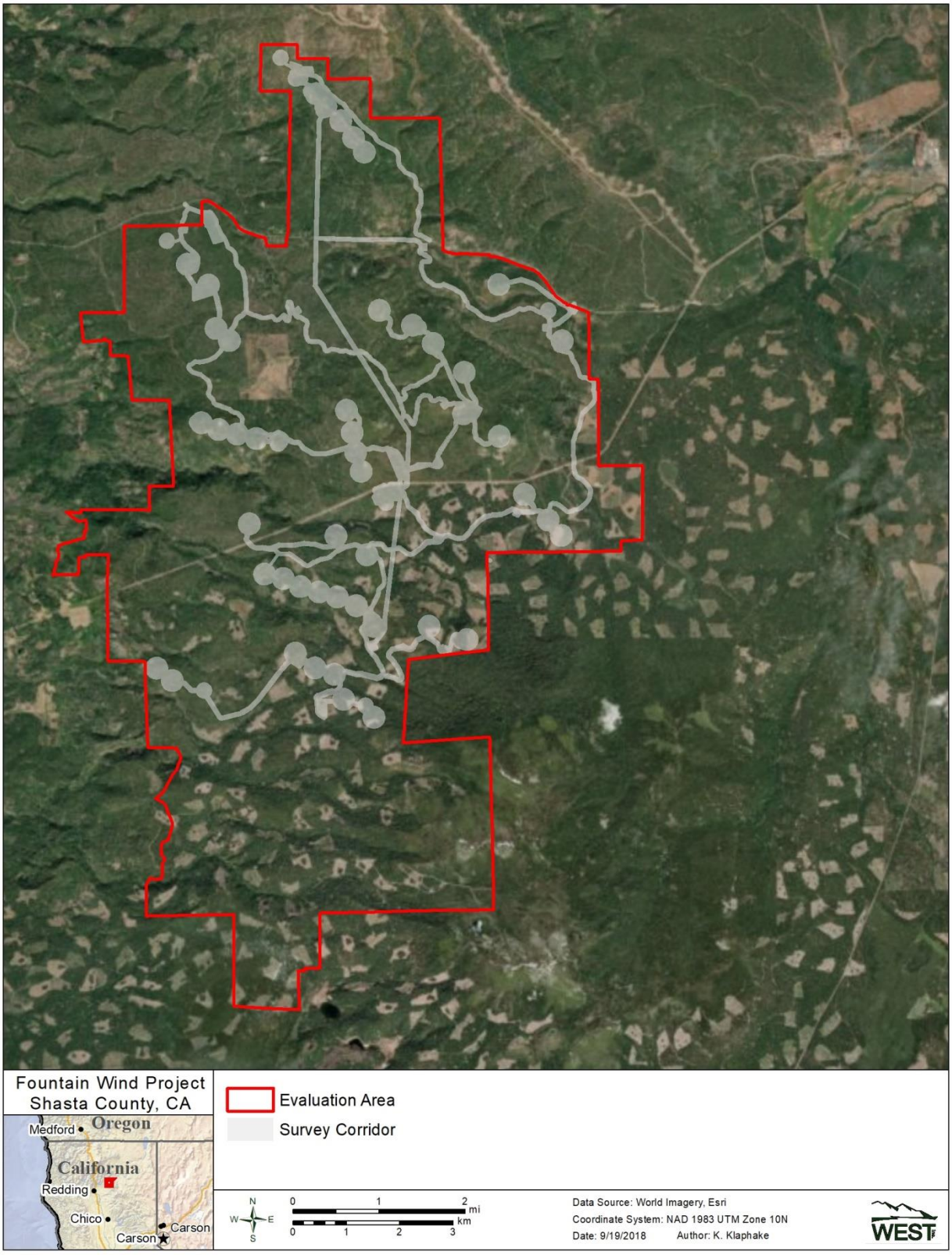

Figure 1. Survey corridors and evaluation area associated with rare plant surveys and natural vegetation community mapping at the Fountain Wind Project, Shasta County, CA.

Natural Vegetation Communities

Mapping of natural vegetation communities within the evaluation area was conducted by WEST during the 2018 rare plant surveys. WEST botanists documented vegetation community types while conducting rare plant surveys and while transiting through the evaluation area en route to survey areas. Dominant plants within each vegetation community were identified to species, and communities were classified in accordance with the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986) or *A Manual of California Vegetation* (2nd Edition, Sawyer et al. 2008). Based on the field data collected during rare plant surveys, natural vegetation communities were hand-drawn on aerial imagery-based field maps created at a scale appropriate for broad-scale mapping (i.e., 1 in = 1,000 feet [2.5 cm = 304.8 m]). The field maps were later digitized in a GIS to incorporate into other GIS mapping efforts.

Invasive Plant Species

Non-native invasive plant species encountered were recorded during both rare plant survey periods in 2018. Broad-scale mapping of non-native species was conducted during the second rare plant survey period and primarily focused on roadsides within the rare plant survey corridors. Based on observations during the rare plant surveys, vegetation within turbine pad areas (most of which were away from developed roads) was largely composed of native plant species, with only a few, occasional non-native invasive species observed; no mapping of non-native species was conducted within these locations. Additionally, no mapping was conducted within recently logged (e.g., within the past 10 years) areas because of the abundance of the same three non-native invasive species within all such areas.

Mapping of non-native invasive species along access roads was conducted by walking and slowly driving roads and estimating the number of individuals of non-native invasive species observed. Non-native plant species for which mapping was conducted included all species identified by the California Invasive Plant Council (CAL-IPC) as “high” (i.e., species that have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure), “moderate” (i.e., species that have substantial and apparent, but generally not severe ecological impacts on physical processes, plant and animal communities, and vegetation structure), and “limited” (i.e., species that are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score). Survey corridors were broken into survey segments identified with a unique letter (A-O), with each segment corresponding to a list of non-native invasive species and their relative distribution documented within the segment. Within each survey segment, non-native invasive plant species-level distributions were rated as “Abundant” (A: over one thousand plants), “Common” (C: 200-1,000 individuals), or “Infrequent” (I: less than 200 individuals). Additional non-native invasive plant species mapping included several point locations along roads where invasive plants were concentrated/clustered. These locations were typically located in high-disturbance areas (e.g., near gates).

RESULTS AND DISCUSSION

Rare Plant Surveys

None of the 51 rare plant species identified as possibly occurring were encountered during the two survey periods in 2018. Given the lack of rare plants identified in the survey corridors, no impacts to rare plants are anticipated during Project construction. A comprehensive list of plant species encountered during the 2018 surveys was compiled and is provided in Appendix B.

Natural Vegetation Communities

A total of 11 natural vegetation communities were identified within the Project evaluation area, including: mixed conifer forest-burned; mixed conifer forest-unburned; mixed montane riparian forest; mixed montane riparian scrub; mixed montane chaparral; black oak woodland; wet montane meadow; montane meadow; logged/recently logged; rock outcrop; and, transmission line corridor (Figure 2; Appendix C). None of the mapped natural vegetation communities were considered sensitive (i.e., none had a state rank of S1-S3; CDFW 2018).

Mixed conifer forest is the predominant vegetation community within the evaluation area (see Figure 2) and is a vegetation community that is heavily managed for timber production throughout the region. Other vegetation communities occur in far lesser amounts and are largely outside of areas potentially at risk of disturbance due to Project construction. While the riparian communities cross the survey corridors in many areas, these are largely at existing road crossings or in areas where future roads may be constructed. It is assumed that any future modifications to habitat along streams (e.g., riparian areas) due to added road work will incorporate riparian protections consistent with other ongoing management activities (i.e., timber harvesting) in the region.

Invasive Plant Species

The most common invasive plant species observed within the Project evaluation area included mullein (*Verbascum thapsus*; CAL-IPC ranked “limited”), bull thistle (*Cirsium vulgare*; CAL-IPC ranked “moderate”), Klammathweed (*Hypericum perforatum*; CAL-IPC ranked “limited”), and houndstongue (*Cynoglossum officinale*; CAL-IPC “moderate”). Based on other plant survey work conducted by WEST within the Project vicinity (Young et al. 2007), these four species are ubiquitous in the area. As mentioned above, mullein, bull thistle, and Klammathweed are widespread within all logged and recently logged areas within the evaluation area. A total of three invasive plant species ranked “high” by CAL-IPC were observed within the Project evaluation area, including Himalayan blackberry (*Rubus armeniacus*), yellow starthistle (*Centaurea solstitialis*), and medusahead (*Elymus caput-medusae*; Figure 3). Additional CAL-IPC ranked invasive plant species observed within the evaluation area included annual dogtail grass (*Cynosurus echinatus*; “moderate”), tall fescue (*Festuca arundinacea*; “moderate”), field sorrel (*Rumex acetosella*; “moderate”), orchardgrass (*Dactylis glomerata*; “limited”), and English plantain (*Plantago lanceolata*; “limited”; Figure 3).

Based on the data collected during 2018 surveys, a number of invasive plant species are present within proposed survey corridors. These results are not unexpected given the primary land use (i.e., commercial timber production), which results in recurring disturbance throughout the area and relatively high traffic volumes resulting from timber harvest activities. Many of the invasive species are actively managed by the landowners to minimize competition with conifer seedlings and enhance timber growth. Many disturbances related to Project construction will be similar to those which occur in the Project evaluation area already (e.g., harvest of trees, road construction and widening, seasonal/temporary increases in vehicle traffic) and are unlikely to contribute to any significant changes in invasive species distributions within the evaluation area. While Project construction will create some additional disturbance to the landscape, once construction is complete, the Project will have minimal influence on the future distribution of invasive species relative to the influence of ongoing commercial timber operations.

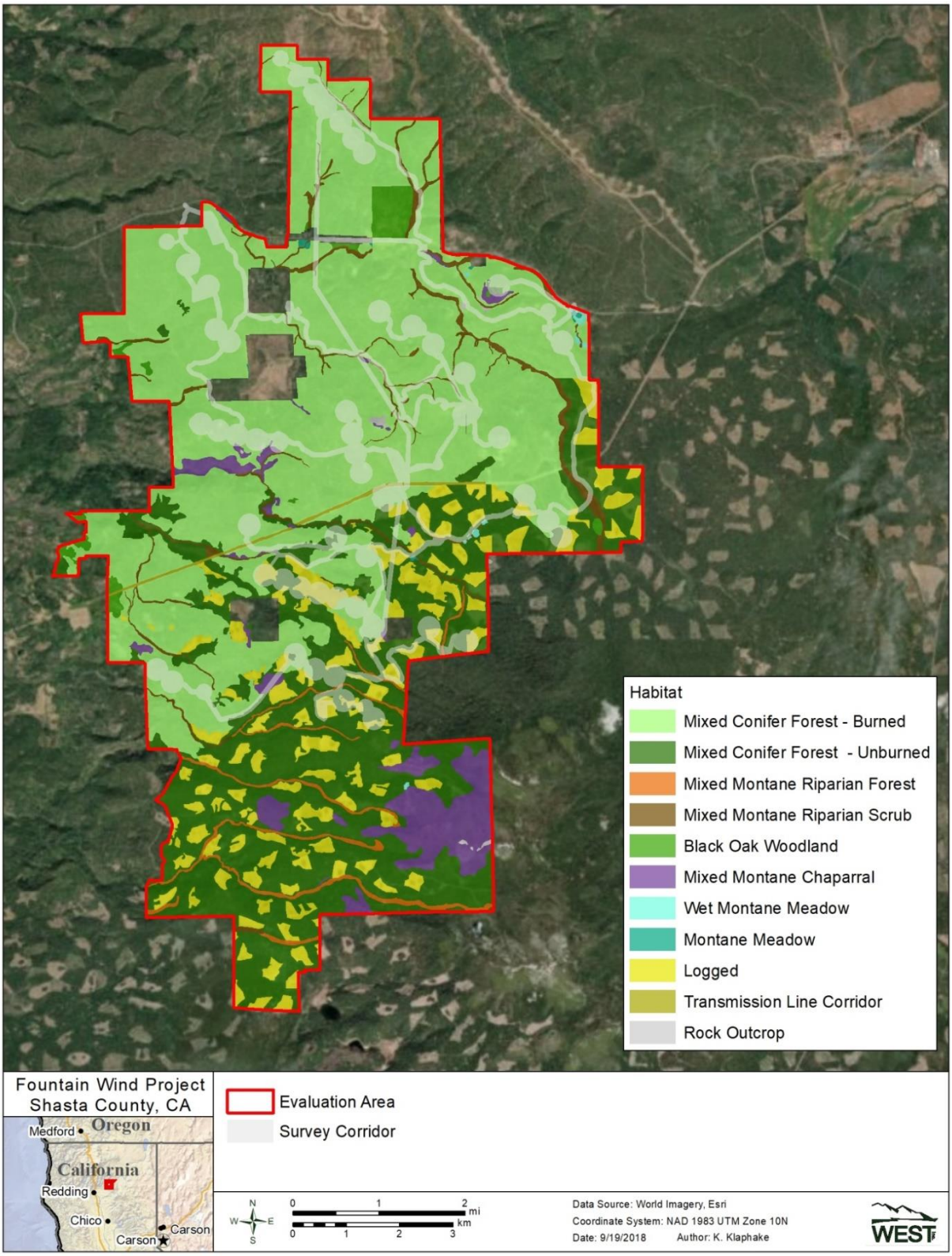

Figure 2. Vegetation communities identified and mapped during plant surveys conducted in 2018 at the Fountain Wind Project, Shasta County, California.

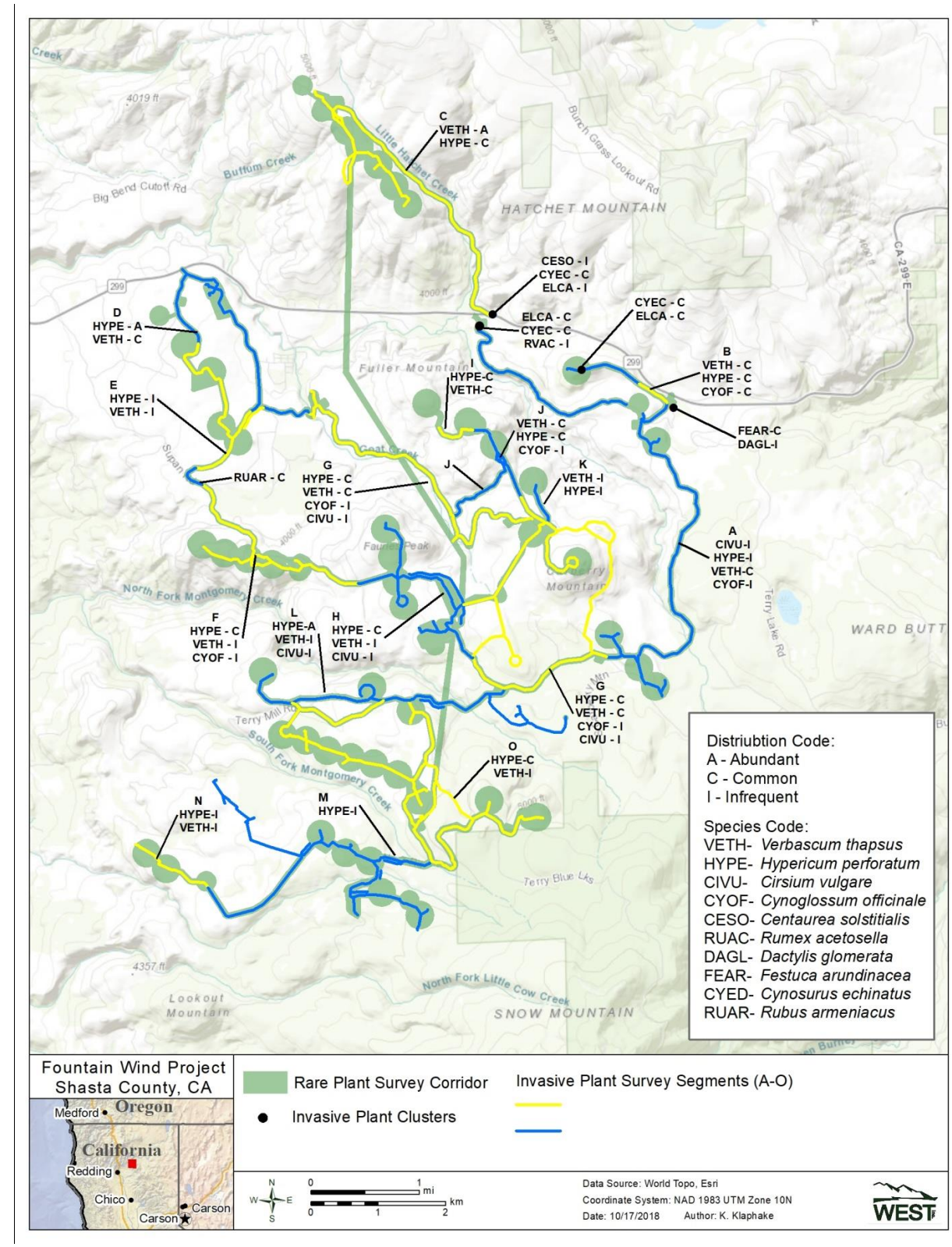

Figure 3. Non-native invasive plant species mapping within the Fountain Wind Project, Shasta County, CA. To differentiate adjacent survey segments (A-O) alternating blue and yellow lines with accompanying notation as to the species present (4-letter species codes) and relative distribution (1-letter distribution code) were used.

REFERENCES

California Native Plant Society (CNPS). 2001. Inventory of Rare and Endangered Plants in California. Sixth Edition. Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. CNPS, Sacramento, California.

California Native Plant Society (CNPS). 2017. Inventory of Rare and Endangered Plants. (online edition, v8-02). Accessed January 2017. California Native Plant Society. Sacramento, California. Online at: http://www.rareplants.cnps.org

California Natural Diversity Database (CNDDB). 2017. Inventory of the Status and Location of Rare Plants and Animals in California. State of California, Natural Resources Agency, Department of Fish and Wildlife (CDFW), Biogeographic Data Branch, CNDDB. Accessed January 2017. Available online at: https://www.wildlife.ca.gov/Data/CNDDB

California Department of Fish and Wildlife (CDFW). 2018. Natural Communities Webpage. https://www.wildlife.ca.gov/data/vegcamp/natural-communities

ESRI. 2013. World Topographic Map. ArcGIS Resource Center. ESRI, producers of ArcGIS software. ESRI, Redlands, California. Last modified June 6, 2018. Available online: http://www.arcgis.com/home/item.html?id=30e5fe3149c34df1ba922e6f5bbf808f

ESRI. 2018. World Imagery and Aerial Photos. ArcGIS Resource Center. Environmental Systems Research Institute (ESRI), producers of ArcGIS software. Redlands, California. Information online: http://www.arcgis.com/home/webmap/viewer.html?useExisting=1

Holland, R.F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. State of California, The Resources Agency, Nongame Heritage Program, Department of Fish and Game (Dept. of Fish and Wildlife), Sacramento, CA.

Natural Resources Conservation Service (NRCS). 2018. Soil Survey Geographic Database (SSURGO). Available online at: https://websoilsurvey.sc.egov.usda.gov

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Sawyer, J.O., T. Keeler-Wolf, J.M. Evens. 2008. A Manual of California Vegetation, 2nd Edition. California Native Plant Society Press, Sacramento, CA.

US Climate Data. 2018. US Climate Data. Version 2.3. Accessed April 2018. Information online: http://www.usclimatedata.com

US Department of Agriculture (USDA). 2018. Imagery Programs - National Agriculture Imagery Program (Naip). USDA, Farm Service Agency (FSA), Aerial Photography Field Office (APFO), Salt Lake City, Utah. Accessed January 2018. Information online: https://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/index

US Fish and Wildlife Service (USFWS). 2017. Critical Habitat Portal. USFWS Critical Habitat for Threatened and Endangered Species: Online Mapper. Accessed February 2017. Online at: http://ecos.fws.gov/crithab/

Young, D., G. Johnson, V. Poulton, and K. Bay. 2007. Ecological baseline studies for the Hatchet Ridge Wind Energy Project, Shasta County, California. Prepared for Hatchet Ridge Wind LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. Cheyenne, Wyoming.

Zhang, J., J. Webster, R.F. Powers, J. Mills. 2008. Reforestation after the Fountain Fire in Northern California: An Untold Success Story. Journal of Forestry, pp. 425-430.

Appendix A. Federally-listed, State-listed, and California Native Plant Society Rare Plant Species and Their Potential for Occurrence within the Fountain Wind Project

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Shasta ageratina *Ageratina shastensis*			1B.2	June-Oct	Rocky, often carbonate sites; lower montane coniferous forest	**Possible.** CNDDB documents species occurrence 10 miles west of site
vanilla-grass *Anthoxanthum nitens* ssp. *nitens*			2B.3	Apr-July	Meadows and seeps	**Possible.** Suitable wetland habitat limited within site
Klamath manzanita *Arctostaphylos klamathensis*			1B.2	May-Aug	Chaparral and upper montane and subalpine coniferous forests; rocky outcrops and slopes	**Possible.** Suitable habitat present within the site; CNDDB documents only 2 occurrences in Shasta County
marbled wild-ginger *Asarum marmoratum*			2B.3	Apr-Aug	Understory of lower montane coniferous forests	**Possible.** Suitable habitat present within the site
northern spleenwort *Asplenium septentrionale*			2B.3	July-Aug	Chaparral and montane coniferous forests; form grass-like tufts in granitic rock crevices	**Possible.** Suitable habitat present within the site
upswept moonwort *Botrychium ascendens*			2B.3	July-Aug	Lower montane coniferous forests; grassy fields and woodlands near springs and creeks	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County
scalloped moonwort *Botrychium crenulatum*			2B.2	June-Sept	Lower montane coniferous forests; moist meadows near creeks; marshes	**Possible.** Suitable habitat may be present within the site; CNDDB documents species occurrence three miles(five km) south of site
mingan moonwort *Botrychium minganense*			2B.2	July-Sept	Creek banks in mixed conifer forests	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County
western goblin *Botrychium montanum*			2B.1	July-Sept	Creek banks in old-growth coniferous forests	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence within the Project
northwestern moonwort *Botrychium pinnatum*			2B.3	July-Oct	Montane coniferous forests; in meadows or along creek banks	**Unlikely.** Suitable habitat may be present within the site but no CNDDB occurrences reported from Shasta County
rattlesnake fern *Botrypus virginianus*			2B.2	June	Streams; bogs and fens; lower montane coniferous forest; meadows and seeps	**Possible.** Suitable habitat may be present; CNDDB documents species occurrence about 3.5 miles west of site
watershield *Brasenia schreberi*			2B.3	Apr-Oct	Freshwater marshes and swamps	**Possible.** Potentially suitable wetland habitat limited within site; CNDDB documents presence seven miles east of site
long-haired star-tulip *Calochortus longebarbatus* var. *longebarbatus*			1B.2	June-Aug	Clay, mesic sites in Great Basin scrub, lower montane coniferous forest openings, meadows and seeps	**Possible.** CNDDB documents species presence 3.5 miles (5.6 km) east of site
Callahan's mariposa lily *Calochortus syntrophus*			1B.1	May-June	Cismontane woodland; vernally mesic valley and foothill grassland	**Possible.** Suitable habitat may be present; CNDDB documents species presence 2.5 miles south of site
Castle Crags harebell *Campanula shetleri*			1B.3	June-Sept	In protected rock crevices in granite; lower montane coniferous forests	**Unlikely.** Granitic rock outcrops absent from site
bristly sedge *Carex comosa*			2B.1	May-Sept	Marshes and swamps (lake margins); valley and foothill grasslands	**Possible.** Suitable wetland habitat may be present within the ; CNDDB documents species occurrence six miles north of site
woolly-fruited sedge *Carex lasiocarpa*			2B.3	June-July	Bogs and fens; freshwater marshes and swamps, lake margins	**Possible.** Potentially suitable wetland habitat limited within site; CNDDB documents presence six miles north of site

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Shasta clarkia *Clarkia borealis* ssp. *arida*			1B.1	June-Aug	Cismontane woodlands	**Possible.** CNDDB documents species presence seven miles to east of site
northern clarkia *Clarkia borealis* ssp. *borealis*			1B.3	June-Sept	Cismontane woodland; lower montane coniferous forest	**Possible.** Suitable habitat may be present within site; CNDDB documents species occurrence approximately 3.5 miles west of site
silky cryptantha *Cryptantha crinita*			1B.2	April-May	Gravelly streambeds of cismontane woodlands, valley foothill grasslands, lower montane coniferous forests, and riparian forests	**Possible.** CNDDB documents occurrence 8.5 miles (13.7 km)south of site
English sundew *Drosera anglica*			2B.3	June-Sept	Bogs and fens; meadows	**Possible.** Suitable wetland habitat limited within site; CNDDB documents species presence seven miles to northeast of site
Oregon fireweed *Epilobium oreganum*			1B.2	June-Sept	Montane coniferous forests; in and near springs and bogs; sometimes on serpentine	**Possible;** but suitable wetland habitat limited within site
blushing wild buckwheat *Eriogonum ursinum var. erubescens*			1B.3	June-Sept	Rocky sites within lower montane coniferous forest and montane chaparral	**Possible.** Suitable rocky habitat may be present within site
Shasta limestone monkeyflower *Erythranthe taylorii*			1B.1	April-May	Openings, carbonate crevices and rocky outcrops of cismontane woodlands and lower montane coniferous forest	**Unlikely.** Suitable carbonate habitat not present within site
Shasta fawn lily *Erythronium shastense*			1B.2	March-April	Usually carbonate, rocky, north-facing or shaded slopes in cismontane woodland and lower montane coniferous forest	**Unlikely.** Suitable habitat not present within site

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Boggs Lake hedge-hyssop *Gratiola heterosepala*		E	1B.2	April-Aug	Freshwater marshes and swamps, vernal pools; clay soils	**Possible.** Suitable wetland habitat may be present within site
Stebbins' harmonia *Harmonia stebbinsii*			1B.2	May-June	Chaparral and lower montane coniferous forests; in ultramafic soils, often along roads	**Unlikely.** Ultramafic soils not present within site
little hulsea *Hulsea nana*			2B.3	July-Aug	Alpine boulder and rock fields, subalpine coniferous forests; volcanic substrates	**Unlikely.** Suitable habitat not present; CNDDB documents species presence nine (15 km) miles to east of site.
Castle Crags ivesia *Ivesia longibracteata*			1B.3	June	Crevices in granitic cliffs; lower montane coniferous forests	**Unlikely**. Granitic cliff habitat not present within site
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*			1B.1	March-May	Vernally mesic meadows and seeps; valley and foothill grassland; vernal pools	**Possible.** Suitable habitat present on site; CNDDB documents species occurrence seven miles to northeast of site
Santa Lucia dwarf rush *Juncus luciensis*			1B.2	April-July	Vernal pools, ephemeral drainages, wet meadows habitats and streamsides	**Possible.** Suitable habitat present on site; CNDDB documents occurrence five miles (eight km) to east of site
Cantelow's lewisia *Lewisia cantelovii*			1B.2		Mesic, granite; lower montane coniferous forest; cismontane woodland	**Unlikely.** Suitable granite habitat not present within site
Bellinger's meadowfoam *Limnanthes floccosa* ssp. *bellingeriana*			1B.2	April-June	Mesic; cismontane woodland; meadows and seeps	**Possible.** Suitable wetland habitat limited within site
tufted loosestrife *Lysimachia thyrsiflora*			2B.3	May-Aug	Meadows and seeps; mesic; upper montane coniferous forest	**Possible.** Suitable habitat present within site; CNDDB documents occurrence seven miles east of site

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence within the Project
broad-nerved hump moss *Meesia uliginosa*			2B.2	July,Oct	Moss on damp soil within meadows and seeps, bogs and fens, upper montane coniferous forest, and subalpine coniferous forest	**Possible.** Suitable wetland habitat limited within site
Shasta snow-wreath *Neviusia cliftonii*			1B.2	May-June	Lower montane coniferous forests, riparian woodlands; shady, north-facing or sheltered canyons	**Possible.** Suitable habitat present within site; CNDDB documents occurrence six miles west of site
slender Orcutt grass *Orcuttia tenuis*	T	E	1B.1	May-Oct	Vernal pools	**Unlikely.** Suitable vernal pool habitat absent; CNDDB documents occurrence seven miles to northeast of site
Cascade grass-of-Parnassus *Parnassia cirrata* var. *intermedia*			2B.2	Aug-Sept	Rock serpentine soils; montane coniferous forests, meadows and seeps, bogs and fens; 780 – 1,980 m	**Possible.** Suitable wetland habitat limited within site
thread-leaved beardtongue *Penstemon filiformis*			1B.3	May-July	Cismontane woodlands and lower montane coniferous forests; dry stony sites, grassy openings, and meadows	**Possible.** Potential suitable habitat present within site
Engelmann spruce *Picea engelmannii*			2B.2		Upper montane coniferous forest	**Possible.** Potential suitable habitat on site; nearest CNDDB occurrence approximately 16 miles northeast of site
Sierra blue grass *Poa sierrae*			1B.3	April-June	Lower montane coniferous forests; shady, moist, rock slopes; often in canyons	**Possible.** Potential suitable habitat present within site; CNDDB documents occurrence six miles to west of site
Modoc County knotweed *Polygonum polygaloides* ssp. *esotericum*			1B.1	May-Sept	Mesic; lower montane coniferous forest (vernal pools/wetlands)	**Possible.** Potential suitable habitat within site
marsh sckullcap *Scutellaria galericulata*			2B.2	June-Sept	Marshes and swamps of lower montane coniferous forests	**Possible.** Suitable wetland habitat limited within site

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Canyon Creek stonecrop *Sedum obtusatum* ssp. *paradisum*			1B.3	May-June	In crevices of exposed granite; chaparral and coniferous forests; 1,060 – 1,860 m	**Unlikely.** No exposed granite habitat present within site
long-stiped campion *Silene occidentalis* ssp. *longistipitata*			1B.2	July-Aug	Lower and upper montane coniferous forest	**Possible.** Suitable habitat present within site; CNDDB documents occurrence within five miles to east and northeast of site
Klamath Mountain catchfly *Silene salmonacea*			1B.2	June-July	Openings, usually serpentine, within lower montane coniferous forest	**Possible.** Potential suitable habitat within site
hairy marsh hedge-nettle *Stachys pilosa*			2B.3	June-Aug	Mesic sites in Great Basin scrub	**Unlikely.** Suitable scrub habitat not present; CNDDB documents species presence four miles (six km) east of site
long-leaved starwort *Stellaria longifolia*			2B.2	May-July	Meadows and seeps, riparian woodlands	**Possible.** CNDDB documents species presence seven miles to northeast of site
Greene's tuctoria *Tuctoria greenei*	E	R	1B.1	May-July	Vernal pools	**Unlikely.** Suitable vernal pool habitat absent; CNDDB documents occurrence within approximately 20 miles northeast of site
Shasta huckleberry *Vaccinium shastense* ssp. *shastense*			1B.3	Dec-May (June-Sept uncommon)	Acidic, mesic site; often on streambanks; sometimes on rocky outcrops, seeps, roadsides, and disturbed areas within chaparral, lower montane and subalpine coniferous forest, and riparian forest	**Possible.** Suitable habitat may be present within site

Appendix A. Federally-listed, State-listed, and CNPS rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	State Status**	CNPS Status***	Survey period	Habitat Requirements	Potential for Occurrence within the Project
oval-leaved viburnum *Viburnum ellipticum*			2B.3	May-June	Chaparral, cismontane woodlands, and lower montane coniferous forests	**Possible.** Potential suitable habitat within site; nearest known occurrence approximately 16 miles southwest of site

Information from CNPS 2017, CNDDB 2017, USFWS 2017.

*E: Federally listed endangered species; T: Federally listed threatened species

**E: State-listed endangered species; R: State-listed rare species (CNDDB 2017)

***CNPS: California Native Plant Society rare species categories (CNPS 2001):

CNPS 1B.1: Plants seriously threatened in California and at a minimum rare elsewhere.

CNPS 1B.2: Plants fairly threatened in California and at a minimum rare elsewhere.

CNPS 1B.3: Plants not vey threatened in California and at a minimum rare elsewhere.

CNPS 2B.1: Plants seriously threatened in California but more common elsewhere

CNPS 2B.2: Plants fairly threatened in California but more common elsewhere.

CNPS 2B.3: Plants which are not very threatened in California and are more common elsewhere.

Appendix B. Plant Species Encountered within the Fountain Wind Project

Appendix B. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
ALLIACEAE	***Allium parvum***	dwarf onion
	***Allium* sp.**	onion
ANACARDIACEAE	***Toxicodendron diversilobum***	poison oak
APIACEAE	***Angelica breweri***	Brewer's angelica
	Heracleum lanatum	cow-parsnip
	Ligusticum californicum	angelica
	***Lomatium* spp.**	lomatium
	Osmorhiza berteroi	sweet cicely
APOCYNACEAE	***Apocynum androsaemifolium***	bitter dogbane
ARISTOLOCHIACEAE	***Asarum hartwegii***	Hartweg's wild ginger
	Asarum caudatum	creeping wild ginger
ASCLEPIADACEAE	***Asclepias speciosa***	showy milkweed
ASTERACEAE	***Achillea millefolium***	common yarrow
	Agoseris grandiflora	giant mountain dandelion
	Arnica cordifolia	heart leaved arnica
	Centaurea solstitialis	yellow starthistle
	Cichorium intybus	chicory
	Cirsium vulgare	bull thistle
	Ericameria nauseosa	gray rabbitbrush
	***Erigeron* sp.**	fleabane
	Eriophyllum lanatum	woolly sunflower
	Grindelia hirsutula	hairy gumweed
	Helenium bigelovii	Bigelow's sneezeweed
	Helianthella californica	California helianthella
	Hieracium nudicaule	naked-stemmed hawkweed
	Hypochaeris sp.	cat's ear
	Lactuca serriola	prickly lettuce
	Madia glomerata	mountain tarweed
	***Senecio* sp.**	groundsel
	***Solidago* sp.**	goldenrod
	Symphyotrichum bracteolatum	Eaton's aster
	Taraxacum officinale	common dandelion
	Wyethia mollis	mountain mule ear
	Tragopogon dubius	yellow salsify
BETULACEAE	***Alnus incana* ssp *tenuifolia***	creek alder
	Corylus cornuta* var. *californica	beaked hazelnut
BORAGINACEAE	***Cryptantha* spp.**	cryptantha
	Cynoglossum officinale	hound's tongue
	Eriodictyon californicum	California yerba santa
	Eriodictyon lobbii	matted yerba santa
	Plagiobothrys stipitatus* var. *micranthus	stalked popcornflower
BRASSICACEAE	***Erysimum capitatum***	western wallflower
	Lepidium campestre	field peppergrass
	Nasturtium officinale	watercress
	Sisymbrium altissimum	tall tumblemustard
CAMPANULACEAE	***Asyneuma prenanthoides***	California harebell
CAPRIFOLIACEAE	***Lonicera involucrata***	twinberry
	Sambucus mexicana	blue elderberry
	Symphoricarpos mollis	creeping snowberry
CARYOPHYLLACEAE	*Dianthus deltoides*	maiden pink

Appendix B. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
	***Silene* sp.**	silene
CHENOPODIACEAE	*Chenopodium album*	lamb's quarters
CONVOLVULACEAE	***Calystegia atriplicifolia* ssp. *buttensis***	Butte County morning glory
	Convolvulus sp.	morning glory
CORNACEAE	***Cornus nuttallii***	mountain dogwood
CUPRESSACEAE	***Calocedrus decurrens***	incense cedar
CYPERACEAE	***Carex comosa***	bristly sedge
	Carex densa	dense sedge
	Carex inops* ssp. *inops	long-stoloned sedge
	Carex nebrascensis	Nebraska sedge
	Carex praegracilis	field sedge
	Carex subfusca	brown sedge
	Carex utriculata	beaked sedge
	Carex spp.	sedge
	Eleocharis acicularis	needle spikerush
	Eleocharis macrostachya	common spikerush
	Schoenoplectus acutus	tule
	Scirpus microcarpus	mountain bog bulrush
DENNSTAEDTIACEAE	***Pteridium aquilinum* var. *pubescens***	bracken
EQUISETACEAE	***Equisetum arvense***	common horsetail
	Equisetum hymale	scouringrush horsetail
ERICACEAE	***Arctostaphylos patula***	greenleaf manzanita
	Chimaphila menziesii	pipsissewa
	Pterospora andromedea	pinedrops
	Pyrola picta	white veined shinleaf
	Rhododendron occidentale	western azalea
FABACEAE	***Acmispon americanus***	Spanish clover
	Hosackia crassifolia	broad leaved lotus
	Lathyrus lanszwertii	Nevada pea
	Trifolium pratense	red clover
FAGACEAE	***Chrysolepis sempervirens***	chinquapin
	Quercus kelloggii	California black oak
GROSSULARIACEAE	***Ribes roezlii***	Sierra gooseberry
	Ribes divaricatum	spreading gooseberry
HYDROPHYLLACEAE	***Phacelia* sp.**	phaclia
HYPERICACEAE	*Hypericum perforatum*	Klamathweed
IRIDACEAE	***Iris missouriensis***	western blue flag
	Iris tenuissima	slender iris
	Sisyrinchium bellum	western blue eyed grass
JUNCACEAE	***Juncus balticus***	Baltic rush
	Juncus ensifolius	sword leaved rush
	Juncus tenuis	slender rush
	Juncus xiphiodes	iris leaved rush
LAMIACEAE	***Mentha arvensis***	American wild mint
	Prunella vulgaris	self heal
	Stachys adjugoides* var. *rigida	rigid hedge nettle
	Scutellaria nana	little skullcap
LILIACEAE	***Fritillaria recurva***	scarlet fritillary
	Lilium pardalinum	leopard lily

Appendix B. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
	Lilium washingtonianum	Washington lily
	Triteleia hyacinthina	wild hyacinth
	Triteleia ixioides	pretty face
	Zigadenus venenosus	death camas
MALVACEAE	***Sidalcea malviflora***	checkermallow
	Sidalcea oregana* ssp. *spicata	checker mallow
MELANTHIACEAE	***Trillium albidum***	giant white wakerobin
	Trillium ovatum	Pacific trillium
	Veratrum californicum	California corn lily
MONTIACEAE	***Claytonia lanceolata***	lanceleaf springbeauty
	Claytonia perfoliata	miner's lettuce
MYRSINACEAE	***Lysimachia latifolia***	Pacific starflower
NYMPHACEAE	***Nuphar polysepala***	Rocky Mountain pond-lily
ONOGRACEAE	***Epilobium angustifolium***	fireweed
	Epilobium brachycarpum	fringed willowherb
	Epilobium ciliatum	California fuchsia
OPHIOGLOSSACEAE	***Botrychium multifidum***	leather grape-fern
ORCHIDACEAE	***Corallorhiza maculata***	spotted coralroot
	Corallorhiza striata	hooded coralroot
	Listera convallarioides	broad lipped twayblade
	Platanthera dilitata* var. *leucostachys	Sierra bog orchid
	Spiranthes romanzoffiana	hooded ladies tresses
OROBANCHACEAE	***Boschniakia strobilacea***	California ground-cone
	Castilleja tenuis	hairy Indian paintbrush
	Pedicularis densiflora	Indian warrior
PAPAVERACEAE	***Dicentra formosa***	bleeding heart
PINACEAE	***Abies concolor***	white fir
	Abies magnifica	red fir
	Pinus lambertiana	sugar pine
	Pinus ponderosa	ponderosa pine
	Pseudotsuga menziesii	Douglas fir
PLANTAGINACEAE	*Plantago lanceolata*	English plantain
	Veronica anagallis-aquatica	water speedwell
PHRYMACEAE	***Mimulus breviflorus***	short flowered monkey flower
	Mimulus guttatus	seep monkey flower
POACEAE	***Agrostis scabra***	rough bent grass
	Alopecurus aequalis	short awned foxtail
	Alopecurus geniculatus	marsh foxtail
	Bromus carinatus	mountain brome
	Bromus tectorum	cheatgrass
	Calamagrostis canadensis	bluejoint reedgrass
	Cynosurus echinatus	annual dogtail grass
	Dactylis glomerata	orchardgrass
	Deschampsia cespitosa	tufted hairgrass
	Deschampsia danthonioides	annual hair grass
	Elymus caput-medusae	medusahead
	Elymus elymoides	bottlebrush
	Elymus glaucus	blue wild-rye
	Elymus trachycaulus	slender wheatgrass
	Festuca arundinacea	tall fescue

Appendix B. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
	Festuca occidentalis	western fescue
	Glyceria borealis	Northern mannagrass
	Glyceria striata	fowl mannagrass
	Phleum pratense	Timothy
	Poa bulbosa	bulbous bluegrass
	Poa palustris	fowl bluegrass
	Poa pratensis	Kentucky bluegrass
	Poa secunda	Sandberg's bluegrass
	Stipa nelsonii	mountain needle grass
POLEMONIACEAE	***Gilia aggregata***	scarlet gilia
	Navarretia divaricata	mountain navarretia
POLYGONACEAE	***Eriogonum lobbii***	buckwheat
	Eriogonum nudum	naked buckwheat
	***Eriogonum* sp.**	buckwheat
	Eriogonum umbellatum	sulfur buckwheat
	Eriogonum vimineum	wicker-stem wild buckwheat
	Polygonum aviculare	prostrate knotweed
	Polygonum bistortoides	American bistort
	Rumex acetosella	field sorrel
	Rumex salicifolius	willow dock
PRIMULACEAE	***Primula hendersonii***	mosquito bill
PTERIDACEAE	***Myriopteris gracillima***	lace lip fern
RANUNCULACEAE	***Aconitum colombianum***	monkshood
	Aquilegia formosa	columbine
	Delphinium nudicaule	canyon larkspur
	Ranunculus aquatilis	whitewater crowfoot
	Thalictrum fendleri	meadow-rue
RHAMNACEAE	***Ceanothus cordulatus***	mountain whitethorn
	Ceanothus cuneatus	buck brush
	Ceanothus integerrimus	deer brush
	Ceanothus prostratus v. prostratus	Mahala mat
	Ceanothus velutinus	tobacco brush
	Frangula californica	California coffee berry
ROSACEAE	***Amelanchier alnifolia***	serviceberry
	Cercocarpus betuloides	birch leaf mountain mahogany
	Fragaria virginiana	mountain strawberry
	Geum macrophyllum	large leaved avens
	Potentilla gracilis	Northwest cinquefoil
	Prunus emarginata	bitter cherry
	Rhamnus purshiana	cascara
	Rosa woodsii* var. *ultramontana	interior rose
	Rubus armeniacus	Himalayan blackberry
	Rubus parviflorus	thimbleberry
	Sorbus californica	mountain ash
	Spiraea douglasii	Douglas spiraea
RUBIACEAE	***Gallium aparine***	common bedstraw
RUSCACEAE	***Maianthemum racemosum***	feathery false lily of the valley
	Maianthemeum stellatum	starry false lily of the valley
SALICACEAE	***Populus tremuloides***	quaking aspen
	Salix scouleriana	Scouler willow

Appendix B. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
	Salix lasiandra	Pacific willow
	Salix lasiolepis	arroyo willow
SAPINDACEAE	***Acer circinatum***	vine maple
	Acer glabrum	Rocky Mountain maple
	Acer macrophyllum	bigleaf maple
SAXIFRAGACEAE	***Heuchera sp.***	alumroot
SCROPHULARIACEAE	***Castilleja* sp.**	paintbrush
	Mimulus guttatus	seep monkey flower
	Mimulus torreyi	Torrey's monkeyflower
	***Pedicularis* sp.**	lousewort
	Penstemon neotericus	Plumas County beardtongue
	***Penstemon* sp.**	penstemon
	Verbascum thapsus	common mullein
URTICACEAE	***Urtica dioica***	stinging nettle
VALERIANACEAE	***Valeriana californica***	California valerian
VERBENACEAE	***Verbena lasiostachys***	western vervain
VIOLACEAE	***Viola adunca***	Western dog violet
	Viola glabella	stream violet
	Viola lobata	pine violet
	Viola purpurea	mountain violet

*Native plant species in bold.

Appendix C. Natural Vegetation Communities Mapped within the Fountain Wind Project Evaluation Area.

Mixed Conifer Forest – Burned (MCF-B)

Areas mapped as this vegetation community type cover a majority of the Project and correspond to the Sierran mixed conifer forest natural community (Holland 1986). This community type intergrades with Sierran white fir forest, western ponderosa pine forest, and lower and upper montane chaparral communities in many places. The MCF-B community structure and composition within the Project have been significantly altered for many decades through active forest management (e.g., timber harvesting, tree planting). Additionally, these areas were burned during the 1992 Fountain Fire.

In the years following the Fountain Fire millions of ponderosa pine, Douglas fir, and white fir seedlings were planted at 10-foot spacing. Thus, the MCF-B vegetation community type was composed of even-aged stands of mixed conifer forest, generally between 23-25 years old, featuring a partially open canopy. Some thinning has occurred in this MCF-B mapped at the Project on the south side of Highway 299, and logging/thinning slash has been left in place. No thinning was observed in this vegetation community within the Project on the north side of the Highway 299. Overall, woody and herbaceous understory vegetation within the MCF-B was variable in composition and density, but typically included some combination of the following woody species: Mahala mat (*Ceanothus prostratus* var. *prostratus*), greenleaf manzanita (*Arctostaphylos patula*), whitethorn (*Ceanothus cordulatus*), Sierra gooseberry (*Ribes roezlii*), and creeping snowberry (*Symphoricarpos mollis*); and herbaceous species: bracken (*Pteridium aquilinum* var. *pubescens*), bottlebrush (*Elymus elymoides*), Pacific starflower (*Lysimachia latifolia*), and mountain needle grass (*Achnatherum nelsonii*). Although not as common as the dominant overstory species, incense cedar is present throughout the majority of areas mapped as MCF-B.

Mixed Conifer Forest – Unburned (MCF-U)

Mixed conifer forest-unburned was primarily mapped in the east-central and southern portions of the Project, where it formed a mosaic with recently logged areas. Areas mapped as MCF-U were not burned in the Fountain Fire. Within the Project this vegetation community featured a mostly-closed canopy of mature mixed conifer species, including sugar pine (*Pinus lambertiana*), incense cedar, red cedar (*Abies magnifica*), and Douglas fir, with some California black oak (*Quercus kelloggii*), ponderosa pine, and white fir. As a result of the closed canopy, understory vegetation was sparse and mostly composed of herbaceous species, including bracken, Pacific starflower, coralroot (*Corallorhiza* spp.), white veined shinleaf (*Pyrola picta*), and pipsissewa (*Chimaphila menziesii*). Scattered seedlings and saplings of the overstory tree species were also present in the understory. On rockier substrates MCF-U typically had a more open canopy and featured a denser understory composed of a variety of the woody and herbaceous species observed in MCF-B. The MCF-U communities mapped within the Project represent a managed (i.e., periodically disturbed) forest. As such, most stands were even-aged, but because of the different intervals at which harvest occurred a mosaic of different age-class even-aged stands exists within MCF-U communities at the Project.

Mixed Montane Riparian Forest (MMRF)

Mixed montane riparian forest was mapped in the southern half of the Project within MCF-U communities. It was documented primarily along perennial stream corridors but also occurred along intermittent streams in some areas. The overstory vegetation was typically composed of mature mixed conifer species which had not been harvested. Riparian tree species commonly observed in the mid-story canopy included bigleaf maple (*Acer macrophyllum*) and thinleaf alder (*Alnus incana* ssp. *tenuifolia*), with a shaded, woody understory of Rocky Mountain maple (*Acer glabrum*), vine maple (*Acer circinatum*), beaked hazelnut (*Corylus cornuta* var. *californica*), twinberry (*Lonicera involucrata*), and mountain dogwood (*Cornus nuttallii*). Understory vegetation was generally sparse and commonly included lily of the valley (*Maianthemum* spp.), common bedstraw (*Galium aparine*), and sweet cicely (*Osmorhiza berteroi*). Areas mapped as MMRF included patches of wetlands that were too small to map independently. These areas included fringe wetlands and small bands of wet montane meadow adjacent channels.

Mixed Montane Riparian Scrub (MMRS)

Mixed montane riparian scrub was primarily mapped throughout the northern half of the Project. Similar to the MMRF community type it occurred along perennial and intermittent drainages, but it can be distinguished (from MMRF) by the absence of a tree-dominated canopy and the presence of a shrub-dominated canopy that included several willow species (*Salix* spp.). The MMRS community type was typically composed of an inner band of vegetation immediately adjacent a drainage channel that was dominated by true riparian species, surrounded by a buffer of mixed montane chaparral species. MMRS was mapped along steep, broad, rocky drainages as well as gently sloping, narrow riparian corridors. Riparian species commonly observed along the immediate channel included arroyo willow (*Salix lasiolepis*), shining willow (*S. lucida*), scouler willow (*S. scouleriana*), thinleaf alder, and mountain dogwood. Shrub species adjacent this inner band of vegetation often included cascara (*Rhamnus purshiana*), blue elderberry (*Sambucus mexicana*), Rocky Mountain maple, and, to a lesser extent, Sierra gooseberry (*Ribes roezlii*) and bitter cherry (*Prunus emarginata*). Herbaceous understory vegetation was variable in composition and density, and typically included similar species as those observed in MMRF. Areas mapped as MMRS include patches of wetlands that were too small to map independently. These areas included fringe wetlands and small bands of wet montane meadow adjacent channels.

Mixed Montane Chaparral (MMC)

Mixed montane chaparral intergraded with almost all other community types within the Project. It was mapped in areas receiving full sunlight, on rocky ridgetops, on steep, rocky slopes, adjacent riparian areas, and in previously burned and logged areas. The majority of MMC observed within the Project corresponds to the *Arctostaphylos patula* Shrubland Alliance (Sawyer et al. 2008), which is characterized by the presence of dense, nearly impenetrable thickets dominated by greenleaf manzanita. Numerous other shrub species that sometimes occurred as co-dominants with greenleaf manzanita were observed within MMC within the Project. Such species included mountain whitethorn, deer brush (*Ceanothus integerrimus*), tobacco brush (*C. velutinus*), buck brush (*C. cuneatus*), bush chinquapin (*Chrysolepis sempervirens*), and golden chinquapin (*C. chrysophylla*). In several locations within the Project

greenleaf manzanita formed an association with scrub-form black oak. Because of the thicket-like growth form of mixed montane chaparral no understory vegetation was observed.

Black Oak Woodland (BOW)

Black oak woodland was mapped in several areas within the Project. It typically either occurred at lower elevations or in previously burned areas, where it formed a mosaic with mixed montane chaparral. The BOW community type corresponds to the *Quercus kelloggii* Forest Alliance, which is composed of a wide variety of vegetation associations (Sawyer et al. 2008). Within the Project the majority of BOW featured a mostly open canopy of black oak with scattered greenleaf manzanita in the shrub strata. The BOW stands typically supported a well-developed herbaceous understory composed primarily of grasses, including Lemmon's needlegrass (*Achnatherum lemmonii*) and blue wildrye (*Elymus glaucus*).

Wet Montane Meadow (WMM)

Wet montane meadow was mapped throughout the Project in areas adjacent to stream corridors, ponds, and springs or seeps with high water tables. The WMM community can be distinguished from the montane meadow community (MM) because it typically remains saturated throughout the growing season. The WMM community within the Project was composed of a diversity of hydrophytic species including grasses, sedges, rushes, and perennial forbs. Commonly observed herbaceous plant species in WMM at the Project included redtop (*Agrostis alba*), bluejoint reedgrass (*Calamagrostis canadensis*), marsh foxtail (*Alopecurus geniculatus*), beaked sedge (*Carex rostrata*), bristly sedge (*C. comosa*), Nebraska sedge (*C. nebrascensis*), brown sedge (*C. subfusca*), swordleaf rush (*Juncus ensifolius*), Baltic rush (*Juncus balticus*), common spikerush (*Eleocharis macrostachya*), tufted hairgrass (*Deschampsia cespitosa*), American bistort (*Polygonum bistortoides*), horsetail (*Equisetum* spp.), Bigelow's sneezeweed (*Helenium bigelovii*), and seep monkey flower (*Mimulus guttatus*). One of the WMM communities mapped within the south-central portion of the Project featured several shallow bogs within the larger meadow. Shrub species observed around the perimeter of WMM and sometimes interspersed but not dominant included rose spirea (*Spiraea douglasii*), willow, and thinleaf alder seedlings and saplings. Additional small patches of WMM habitat were observed along drainage channels within MMRF and MMRS communities. Because of the small size of these patches, they were included in the larger riparian community mapping (i.e., they were not mapped independently).

Montane Meadow (MM)

Within the Project, montane meadow was mapped in forest openings and adjacent wet montane meadow and riparian habitats. This community type supports mesic and upland herbaceous vegetation but is distinguished from WMM by featuring soils that are not saturated during the growing season. Common grasses and forbs occurring within MM mapped within the Project included Timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), redtop, tall fescue (*Festuca arundinacea*), orchardgrass (*Dactylis glomerata*), blue wildrye, yarrow (*Achillea millefolium*), and goldenrod (*Solidago* sp.).

Logged/Recently Logged (L)

Logging operations are ongoing within the Project, particularly south of Highway 299. Areas mapped as logged have been harvested at various intervals within the last several years (or more). Most logged sites featured planted seedlings and saplings of various age classes. Ponderosa pine and, to a lesser extent, white fir were the most common tree species planted within recently logged areas. The majority of logged areas included small patches of mature trees that were presumably left to provide wildlife habitat. Understory vegetation was typically sparse in logged areas and was mostly composed of ruderal, disturbance-tolerant herbaceous species.

Rock Outcrop (RO)

The majority of areas mapped as rock outcrop included rocky knolls and outcrops that either featured sparse vegetation or were completely devoid of vegetation. Where vegetation was observed, it was mostly restricted to shelves, cracks, and crevices in the rock, and to scree slopes below the outcrops. Herbaceous species observed within this vegetation community included lace lip fern (*Myriopteris gracillima*), sulfur buckwheat (*Eriogonum umbellatum*), buckwheat (*Eriogonum* sp.), Plumas County beardtongue (*Penstemon neotericus*), and onion (*Allium* sp.).

Transmission Line Corridor (TLC)

A transmission line corridor was mapped in the central portion of the Project. It was situated on a more or less east-west axis. Vegetation within this corridor is maintained to deter the establishment of woody plant species, primarily trees. Dominant plant species observed along the corridor included bracken and a mix of recently established woody chaparral species (*Arctostaphylos* spp., *Ceanothus* spp.). Small patches devoid of vegetation were also observed along this corridor.

C4. Clarification of 2018 Rare Plant Surveys and Natural Vegetation Community Mapping

ENVIRONMENTAL & STATISTICAL CONSULTANTS

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TECHNICAL MEMORANDUM

DATE: January 10, 2019

TO: Kristen Goland, Pacific Wind Development LLC

FROM: Andrea Chatfield and Kurt Flaig, WEST, Inc.

RE: Request for clarifications on 2018 Rare Plant Survey and Natural Vegetation Community Mapping Report for the Fountain Wind Project

On behalf of Pacific Wind Development LLC, Western EcoSystems Technology, Inc. (WEST) prepared a Rare Plant Survey and Natural Vegetation Community Mapping Report (Report) for the proposed Fountain Wind Energy Project (Project). The Report, dated October 17, 2018, was submitted to Shasta County and subsequently reviewed by ESA. Based on their review, ESA requested, in a memorandum dated January 4, 2019, that clarifications or additional data be provided in regard to the Report. Each of ESA's specific requests is listed below followed by WEST's response.

1. *The report is not clear as to why a single year would be sufficient for the presence/absence study. Please elaborate on whether seasonal climate conditions were sufficient for detection or if there were any adverse conditions that could prevent surveyors from determining presence.*

No adverse conditions occurred within the Project area in 2017-2018 that may have precluded the presence or identification of special status plant species. A review of precipitation data from November 1, 2017 to May 31, 2018 shows that precipitation during the winter and spring time period preceding the survey was about 63% of average based on historical precipitation data for Redding, California (US Climate Data 2019). While this is somewhat lower than normal precipitation for the region, it would be expected that individuals of the targeted rare plant species would have been visible during the 2018 botanical survey, if present. Based on this expectation, a second year of rare plant surveys is not warranted for the Project. Additional rare plant surveys are scheduled to occur within newly added development corridors in the Project's southern Expansion Area in spring of 2019.

2. *Butte County morning-glory (Calystegia atriplicifolia ssp. buttensis) was described as present in the Site Characterization Study, and is listed as observed in their Rare Plant*

Survey report. While it is a CNPS Rare Plant Rank 4.2 (limited distribution), the species observation should be noted for analysis as part of the CEQA process.

For the purpose of the rare plant survey at the Project, target species were limited to state or federal-listed species, and species with a California Native Plant Society (CNPS) rare species rank of 1B and 2B (rare, threatened, or endangered in California). Butte County morning-glory has a CNPS ranking of 4.2 and was, therefore, not include as a focal species. However, individuals of species with a CNPS ranking of 3 and 4, including Butte County morning-glory, were noted when encountered over the course of the survey. The Butte County morning-glory observations were made just outside of the Project boundary, near a gate approximately 80 meters south of Hwy 299. These observations should not have been included in Appendix B (Plant Species Encountered within the Fountain Wind Project), as they fell just outside of the Project boundary. No other individuals of this species were located within the Project boundary or within survey corridors. The vast majority of historic Butte County morning-glory observations documented in the California Natural Diversity Database and included in the 2017 Site Characterization Study were located in the northwest portion of the larger Project area evaluated in the SCS and outside of the area surveyed during the 2018 botanical survey effort.

C5. 2019 Rare Plant Surveys and Natural Vegetation Community Mapping

RARE PLANT SURVEYS AND NATURAL VEGETATION COMMUNITY MAPPING

Fountain Wind Project

Shasta County, California

Prepared for:

ConnectGen Operating LLC

Prepared by:

Kurt Flaig, Andrea Chatfield, and Joel Thompson

Western EcoSystems Technology, Inc.
2725 NW Walnut Boulevard
Corvallis, Oregon 97330

December 20, 2019

STUDY PARTICIPANTS

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Klarissa Lawrence	Biologist / field surveyor
Julia Preston-Fulton	Technical Editor

REPORT REFERENCE

Flaig, K., A. Chatfield, and J. Thompson. 2019. Rare Plant Surveys and Natural Vegetation Community Mapping, Fountain Wind Project, Shasta County, California. Prepared for ConnectGen Operating LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon. December 20, 2019.

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INTRODUCTION

In 2018, Western EcoSystems Technology, Inc. (WEST) performed rare plant surveys and vegetation community mapping at the proposed Fountain Wind Project (Project) in Shasta County, California. The methods and results of the 2018 survey effort are presented in Flaig et al. (2018). In early 2019, the Project layout was amended, and WEST performed supplemental rare plant surveys and vegetation mapping within newly added development corridors. The following memorandum describes the methods and results of rare plant surveys conducted at the Project during the 2018 and 2019 growing seasons. The primary purpose of these surveys was to determine the presence or absence of rare plant species that may be subject to impacts resulting from Project construction. A description of the natural vegetation communities present within the Project evaluation area and information on invasive plant species are also provided.

SURVEY AREA

The Project is located on privately owned commercial timberlands in central Shasta County, California. The dominant vegetation type in and around the Project is early seral mixed coniferous forest (post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use in this area is commercial timber production, which has resulted in a highly fragmented landscape across much of the area. Dominant overstory species include a combination of ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense-cedar (*Calocedrus decurrens*), and sugar pine (*Pinus lambertiana*).

The Project is located within the Southern Cascades Ecoregion, near the southern terminus of the Cascade Mountains. A Mediterranean climate dominates the region, characterized by hot, dry summers and cold, wet winters. On average, the area receives about 63 inches (in; 160 centimeters [cm]) of precipitation per year, of which 28 in (71 cm) occur as rainfall and 35 in (89 cm) as snowfall (US Climate Data 2018). A number of perennial and intermittent streams flow primarily west and northwest from the Project into the Pit River and Sacramento River watersheds. Soils range from stony to clay loams that have formed in residuum weathered from volcanic rock (Natural Resources Conservation Service 2018). In August 1992, the Fountain Fire burned approximately 64,000 acres (ac; 25,900 hectares [ha]) in and around the Project. Post-fire management included salvage logging, site preparation, and planting in the year following the fire. Within five years of the fire, approximately 17 million seedlings were planted in industrial areas previously supporting timber (Zhang et al. 2008). Planted species included ponderosa pine, Douglas fir and white fir at 10-foot (ft; 3-meter [m]) spacing. Incense cedar were planted along stream buffers. In order to reduce competition for (tree) seedling establishment, growth regulator herbicides were applied in many areas where manzanita (*Arctostaphylos* spp.) and California lilac (*Ceanothus* spp.) had naturally colonized (Zhang et al. 2008). With historic and on-going timber management activities and post-Fountain Fire salvage and reclamation activities, the natural vegetation communities have been periodically altered and/or disturbed, likely having at least some effect on plant species composition, distribution, and diversity in these areas.

For the purpose of conducting rare plant surveys, development corridors were provided in Global Information System (GIS) format by the project proponent. The initial 2018 surveys were performed within development corridors provided by the project proponent on May 11, 2018. Supplemental surveys performed in 2019 were conducted within newly added development corridors provided by the project proponent on May 20, 2019. Both the 2018 and 2019 rare plant survey corridors included areas of potential disturbance during Project construction (Figure 1). The survey corridors varied in size and included buffers of all areas of proposed infrastructure that may be subject to ground disturbance (e.g., newly proposed roads, roads that may be expanded, turbine pads, and underground collection lines). Natural vegetation communities were mapped in a broader evaluation area that encompassed the rare plant survey corridors and additional surrounding lands (Figure 2).

METHODS

Rare Plant Surveys

WEST conducted a query of the California Natural Diversity Database (CNDDB), an inventory of the status and locations of rare plants, rare plant communities, and animals in California managed by the California Department of Fish and Wildlife (CDFW), and searched the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants to compile a list of special status plant species and sensitive natural vegetation communities that may have potential to occur within the evaluation area. The CNDDB query was limited to an area within a 10-mile radius of the Project and the CNPS search was focused on Shasta County. Additional special status plant species were identified by CDFW personnel and were added to the list.

Sixty-nine rare plants were identified in the pre-field review (Appendix A). Based on further review of the habitat requirements of the 69 species and knowledge of the natural vegetation communities known to occur within the evaluation area (based on previous WEST surveys in the region), WEST biologists determined that potential suitable habitat was present for 47 of the 69 rare plant species (identified as “Possible” in Appendix A). These 47 species were targeted for rare plant surveys within the Project area. WEST determined that suitable habitat was not present within the Project area for 22 of the original 69 rare plant species (identified as “Unlikely” in Appendix A). Rationales for exclusion included absence of suitable habitat within the Project (e.g., vernal pools) and absence of appropriate substrates (e.g., ultramafic soils, granitic crevices). Two of the 69 species on the initial list were federally-listed, including slender Orcutt grass (*Orcuttia tenuis*; Threatened) and Greene’s tuctoria (*Tuctoria greenei*; Endangered). However, both of these plant species are endemic to vernal pool habitats which are absent from the survey corridors. No state-listed plants are among the 47 rare plant species identified as possibly occurring in the survey area.

Prior to conducting surveys, WEST reviewed species descriptions, habitat requirements, and photographs of all 69 species identified in the initial assessment. Although 22 species were determined “unlikely” to occur based on their habitat requirements, they were included in the pre-

field review because their flowering/fruiting periods overlapped with those of the 47 targeted species (Appendix A).

Focused surveys to determine presence or absence of target species were conducted in 2018 and 2019, during two survey periods. Surveys in 2018 occurred from May 21 – 29 and July 30 – August 3, and were conducted in the northern portion of the Project area (Figure 1). Surveys in 2019 were primarily focused on the southern portion of the Project area (Figure 1), but included additional infrastructure in the northern portion, and were conducted from May 29 – June 3 and July 30 – August 2. The two survey periods were selected to capture the range of flowering and fruiting periods for the 47 targeted species. All surveys were conducted by experienced WEST botanists and botanical field surveyors; qualifications of field surveyors are included in Appendix B. WEST field surveyors conducted pedestrian transect surveys within the survey corridors, with special attention given to areas that might provide suitable habitat for rare plant species, in accordance with the 2018 *CDFW Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities*. The survey corridors were uploaded to Global Positioning System units with sub-foot accuracy (Trimble Geo 7x). In addition, surveyors used aerial imagery-based field maps depicting the evaluation area to map natural vegetation communities and invasive plant species and for general navigation.

A list of all vascular plant species encountered during the rare plant surveys was maintained. Plant species were identified to the highest taxonomic level possible when encountered using *The Jepson Manual: Vascular Plants of California, Second Edition* (Baldwin et al. 2012).

Natural Vegetation Communities

Mapping of natural vegetation communities within the evaluation area was conducted by WEST during the 2018/2019 rare plant surveys. WEST botanists documented natural vegetation community types while conducting rare plant surveys and while transiting through the evaluation area in route to survey areas. Natural vegetation communities were identified on-site using *A Manual of California Vegetation* (Sawyer et al. 2009). Based on the field data collected during rare plant surveys, natural vegetation communities were hand-drawn on aerial imagery-based field maps created at a scale appropriate for broad-scale mapping (i.e., 1 in = 1,000 ft [2.5 cm = 304.8 m]). The field maps were later digitized in a GIS to incorporate into other GIS mapping efforts.

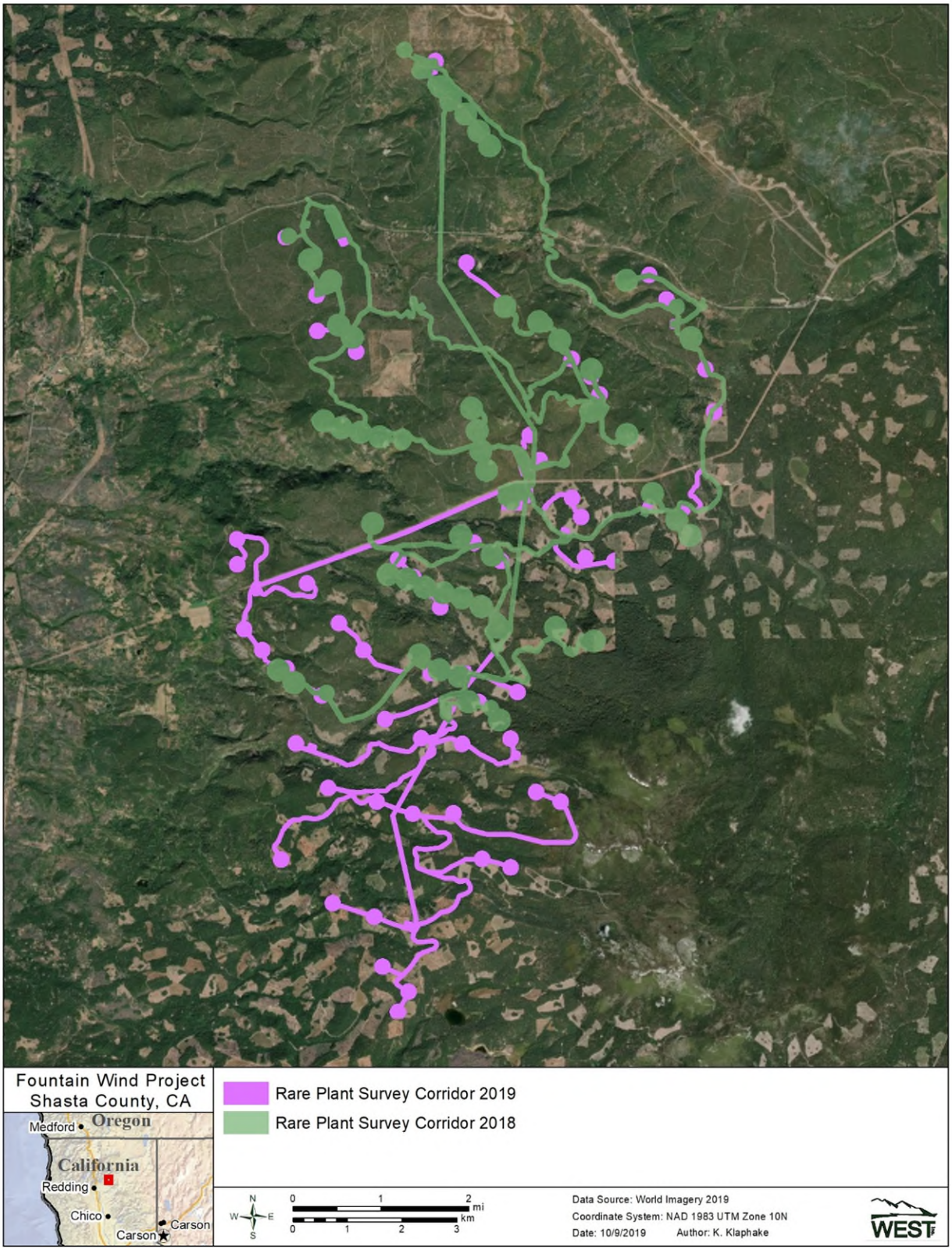

Figure 1. Survey corridors for 2018 and 2019 rare plant surveys at the Fountain Wind Project, Shasta County, California.

Invasive Plant Species

WEST recorded non-native invasive plant species encountered and conducted broad-scale invasive species mapping during the 2018/2019 rare plant surveys. Mapping was primarily focused on roadsides within the corridors. Based on observations during the rare plant surveys, vegetation composition within turbine pad areas (most of which were away from developed roads) was largely native, with only a few, occasional non-native invasive species observed; no mapping of non-native species was conducted within these locations. Additionally, limited mapping was conducted within recently logged (e.g., within the past 10 years) areas because of the abundance of the same three non-native invasive species (i.e., common mullein [*Verbascum Thapsus*], bull thistle [*Cirsium vulgare*], and Klamath weed [*Hypericum perforatum*]) within all such areas.

Mapping of non-native invasive species along access roads was conducted by walking and slowly driving roads and estimating the number of individuals of non-native invasive species observed. Non-native plant species for which mapping was conducted included all species identified by the California Invasive Plant Council (CAL-IPC) as "high" (i.e., species that have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure), "moderate" (i.e., species that have substantial and apparent, but generally not severe ecological impacts on physical processes, plant and animal communities, and vegetation structure), and "limited" (i.e., species that are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score). Survey corridors in which invasive species were encountered were broken into survey segments identified with alternating blue and yellow lines (see Figure 2) to differentiate the non-native invasive species present and their relative distribution documented within the segment. Within these segments, non-native invasive plant species-level distributions were rated as "Abundant" (A: over one thousand plants), "Common" (C: 200-1,000 individuals), or "Infrequent" (I: less than 200 individuals). Additional non-native invasive plant species mapping included several point locations along roads where invasive plants were concentrated/clustered. These locations were typically located in high-disturbance areas (e.g., near gates).

RESULTS AND DISCUSSION

Rare Plant Surveys

None of the 47 rare plant species identified as possibly occurring was encountered during the two survey periods in 2018 or 2019. Given the lack of rare plants identified in the survey corridors, no impacts to rare plants are anticipated during Project construction. A comprehensive list of plant species encountered during the 2018/2019 surveys was compiled and is provided in Appendix C.

Precipitation data for Redding, California, the nearest town for which historical data was reported, was reviewed to determine if adequate seasonal climatic conditions existed for the 2018 and 2019 surveys. During the winter and spring time period preceding the 2018 surveys (November 1, 2017 − May 31, 2018) precipitation was 63% of average (US Climate Data 2019). While this is somewhat lower than normal for the Region, it would be expected that individuals of the targeted

plant species would have been visible during the 2018 botanical survey, if present. Recorded precipitation during the same time period preceding the 2019 surveys was 138% of average (US Climate Data 2019). This indicates that seasonal climatic conditions were most favorable (i.e., well above average) for the 2019 survey year and that the likelihood of detection of individuals of the targeted plant species, if present, was high. Despite the variation in seasonal differences preceding the 2018 and 2019 surveys, WEST botanists observed no noticeable differences in the composition or abundance of flowering plant species between years.

Natural and Sensitive Vegetation Communities

Eight natural vegetation communities were identified within the Project evaluation area (Figure 2). These include: *Pinus ponderosa* Forest Alliance; *Pinus ponderosa* Forest Alliance–Logged/Recently Logged; *Abies concolor–Pseudotsuga menziesii* Forest Alliance; *Quercus kelloggii* Forest Alliance; *Acer glabrum* Provisional Shrubland Alliance; *Arctostaphylos patula* Shrubland Alliance; *Carex utriculata* Herbaceous Alliance, and; *Agrostis* (*gigantea,stolonifera*)–*Festuca arundinacea* Harbaceous Semi-Natural Alliance. Descriptions of the eight natural vegetation communities are provided in Appendix D. One of the mapped natural vegetation communities may be considered a sensitive natural community by the CDFW. The *Acer glabrum* Provisional Shrubland Alliance is designated as a State Rank "3?" natural community by the CDFW. Vegetation communities with a State Rank of S1−S3 are considered sensitive natural communities by CDFW. The question mark in the ranking denotes "an inexact numeric rank because we (CDFW) know we have insufficient samples over the full expected range of the type, but existing information points to this rank…" (CDFW 2019). Based on the 2018/2019 vegetation community mapping at the Project, approximately 1,036 ac (419 ha) within the evaluation area are classified as *Acer glabrum* Provisional Shrubland Alliance (4.1%), most of which are located in the southeastern portion of the Project (Figure 2). Within the 2019 development corridors, this vegetation community occurs on just 31 ac (12 ha) or 1.5% of the total area potentially impacted by Project development. .

Mixed coniferous forest (i.e., *Pinus ponderosa* Forest Alliance and *Abies concolor–Pseudotsuga menziesii* Forest Alliance) is the predominant vegetation cover type within the evaluation area (see Figure 2). This cover type is heavily managed for timber production throughout the region. Other vegetation communities occur in far lesser amounts and are largely outside of areas potentially at risk of disturbance due to Project construction. While riparian communities cross the develoment corridors in many areas, they are largely at existing road crossings or in areas where future roads may be constructed. It is assumed that any future modifications to habitat along streams (e.g., riparian areas) due to added road work will incorporate riparian protections consistent with other ongoing management activities (i.e., timber harvesting) in the region.

Invasive Plant Species

The most common invasive plant species observed within the Project evaluation area included common mullein (CAL-IPC ranked "limited"), bull thistle (CAL-IPC ranked "moderate"), Klamath weed (CAL-IPC ranked "limited"), and houndstongue (*Cynoglossum officinale*; CAL-IPC "moderate"). Based on other plant survey work conducted by WEST within the Project vicinity (Young et al. 2007), these four species are ubiquitous in the area. As mentioned above, mullein,

bull thistle, and Klamath weed are widespread within all logged and recently logged areas within the evaluation area. Three invasive plant species ranked "high" by CAL-IPC were observed within the Project evaluation area, including Himalayan blackberry (*Rubus armeniacus*), yellow star thistle (*Centaurea solstitialis*), and medusahead (*Elymus caput-medusae*; Figure 3). Additional CAL-IPC ranked invasive plant species observed within the evaluation area included annual dogtail grass (*Cynosurus echinatus*; "moderate"), tall fescue (*Festuca arundinacea*; "moderate"), common velvet grass (*Holcus lanatus*; "moderate"), field sorrel (*Rumex acetosella*; "moderate"), orchardgrass (*Dactylis glomerata*; "limited"), and English plantain (*Plantago lanceolata*; "limited"; Figure 3).

Based on the data collected during 2018/2019 surveys, a number of invasive plant species are present within proposed development corridors. These results are not unexpected given the primary land use (i.e., commercial timber production), which results in recurring disturbance throughout the area and relatively high traffic volumes resulting from timber harvest activities, and WEST knowledge of invasive plant species within the region. Many of the invasive species are actively managed by the landowners to minimize competition with conifer seedlings and enhance timber growth. Many disturbances related to Project construction will be similar to those which occur in the Project evaluation area already (e.g., harvest of trees, road construction and widening, seasonal/temporary increases in vehicle traffic). While Project construction will create some additional disturbance to the landscape, once construction is complete, the Project will have minimal influence on the future distribution of invasive species relative to the influence of ongoing commercial timber operations.

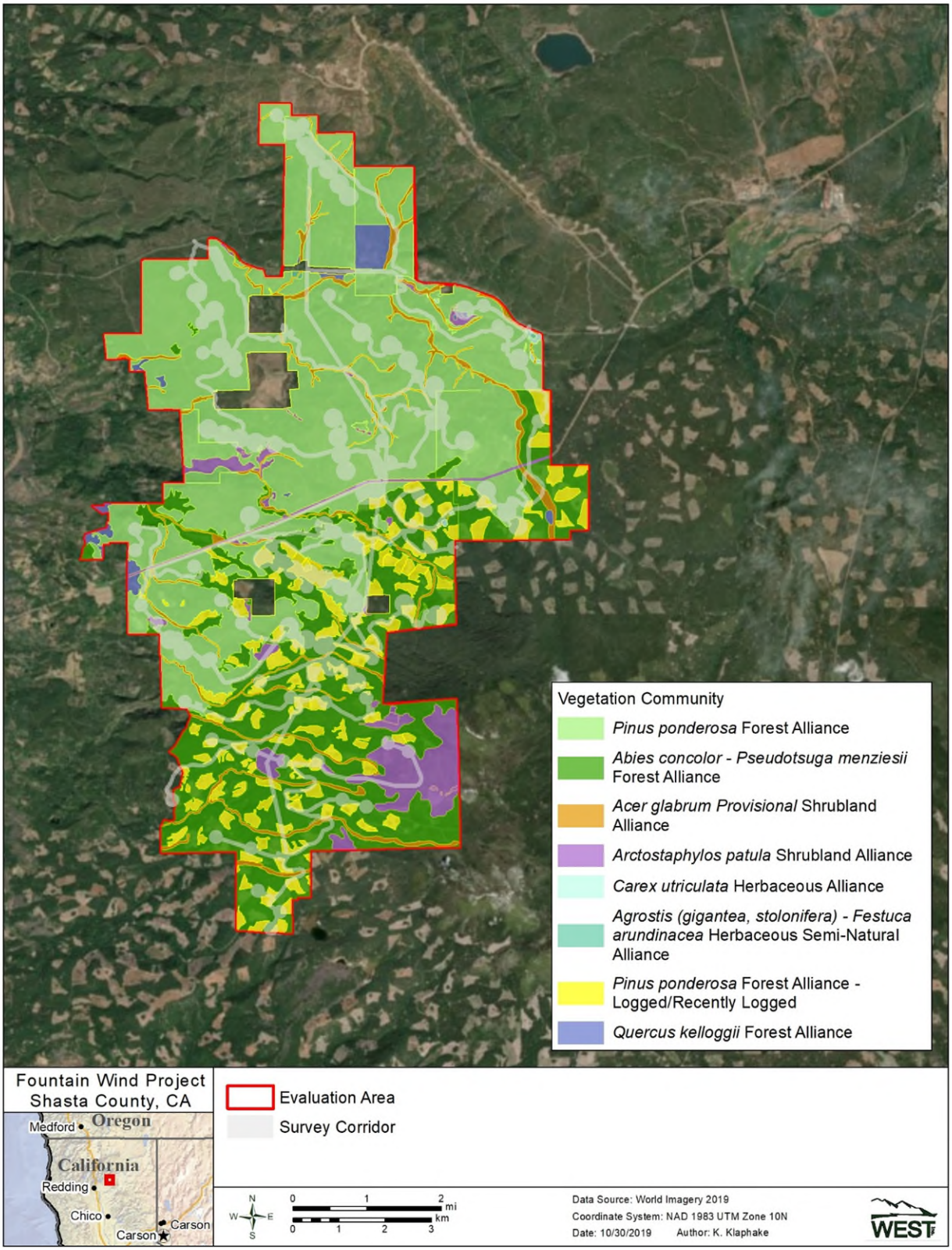

Figure 2. Vegetation communities identified and mapped during rare plant surveys conducted in 2018 and 2019 at the Fountain Wind Project, Shasta County, California.

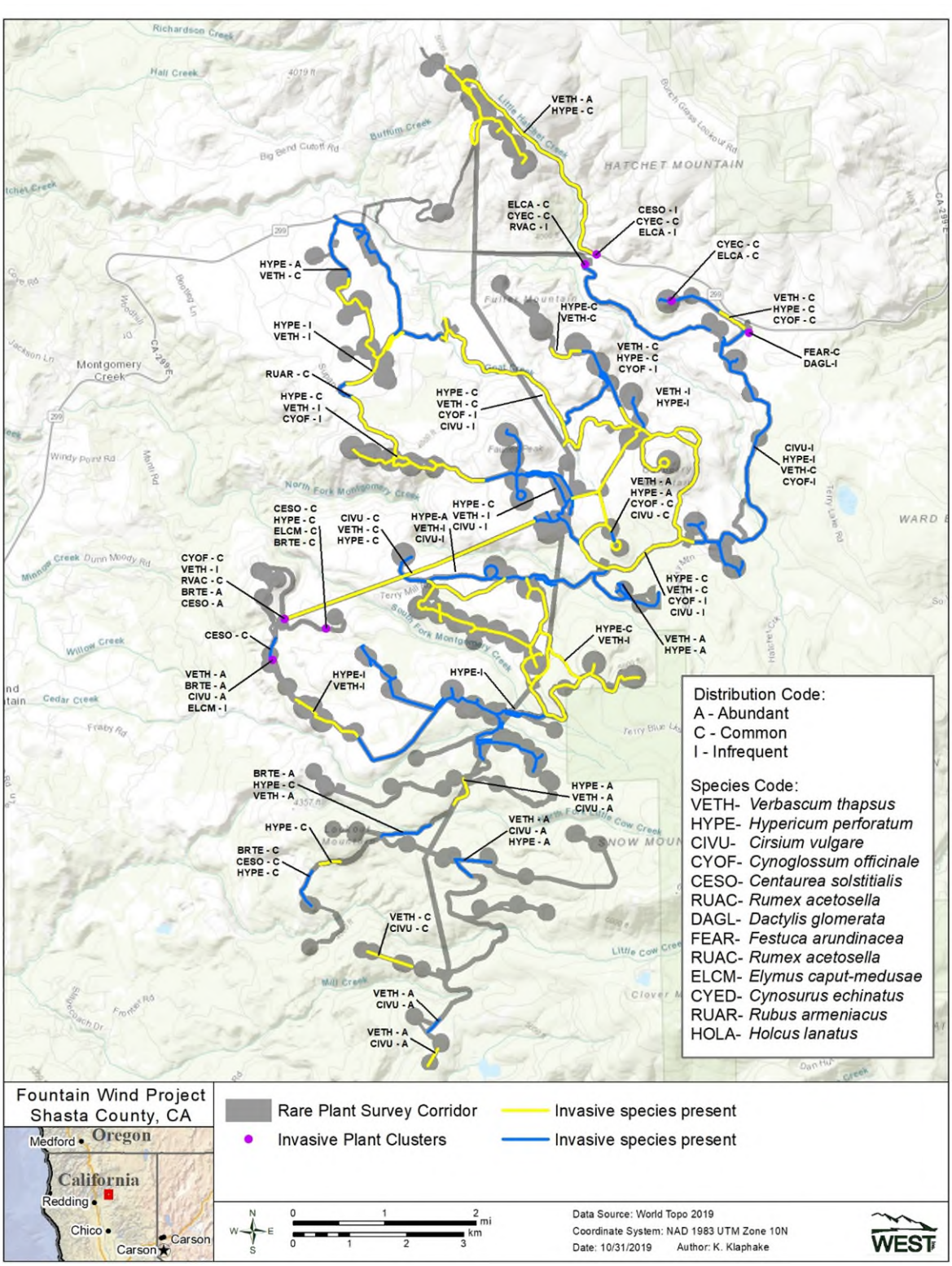

Figure 3. Non-native invasive plant species mapping within the Fountain Wind Project, Shasta County, California. To differentiate adjacent survey segments in which invasive species were encountered, alternating blue and yellow lines with accompanying notations as to the species present (4-letter species codes) and relative distribution (1-letter distribution code) were used.

REFERENCES

Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken (eds.). 2012. *The Jepson Manual: Vascular Plants of California*, second edition. University of California Press, Berkley.

California Native Plant Society (CNPS) Rare Plant Program. 2019. Inventory of Rare and Endangered Plants of Califronia (Online Edition, V8-0. 0.39). Last Update: May 2019. Information online: http://www.rareplants.cnps.org

California Natural Diversity Database (CNDDB). 2019. Inventory of the Status and Location of Rare Plants and Animals in California. State of California, Natural Resources Agency, Department of Fish and Wildlife (CDFW), Biogeographic Data Branch, CNDDB. Accessed January 2017. Available online at: https://www.wildlife.ca.gov/Data/CNDDB

California Department of Fish and Wildlife (CDFW). 2018. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities. March 20, 2018. State of California California Natural Resources Agency Department of Fish and Wildlife.

California Department of Fish and Wildlife (CDFW). 2019. Natural Communities Webpage. https://www.wildlife.ca.gov/data/vegcamp/natural-communities

ESRI. 2019. World Imagery and Aerial Photos. ArcGIS Resource Center. Environmental Systems Research Institute (ESRI), producers of ArcGIS software. Redlands, California. Information online: http://www.arcgis.com/home/webmap/viewer.html?useExisting=1

Flaig, K., Q. Hays, and J. Thompson. 2018. Rare Plant Surveys and Natural Vegetation Community Mapping, Fountain Wind Project, Shasta County, California. Prepared for Pacific Wind Development LLC; Portland, OR. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon.

Natural Resources Conservation Service (NRCS). 2018. Soil Survey Geographic Database (SSURGO). Available online at: https://websoilsurvey.sc.egov.usda.gov

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Sawyer, J.O., T. Keeler-Wolf, J.M. Evens. 2009. A Manual of California Vegetation, 2nd Edition. California Native Plant Society Press, Sacramento, CA.

US Climate Data. 2018, 2019. US Climate Data. Version 2.3. Accessed September 2019. Information online: http://www.usclimatedata.com

US Fish and Wildlife Service (USFWS). 2017. Critical Habitat Portal. USFWS Critical Habitat for Threatened and Endangered Species: Online Mapper. Accessed February 2017. Online at: http://ecos.fws.gov/crithab/

Young, D., G. Johnson, V. Poulton, and K. Bay. 2007. Ecological baseline studies for the Hatchet Ridge Wind Energy Project, Shasta County, California. Prepared for Hatchet Ridge Wind LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. Cheyenne, Wyoming.

Zhang, J., J. Webster, R.F. Powers, J. Mills. 2008. Reforestation after the Fountain Fire in Northern California: An Untold Success Story. Journal of Forestry, pp. 425-430.

Appendix A. Federally listed, State-listed, and California Native Plant Society Rare Plant Species and Their Potential for Occurrence within the Fountain Wind Project

Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	CNPS Status**	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Shasta ageratina *Ageratina shastensis*		1B.2	June-Oct	Rocky, often carbonate sites; lower montane coniferous forest	**Possible.** Although uncommon, suitable habitat may be present within the Project
Scabrid alpine tarplant *Anisocarpus scabridus*		1B.3	June-Sept	Open ridges or slopes on metamorphics	**Possible.** Suitable habitat may be present within the Project
Slender silver-moss *Anomobryum julaceum*		4.2		Rocky, moist (bryophyte-moss)	**Possible.** Although far from its known range, suitable habitat may be present within the Project
vanilla-grass *Anthoxanthum nitens* ssp. *nitens*		2B.3	Apr-July	Meadows and seeps	**Possible.** Although limited, suitable wetland habitat may be present within the Project
Klamath manzanita *Arctostaphylos klamathensis*		1B.2	May-Aug	Chaparral and upper montane and subalpine coniferous forests; rocky outcrops and slopes	**Possible.** Although uncommon, suitable habitat may be present within the Project; CNDDB documents only 2 occurrences in Shasta County
marbled wild-ginger *Asarum marmoratum*		2B.3	Apr-Aug	Understory of lower montane coniferous forests	**Possible.** Suitable habitat may be present within the site
northern spleenwort *Asplenium septentrionale*		2B.3	July-Aug	Chaparral and montane coniferous forests; form grass-like tufts in granitic rock crevices	**Unlikely.** No granitic rock crevices present within the survey corridors
upswept moonwort *Botrychium ascendens*		2B.3	July-Aug	Lower montane coniferous forests; grassy fields and woodlands near springs and creeks	**Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project
scalloped moonwort *Botrychium crenulatum*		2B.2	June-Sept	Lower montane coniferous forests; moist meadows near creeks; marshes	**Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project
mingan moonwort *Botrychium minganense*		2B.2	July-Sept	Creek banks in mixed conifer forests	**Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project
western goblin *Botrychium montanum*		2B.1	July-Sept	Creek banks in old-growth coniferous forests	**Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project

Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	CNPS Status**	Survey period	Habitat Requirements	Potential for Occurrence within the Project
northwestern moonwort *Botrychium pinnatum*		2B.3	July-Oct	Montane coniferous forests; in meadows or along creek banks	**Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project
rattlesnake fern *Botrypus virginianus*		2B.2	June	Streams; bogs and fens; lower montane coniferous forest; meadows and seeps	**Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project
Watershield *Brasenia schreberi*		2B.3	Apr-Oct	Freshwater marshes and swamps	**Possible.** Although extremely limited, suitable wetland habitat may be present within the Project
long-haired star-tulip *Calochortus longebarbatus* var. *longebarbatus*		1B.2	June-Aug	Clay, mesic sites in Great Basin scrub, lower montane coniferous forest openings, meadows and seeps	**Possible.** Suitable habitat may be present within the Project
Callahan's mariposa lily *Calochortus syntrophus*		1B.1	May-June	Cismontane woodland; vernally mesic valley and foothill grassland	**Possible.** Suitable habitat may be present within the Project
Butte County morning-glory *Calystegia atriplicifolia* ssp. *buttensis*		4.2	May-July	Dry, rocky places in open forest, chaparral	**Possible.** Suitable habitat may be present within the Project
Castle Crags harebell *Campanula shetleri*		1B.3	June-Sept	In protected rock crevices in granite; lower montane coniferous forests	**Unlikely.** No granitic rock outcrops present within the survey corridors
bristly sedge *Carex comosa*		2B.1	May-Sept	Marshes and swamps (lake margins); valley and foothill grasslands	**Possible.** Although limited, suitable wetland habitat may be present within the Project
woolly-fruited sedge *Carex lasiocarpa*		2B.3	June-July	Bogs and fens; freshwater marshes and swamps, lake margins	**Possible.** Although limited, suitable wetland habitat may be present within the Project
Lassen paintbrush *Castilleja lassenensis*		1B.3	June-Sept	Meadows and seeps; subalpine forest (volcanic)	**Unlikely.** Known occurrences restricted to flanks of Lassen and granite substrates in the Sierras

Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	CNPS Status**	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Shasta clarkia *Clarkia borealis* ssp. *arida*		1B.1	June-Aug	Cismontane woodlands	**Possible.** Suitable habitat may be present within the Project
northern clarkia *Clarkia borealis* ssp*. borealis*		1B.3	June-Sept	Cismontane woodland; lower montane coniferous forest	**Possible.** Suitable habitat may be present within the Project
silky cryptantha *Cryptantha crinita*		1B.2	April-May	Gravelly streambeds of cismontane woodlands, valley foothill grasslands, lower montane coniferous forests, and riparian forests	**Possible.** Although limited, suitable streambed habitat may be present within the Project
Jepson's dodder *Cuscuta jepsonii*		1B.2	July-Sept	Broadleafed upland forest, lower and upper montane coniferous forest (host spp. are *Ceanothus diversifolius* and *C. prostratus*)	**Possible.** Suitable habitat may be present within the Project
English sundew *Drosera anglica*		2B.3	June-Sept	Bogs and fens; meadows	**Possible.** Although extremely limited, suitable wetland habitat may be present within the Project
Oregon fireweed *Epilobium oreganum*		1B.2	June-Sept	Montane coniferous forests; in and near springs and bogs; sometimes on serpentine	**Possible.** Although limited, suitable wetland habitat may be present within the Project
Tracy's eriastrum *Eriastrum tracyi*		3.2	June-July	Open areas on shale or alluvium	**Possible.** Suitable habitat may be present within the Project
blushing wild buckwheat *Eriogonum ursinum var. erubescens*		1B.3	June-Sept	Rocky sites within lower montane coniferous forest and montane chaparral	**Possible.** Suitable habitat may be present within the Project
Shasta limestone monkeyflower *Erythranthe taylorii*		1B.1	April-May	Openings, carbonate crevices and rocky outcrops of cismontane woodlands and lower montane coniferous forest	**Unlikely.** Suitable carbonate habitat not present within survey corridors
Shasta fawn lily *Erythronium shastense*		1B.2	March-April	Usually carbonate, rocky, north-facing or shaded slopes in cismontane woodland and lower montane coniferous forest	**Unlikely.** No suitable carbonate habitats present within the survey corridors

Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	CNPS Status**	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Butte County fritillary *Fritillaria eastwoodiae*		3.2	March-June	Dry benches, slopes of yellow pine forest, chaparral	**Possible.** Suitable habitat may be present within the Project
Boggs Lake hedge hyssop *Gratiola heterosepala*		1B.2	April-Aug	Freshwater marshes and swamps, vernal pools; clay soils	**Possible.** Although extremely limited, suitable wetland habitat may be present within the Project
Stebbins' harmonia *Harmonia stebbinsii*		1B.2	May-June	Chaparral and lower montane coniferous forests; in ultramafic soils, often along roads	**Unlikely.** No ultramafic substrates present within the Project
little hulsea *Hulsea nana*		2B.3	July-Aug	Alpine boulder and rock fields, subalpine coniferous forests; volcanic substrates	**Unlikely.** Suitable habitat not present within the Project
Baker's globe mallow *Iliamna bakeri*		4.2	June-Sept	Chaparral, juniper woodland	**Possible.** Suitable habitat may be present within the Project
Castle Crags ivesia *Ivesia longibracteata*		1B.3	June	Crevices in granitic cliffs; lower montane coniferous forests	**Unlikely**. No granitic cliff habitat present within the survey corridors
Finger rush *Juncus digitatus*		1B.1	May-June	Vernal pools, swales, volcanic seeps	**Possible.** Although extremely limited, suitable wetland habitat may be present within the Project
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*		1B.1	March-May	Vernally mesic meadows and seeps; valley and foothill grassland; vernal pools	**Possible.** Although limited, suitable wetland habitat may be present within the Project
Santa Lucia dwarf rush *Juncus luciensis*		1B.2	April-July	Vernal pools, ephemeral drainages, wet meadows habitats and streamsides	**Possible.** Although limited, suitable wetland habitat may be present within the Project
Cantelow's lewisia *Lewisia cantelovii*		1B.2	May-Oct	Mesic, granite; lower montane coniferous forest; cismontane woodland	**Unlikely.** Suitable granitic or serpentine seeps not present within the Project
Bellinger's meadowfoam *Limnanthes floccosa* ssp. *bellingeriana*		1B.2	April-June	Mesic; cismontane woodland; meadows and seeps	**Possible.** Although limited, suitable wetland habitat may be present within the Project
tufted loosestrife *Lysimachia thyrsiflora*		2B.3	May-Aug	Meadows and seeps; mesic; upper montane coniferous forest	**Possible.** Although limited, suitable wetland habitat may be present within the Project

Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	CNPS Status**	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Three-ranked hump-moss *Meesia triquetra*		4.2	July	Wetlands (fens)	**Possible.** Although extremely limited, suitable wetland habitat may be present within the Project
broad-nerved hump-moss *Meesia uliginosa*		2B.2	July, Oct	Moss on damp soil within meadows and seeps, bogs and fens, upper montane coniferous forest, and subalpine coniferous forest	**Possible.** Although limited, suitable wetland habitat may be present within the Project
Shasta snow-wreath *Neviusia cliftonii*		1B.2	May-June	Lower montane coniferous forests, riparian woodlands; shady, north-facing or sheltered canyons	**Possible.** Although limited, suitable habitats may be present within the Project
slender Orcutt grass *Orcuttia tenuis*	T	1B.1	May-Oct	Vernal pools	**Unlikely.** No vernal pool habitat present within the survey corridors
Cascade grass of Parnassus *Parnassia cirrata* var. *intermedia*		2B.2	Aug-Sept	Rock serpentine soils; montane coniferous forests, meadows and seeps, bogs and fens	**Unlikely.** Suitable habitat absent from the survey corridors; nearest occurrence approximately 30 miles northwest of site
thread leaved beardtongue *Penstemon filiformis*		1B.3	May-July	Cismontane woodlands and lower montane coniferous forests; dry stony sites, grassy openings, and meadows	**Possible.** Suitable habitat may be present within the Project
Engelmann spruce *Picea engelmannii*		2B.2	May-June	Upper montane coniferous forest	**Possible.** Suitable habitat may be present within the Project
Sierra blue grass *Poa sierrae*		1B.3	April-June	Lower montane coniferous forests; shady, moist, rock slopes; often in canyons	**Possible.** Suitable habitat may be present within the Project
Profuse flowered pogogyne *Pogogyne floribunda*		4.2	May-Sept	Vernal pools, seasonal lakes	**Unlikely.** No suitable habitat present within the survey corridors
Modoc county knotweed *Polygonum polygaloides* ssp. *esotericum*		1B.3	May-Sept	Mesic; lower montane coniferous forest (vernal pools)	**Unlikely.** No vernal pool habitat present within the survey corridors

Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	CNPS Status**	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Eel grass pondweed *Potamogeton zosteriformis*		2B.2	June-July	Freshwater marsh	**Unlikely.** No suitable habitat present within the survey corridors
Newberry's cinquefoil *Potentilla newberryi*		2B.3	May-Aug	Receding shorelines	**Unlikely.** No suitable habitat present within the survey corridors
Pacific fuzz wort *Ptilidium californicum*		4.3	May-Aug	Bark of standing mature or recently fallen logs	**Possible.** Although limited, suitable wetland habitat may be present within the Project
marsh sckullcap *Scutellaria galericulata*		2B.2	June-Sept	Meadows and freshwater marshes of lower montane coniferous forests	**Possible.** Although limited, suitable wetland habitat may be present within the Project
Canyon creek stonecrop *Sedum obtusatum* ssp. *paradisum*		1B.3	May-June	In crevices of exposed granite; chaparral and coniferous forests	**Unlikely.** No exposed granite habitat present within the survey corridors
long-stiped campion *Silene occidentalis* ssp. *longistipitata*		1B.2	July-Aug	Lower and upper montane coniferous forest	**Possible.** Suitable habitat may be present within the Project
Klamath Mountain catchfly *Silene salmonacea*		1B.2	June-July	Openings, usually serpentine, within lower montane coniferous forest	**Unlikely.** Potential suitable habitat likely absent within the survey corridors
English Peak greenbriar *Smilax jamesii*		4.2	May-July	Riparian, streambanks, lake margins	**Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project
hairy marsh hedgenettle *Stachys pilosa*		2B.3	June-Sept	Mesic sites in Great Basin scrub	**Unlikely.** Suitable scrub habitat not present within the survey corridors
Long leaved starwort *Stellaria longifolia*		2B.2	May-July	Meadows and seeps, riparian woodlands	**Possible.** Although limited, suitable wetland/riparian habitat may be present within the Project
Fineleaf pondweed *Stuckenia filiformis* ssp. *alpina*		2B.2	May-July	Shallow, clear water of lakes, drainage channels	**Unlikely.** Potential suitable habitat absent from the survey corridors
Piorkowski's clover *Trifolium piorkowski*		1B.2	April-May	Chaparral, cismontane woodland, lower montane coniferous forest (volcanic clay)	**Unlikely.** Potential suitable habitat likely absent within site; nearest occurrence over 30 miles north of site

Appendix A. Federally listed and California Native Plant Society- (CNPS) listed rare plant species and their potential for occurrence within the Fountain Wind Project.

Species	Federal Status*	CNPS Status**	Survey period	Habitat Requirements	Potential for Occurrence within the Project
Siskiyou clover *Trifolium siskiyouense*		1B.1	June-July	Wet mountain meadows	**Unlikely.** Potential suitable habitat likely absent from the survey corridors; nearest occurrence on volcanic plateau approximately 30 miles south of Project
Greene's tuctoria *Tuctoria greenei*	E	1B.1	May-July	Vernal pools	**Unlikely.** No vernal pool habitat present within the survey corridors
Shasta huckleberry *Vaccinium shastense* ssp. *shastense*		1B.3	Dec-May	Acidic, mesic site; often on streambanks; sometimes on rocky outcrops, seeps, roadsides, and disturbed areas (chaparral, lower montane and subalpine coniferous forest, and riparian forest)	**Possible.** Although limited, suitable habitat may be present within the Project
oval-leaved viburnum *Viburnum ellipticum*		2B.3	May-June	Chaparral, cismontane woodlands, and lower montane coniferous forests	**Possible.** Suitable habitat may be present within the Project

Information from CNPS 2019, California Natural Diversity Database 2019, US Fish and Wildlife Service 2017.

*E: Federally listed endangered species; T: Federally listed threatened species

**CNPS: California Rare Plant Ranks (CNPS 2019):

CNPS 1A: Plants presumed extirpated in California and either rare or extinct elsewhere.

CNPS 1B: Plants rare, threatened, or endangered in California and elsewhere.

CNPS 2A: Plants presumed extirpated in California, but common elsewhere.

CNPS 2B: Plants rare, threatened, or endangered in California, but more common elsewhere.

CNPS 3: Plants about which more information is needed – a review list.

CNPS 4: Plants of limited distribution – a watch list.

Threat Ranks

- 0.1 – Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat).
- 0.2 − Moderately threatened in California (20-80% of occurrences threatened/moderate degree and immediacy of threat).
- 0.3 – Not very threatened in California (less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known).

Appendix B. Botanical Field Surveyor Qualifications

Kurt F. Flaig, *Plant Ecologist*

PROFESSIONAL EXPERIENCE

2004-Present	*Plant Ecologist,* Western EcoSystems Technology, Inc., Cheyenne, Wyoming
2001-2003	*Plant Ecologist,* H.T. Harvey & Associates, San Jose, California
2000-2001	*Range Technician,* Colorado State Cooperative Extension Program and Division of Wildlife, Weston, Colorado
2000-2001	*Natural Resource Technician,* Center for Ecological Management of Military Lands, Fort Collins Colorado
1999-2000	*Biological Science Technician,* U.S. Forest Service, Canyon Lakes District, Fort Collins, Colorado
1998-1999	*Range Technician,* Colorado State Cooperative Extension Program, Fort Collins, Colorado and Y-Cross Ranch, Horse Creek, Wyoming
1996-1999	*Graduate Research Assistant,* Department of Rangeland Ecosystem Science, Fort Collins, Colorado and Fort Richardson, Alaska

EDUCATION

M.S.
Colorado State University
Fort Collins, Colorado
1999
Range Ecology

B.S.
Colorado State University
Fort Collins, Colorado
1995
Natural Resource Management

B.A.
Florida Atlantic University
Boca Raton, Florida
1989
Political Science

SCIENTIFIC ORGANIZATION MEMBERSHIPS

California Native Plant Society

Colorado Native Plant Society

Wyoming Native Plant Society

Society of Wetland Scientists

SPECIALTY AREAS

Rare Plants: Kurt has been conducting rare plant assessments and surveys for county, state, BLM, and USFS sensitive species, and ESA listed species since 2001. This experience includes evaluating project impacts to rare plant species and communities, and designing and implementing mitigation measures to address such impacts. Kurt has detected numerous occurrences of special-status plant species, including federally threatened and endangered species, in the western U.S. This experience includes locating occurrences in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, New Mexico, North Dakota, South Dakota, Texas, Utah, Washington, and Wyoming.

Wetlands: Kurt has 15 years of experience in conducting wetland delineations throughout the western U.S. He has prepared and assisted clients in preparing USACE Section 404 permits, California Department of Fish and Game Streambed Alteration Agreements, and in complying with various states' waters regulatory requirements. Kurt has designed wetland mitigation sites and conducted extensive mitigation monitoring. He also has formal training and considerable experience in conducting wetland functional assessments.

Vegetation Classification, Mapping and Monitoring: Kurt has extensive experience in the classification and mapping of vegetation in a variety of community and ecosystem types throughout the western U.S. This includes detailed descriptions of habitats and identification of component flora. Kurt has over 15 years of experience in conducting vegetation monitoring in systems ranging from shortgrass and coastal prairies to mixed coniferous forest and coastal salt marsh. This experience includes baseline studies and short- and long-term monitoring studies for projects involving range inventories, grassland restoration, wetland/riparian restoration and mitigation, and soil erosion analysis. Kurt is proficient in the utilization of numerous sampling methods.

Technical Report Preparation: Kurt is an accomplished technical writer and editor. He provides expertise in the preparation of various NEPA related documents, including Environmental Impacts Statements, Biological Assessments, Biological Evaluations, and Habitat Conservation Plans, and has authored numerous technical reports and documents.

ADDITIONAL TRAINING & CERTIFICATION

WAFWA Lesser Prairie Chicken Vegetation Monitoring Training, 2014

Wyoming Reclamation and Restoration Center Workshop, 2012

Functional Assessment of Colorado Wetlands (FACWet) Methodology Training, 2009

Biological Assessment/Biological Evaluation Preparation Training, 2008, USFS

Advanced Hydric Soils Course, 2005, Wetland Training Institute (CA)

Wetland Delineation Course, 2003, Wetland Training Institute (CA)

California Native Plant Society Rapid Assessment Course for Vegetation Mapping, 2001

EIR/EIS Preparation and Review, 2001, University of California Davis Extension

Wetland Regulations, 2001, University of California Davis Extension

RARE PLANT SURVEYS CONDUCTED

(Served as lead botanist for all projects with asterisk*)

Fountain Wind Project (2018/2019) – Shasta County, California
Surveyed for 51 state and ESA listed plant species and mapped natural vegetation communities.

Zapata Wind Project (2018) – Zapata County, Texas
Surveyed for Zapata bladderpod, ashy dogweed, prostrate milkweed, and bushy Whitlow-wort.

Desert Quartzite Solar Energy Project (2017) – Riverside County, California
Surveyed for Harwood's eriastrum.

Dyno Nobel Project (2017) – Laramie County, Wyoming
Surveyed for Ute ladies'-tresses and Colorado butterfly plant.

Moran Wind Project (2016) – Allen County, Kansas
Surveyed for western prairie fringed orchid and Mead's milkweed.

Infigen Strata Solar Project (2015) – Eddy County, New Mexico
Surveyed for Tharp's blue-star, Scheer's beehive cactus, and gypsum wild buckwheat.

Spar Canyon-Round Valley Transmission Line (2014) – Custer County, Idaho
Surveyed for Challis milkvetch, Lemhi milkvetch, white eatonella, Welsh's buckwheat, Salmon wildrye, Challis crazyweed, Simpson's hedgehog cactus, elusive Jacob's-ladder, and wavy-leaf thelypody.

WYDOT US Highway Hazard Tree Removal Project (2014) – Albany County, Wyoming
Surveyed for 53 special status plant species including federally listed species and USFS sensitive species.

WYDOT Shutts Flat/Burgess Junction South Section (2014) – Sheridan County, Wyoming
Surveyed for Sartwell's sedge, leafy thistle, Russet cotton-grass, slender cotton-grass, Howard forget-me-not, Hall's fescue, common sweetgrass, northern twayblade, broad-leaved twayblade, pink coil-beaked lousewort, large-leaved pondweed, hairy tranquil goldenweed, Nagoonberry, soft aster, slim-pod Venus' looking-glass, and lesser bladderwort.

Meritage Pipeline Project (2013) – Platte and Laramie counties, Wyoming
Surveyed for Ute ladies'-tresses and Colorado butterfly plant.

Rising Tree Wind Energy Project (2013) – Kern County, California
Surveyed for Bakersfield cactus.

Uinta County 3D Seismic Project (2012) – Uintah County, Wyoming
Surveyed for Unita greenthread and Cedar Mountain Easter daisy.

Bear Den Pipeline Project (2012) – Dunne and McKenzie counties, North Dakota
Surveyed for Missouri foxtail cactus and Hooker's Townsend daisy.

Bakken Natural Gas Liquids Pipeline Project (2011-2012) – Laramie, Goshen, Niobrara, Weston, and Crook counties, Wyoming
Surveyed for Ute ladies'-tresses and Colorado butterfly plant.

Wildflower Green Renewable Energy Project (2010, 2011) – Los Angeles County, California
Surveyed for round-leaved filaree, golden goodmania, Coulter's goldfields, Pierson's morning glory, Barstow woolly sunflower, and pale-yellow layia.

Rising Tree Wind Energy Project (2010, 2011) – Kern County, California
Surveyed for alkali mariposa-lily, white pygmy-poppy, Mojave spineflower, white-bracted spineflower, desert cymopterus, Bakersfield cactus, Barstow woolly sunflower, Red Rock

poppy, short-joint beavertail, and golden goodmania.

China Mountain Wind Energy Project (2010) – Twin Falls County, Idaho
Surveyed for slickspot peppergrass.

**Mojave Solar Energy Project (2010) – Kern County, California*
Surveyed for alkali mariposa-lily, white pygmy-poppy, Mojave spineflower, white-bracted spineflower, desert cymopterus, Barstow woolly sunflower, Red Rock poppy, short-joint beavertail, and golden goodmania.

**WYDOT Douglas West Section (2010) – Converse County, Wyoming*
Surveyed for Ute ladies'-tresses.

**Kanda to Wamsutter Expansion Pipeline Project (2008) – Sweetwater County, Wyoming*
Surveyed for Ute ladies'-tresses, Nelson's milkvetch, Trelease's racemose milkvetch, Cedar Rim thistle, Ownbey's thistle, Gibben's penstemon, large-fuited bladderpod, prostrate bladderpod, tufted twinpod, persisitent sepal yellowcress, Laramie false sagebrush, and Green River greenthread.

**WYDOT Cody Northeast Section (2010) – Park County, Wyoming*
Surveyed for Ute ladies'-tresses.

**WYDOT Douglas-Glenrock Section (2010) – Converse County, Wyoming*
Surveyed for Ute ladies'-tresses.

**Sidewinder Wind Energy Project (2008) – San Bernardino County, California*
Surveyed for Lane Mountain milkvetch, desert cymopterus, Barstow woolly sunflower, Mojave monkeyflower, short-joint beavertail.

**White Hills Wind Energy Project (2008) – Mohave County, Arizona*
Surveyed for Las Vegas bearpoppy, clustered barrel cactus, silverleaf sunray, and Navajo bridge cactus.

**Victor, Longreach, and Ballard Petroleum Project (2008) – Campbell County, Wyoming*
Surveyed for Ute ladies'-tresses, Colorado butterfly plant, Barr's milkvetch, Iowa moonwort, and narrow-leaf moonwort.

**Overland Pass Pipeline Project (2007-2008) – Larimer, Weld, Logan, Washington, and Yuma counties, Colorado; Albany, Carbon, Laramie, Lincoln, and Sweetwater counties, Wyoming*
Surveyed for Ute ladies'-tresses, Colorado butterfly plant, dwarf milkweed, prairie moonwort, sandhills goosefoot, showy gentian, Wyoming feverfew, Nelson's milkvetch, Trelease's racemose milkvetch, Cedar Rim thistle, Ownbey's thistle, Gibben's penstemon, large-fuited bladderpod, prostrate bladderpod, tufted twinpod, persisitent sepal yellowcress, Laramie false sagebrush, and Green River greenthread.

**Halligan Seaman Water Supply Project EIS (2006-2008) – Larimer and Weld counties, Colorado*
Surveyed for Ute ladies'-tresses, Colorado butterfly plant, lavender hyssop, Larmier aletes, slender wildparsley, dwarf milkweed, Park milkvetch, kittentails, prairie moonwort, lesser-panicled sedge, Rocky Mountain sedge, yellow lady's-slipper, wood lily, white adder's-mouth orchid, purple cliff brake, Bell's twinpod, western polypody, Rocky Mountain cinquefoil, and prairie goldenrod.

**WYDOT Tisdale Creek Section (2008) – Campbell County, Wyoming*
Surveyed for Ute ladies'-tresses.

**Hatchet Ridge Wind Energy Project (2007) – Shasta County, California*
Surveyed for scabrid alpine tarplant, Butte County morning glory, long stolon sedge, western campion, northern clarkia, and Callihan's mariposa lily.

**PPM Dry Lake Wind Energy Project (2006) – Navajo County, Arizona*
Surveyed for roundleaf errazurizia, paper-spined cactus, and Peebles Navajo cactus.

Vantage Wind Energy Project (2006) – Kittitas County, Washington

Whiskey Ridge Wind Energy Project (2006) – Kittitas County, Washington

Valentine National Wildlife Refuge (2005) – Cherry County, Nebraska
Surveyed for western prairie fringed orchid.

Rosebud Wind Energy Project (2005) – Todd County, South Dakota
Surveyed for western prairie fringed orchid.

WYDOT Saratoga South Section (2005) – Carbon County, Wyoming
Surveyed for Ute ladies'-tresses.

Westside Irrigation District EIS (2005) – Big Horn and Washakie counties, Wyoming
Surveyed for Ute ladies'-tresses.

Entrega Pipeline Project (2004-2005) – Laramier, Weld, Rio Blanco and Moffat counties, Colorado; Albany, Carbon, Laramie, and Sweetwater counties, Wyoming
Surveyed for Ute ladies'-tresses, Colorado butterfly plant, dwarf milkweed, prairie moonwort, sandhills goosefoot, showy gentian, Wyoming feverfew, Nelson's milkvetch, Trelease's racemose milkvetch, Cedar Rim thistle, Ownbey's thistle, Gibben's penstemon, large-fuited bladderpod, prostrate bladderpod, tufted twinpod, Dudley Bluffs bladderpod, Piceance twinpod, persisitent sepal yellowcress, Laramie false sagebrush, and Green River greenthread.

Hoover's woolly-star (Eriastrum hooveri) Survey (2003) – Los Angeles County and Kern County, California
Surveyed for Hoover's woolly-star at various locations throughout the Antelope Valley in support of its proposed delisting as a Federal-threatened species by the USFWS.

Vista Oaks Draft Environmental Impact Report (2003) – Placer County, California

Dublin Ranch/Fallon Road Initial Study (2003) – Alameda County, California

Kottinger Ranch Initial Study (2003) – Contra Costa County, California

Gregory D. Johnson, *Research Biologist*

Professional Experience

1991-Present	Research Biologist, Western EcoSystems Technology, Inc., Cheyenne, Wyoming
1987-1991	*Study Director/Project Manager*, Wildlife International, Easton, Maryland
1985-1987	*Research Assistant,* University of Wyoming, Laramie, Wyoming
1984-1986	*Teaching Assistant,* University of Wyoming, Laramie, Wyoming
1984	*Wildlife Technician,* U.S. Forest Service, Laramie, Wyoming
1983	*Wildlife Technician,* University of Wyoming, Laramie, Wyoming

EDUCATION

M.S.
University of Wyoming
Laramie, Wyoming
1987
Zoology and Physiology

B.S.
University of Wyoming
Laramie, Wyoming
1983
Wildlife Conservation and Management

CERTIFICATIONS

Certified Senior Ecologist,
Ecological Society of America

Certified Wildlife Biologist,
The Wildlife Society

Professional Wetland Scientist,
Society of Wetland Scientists

Professional Summary

Greg Johnson has been an Ecologist and Project Manager for WEST since 1991. He received a B.S. degree in Wildlife Conservation and Management and a M.S. degree in Zoology and Physiology from the University of Wyoming. He has over 30 years of consulting experience in wildlife and ecological studies. He is a Certified Wildlife Biologist through The Wildlife Society, a Professional Wetland Scientist through the Society of Wetland Scientists, and a certified Senior Ecologist through the Ecological Society of America. His specialty areas include wildlife research with an emphasis on contaminants and wind power development; endangered species; wetland delineation, mitigation, and functional value assessment; and vegetation sampling. He is the author/coauthor of 49 professional journal articles, book chapters or peer reviewed proceedings papers and is an author/coauthor of 61 presentations at scientific meetings.

Relevant Work Experience

Mr. Johnson has extensive experience sampling vegetation. He prepared a weed management plan and collected quantitative data on weed cover to establish baseline conditions prior to implementing the plan for a reservoir project in CO. He collected transect data on willows and alders along 7.5 miles of stream south of Rawlins, WY to establish baseline conditions of woody riparian habitats used for mitigation purposes. He has collected quantitative plot and transect data on over 60 created and restored wetlands. In 1995 and 1996, he monitored success of reclamation of the 41-mile Wasatch Sour Gas Gathering System pipeline on the Utah/Wyoming border through quantifying vegetation species composition and % cover. He has identified wetland plants on over 100 project sites while conducting wetland delineations. In the summer of 1984, he collected quantitative vegetation data on an elk winter range in southern WY. In the summers of 1979-82, he was employed by the USDA Agricultural Research Service, where he collected extensive vegetation data on reclaimed mined lands in southeast WY. He has mapped vegetation, described vegetation types, and prepared the vegetation portion of numerous EIS's, EA's, and BA's. He has also conducted numerous searches for rare and sensitive plant species prior to construction activities in Wyoming, Idaho, Colorado, Oregon, Washington and California.

He has been certified as a Professional Wetland Scientist (PWS) by the Society of Wetland Scientists since 1997. He is formally trained in wetland delineations, wetland construction and restoration, and wetland plant identification. He has 23 years of wetland experience and has delineated over 5,000 acres of wetland using the Corps of Engineers 1987 manual on over 100 project sites. He was selected by the Corps of Engineers to peer review the Great Plains Region and Western Mountains, Valleys and Coast Region regional supplements to the 1987 Corps of Engineers wetland delineation manual. He has selected numerous wetland mitigation sites and assisted engineers with designs of created wetlands for mitigation purposes. He has quantitatively assessed the functions and values of

impacted wetlands as well as wetlands created for mitigation purposes to ensure that proposed wetland mitigation plans will result in created wetlands that completely replace the functions and values of impacted wetlands. He has also monitored the success of over 75 created wetlands using quantitative line transect and plot methods to measure vegetative composition and success.

Rare Plant Survey Experience:

2018 Fountain Wind Energy Project, Shasta County, California.
Species: Fifty-one state and ESA listed plant species

2017 Proposed Quartzsite Solar Energy Project, Riverside County, California.
Species: Harwood's eriastrum (*Eriastrum harwoodii*)

2014 U.S. Highway 14 reconstruction project, Sheridan County, Wyoming.
Species: 59 species of U.S. Forest Service and Wyoming Natural Diversity database sensitive species.

2013 Highway 130 roadside hazard tree clearing project, Carbon County, Wyoming.
Species: 53 species of U.S. Forest Service sensitive species.

2013 Confidential Pipeline, Laramie and Platte Counties,Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2012 Cheyenne Prairie Generating Station Pipeline, Laramie County, Wyoming
Species: Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2006 Wyoming State Highway 150 Reconstruction Project, Campbell County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2006 Lance Creek East Highway Reconstruction Project, Niobrara County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2005 Entrega Gas Pipeline Project, Carbon County, Wyoming
Species: Nelson's milkvetch (*Astragalus nelsonianus*), Gibben's penstemon (*Penstemon gibbensii*)

2004 Reuter-Hess Reservoir Project, Parker, Colorado
Species: Carrionflower (*Smilax lasioneura*) and American black currant (*Ribes americanum*). Located over 40 currant and over 300 carrionflower plants for transplant from the reservoir site.

2004 Entrega Gas Pipeline Project, Rio Blanco and Moffat Counties, Colorado
Species: debris milkvetch (*Astragalus detritalis*), narrow-stem gilia (*Gilia stenothysra*), Rollins cryptanth (*Oreocarya rollinsii*)

2004 City of Cheyenne Belvoir Ranch Landfill and Access Road, Laramie County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2004 Bear Creek Bridge replacement project, Goshen County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2004 Happy Jack Road Reconstruction Project, Laramie County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2004 Basin - Greybull Highway Reconstruction Project, Bighorn County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2004 Farson-Lander Highway Reconstruction Project, Sweetwater County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2003 Casper East I-25 Reconstruction Project, Natrona County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2003 Evanston South Highway Reconstruction Project, Uinta County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2003 Henry's Fork Bridge replacement Project, Uinta County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*)

2003 Wild Horse Wind Development Project, Kittitas County, Washington.
Species: Tall agoseris (*Agoseris elata*), Pasque flower (*Anemone nuttalliana*), Palouse milk-vetch (*Astragalus arrectus*), Columbia milk-vetch (*Astragalus columbianus*), Pauper milk-vetch (*Astragalus misellus* var. *pauper*), Dwarf evening-primrose (*Camissonia pygmaea*), Naked-stemmed evening primrose (*Camissonia scapoidea*), Bristle-flowered collomia (*Collomia macrocalyx*), Golden corydalis (*Corydalis aurea*), Beaked cryptantha (*Cryptantha rostellata*), Shining flatsedge (*Cyperus bipartitus*), Wenatchee larkspur (*Delphinium viridescens*), White eatonella (*Eatonella nivea*), Basalt daisy (*Erigeron basalticus*), Piper's daisy (*Erigeron piperianus*), Sagebrush stickseed (*Hackelia hispida* var. *disjuncta*), Longsepal globemallow (*Iliamna longisepala*), Hoover's desert-parsley (*Lomatium tuberosum*), Suksdorf's monkey-flower (*Mimulus suksdorfii*), Coyote tobacco (*Nicotiana attenuata*), Cespitose evening-primrose (*Oenothera cespitosa* ssp.*cespitosa*), Hedgehog cactus (*Pediocactus simpsonii* var. *robustior*), Brewer's cliff-brake (*Pellaea breweri*), Fuzzytongue penstemon (*Penstemon eriantherus* var.*whitedii*), Least phacelia (*Phacelia minutissima*), Sticky goldenweed (*Pyrrocoma hirta* var. *sonchifolia*), Seely's silene (*Silene seelyi*), Ute ladies'-tresses (*Spiranthes diluvialis*), and Hoover's tauschia (*Tauschia hooveri*).

2002 Crystal Canyon Pipeline Project, Laramie County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2002 Harriman Road Interchange, Interstate 80, Laramie County, Wyoming
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2002 Dubois - Moran Junction Highway Reconstruction project, Fremont County, Wyo.
Species: Pink agoseris (*Agoseris lackschewitzii*), Teton wire-lettuce (*Stephanoneria fluminea*).

2001 Unnamed tributary to Lone Tree Creek, Albany County, Wyoming, Prestridge Stock Reservoir Project
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2001 South Fork of Crow Creek, Laramie County, Wyoming, City of Cheyenne Diversion Dam Rehabilitation Project
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2001 City of Cheyenne water line crossing of the South Fork of Crow Creek
Species: Ute Ladies Tresses (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)

2000 & 2001 Seminoe Dam Road improvement project, Carbon County, Wyo.
Species: blowout penstemon (*Penstemon haydenii*)

2000 22 abandoned bentonite mines, Crook and Weston counties, Wyo.
Species: water-thread pondweed (*Potamogeton diversifolius*), slender bulrush (*Scirpus heterochaetus*), matted broom-spurge (*Euphorbia serpens*), spring forget-me-not (*Myosotis verna*), small-flowered flame-flower (*Talinum parviflorum*), prairie three-awn (*Aristida oligantha*), roundleaf water-hyssop (*Bacopa rotundifolia*), Texas spreading loeflingia (*Loeflingia squarrosa* var. *texana*)

2000 Sand mining operation, BP Amoco Soda Lake Remediation site, Casper, Wyo.
Species: blowout penstemon (*Penstemon haydenii*)

1999 Snow Sail project, Teton County, Wyoming
Species: Soft aster (*Aster mollis*), Boreal draba (*Draba borealis*), Narrowleaf goldenweed *(Haplopappus macronema* var. *linearis)*, Payson's bladderpod *(Lesquerella paysonii)*

1999 Haul Road construction project, Hanna, Wyoming
Species: bun milk-vetch (*Astragalus simplicifolius*), bedstraw milkweed (*Asclepias subverticillata*)

1998 Sinks Canyon Highway Reconstruction Project, Fremont County, Wyoming
Species: Fremont bladderpod (*Lesquerella fremontii*), Beaver Rim phlox (*Phlox pungens*), Rocky Mountain twinpod (*Physaria saximontana* var *saximontana*), Barneby's clover (*Trifolium barnebyi*)

1998 Dubois - Moran Junction Highway Reconstruction project, Fremont County, Wyo.
Species: Wyoming Tansymustard *(Descurainia torulosa),* Sweet-flowered Rock Jasmine *(Androsace chamaejasme),* Upward-lobe Moonwort *(Botrychium ascendens),* Seaside Sedge (*Carex incurviformis*), Narrowleaf Goldenweed (*Haplopappus macronema*)

1997 Proposed campground site, Bighorn National Forest, Wyoming
Species: limestone columbine *(Aquilegia jonsii)*, northern arnica *(Arnica lonchophylla)*, soft aster *(Aster mollis)*, balsamroot *(Balsamorhiza X tomentosa)*, moonwort *(Botrychium lunaria)*, livid sedge *(Carex livida)*, northern single-spike sedge *(Carex scirpoidea)*, conimitella *(Conimetella williamsii)*, Williams waterparsnip *(Cymopterus williamsii)*, yellow ladyslipper *(Cypripedium calceolus)*, mountain ladyslipper *(Cypripedium montanum)*, giant helleborine *(Epipactis gigantea)*, rough fescue *(Festuca hallii)*, broad-leaved twayblade *(Listera convallaroides)*, marsh muhly *(Muhlenbergia glomerata)*, Kotzebue's grass of parnassus *(Parnasia kotzebuei)*, mountain lousewort *(Pedicularis pulchella)*, Cary beardtongue *(Penstemon caryii)*, Pacific bluegrass *(Poa gracillima)*, greenland primrose *(Primula egaliksensis)*, nagoonberry *(Rubus acaulis)*, Hapeman's saxifrage *(Sullivantea hapmanii)*

1997 Three abandoned uranium mines, Gas Hills in Fremont County, Wyoming
Species: cedar rim thistle (*Cirsium aridum*), contracted Indian ricegrass (*Oryzopsis contracta*), Payson beardtongue (*Penstemon paysoniorum*), bun milk-vetch (*Astragalus simplicifolius*), Nelson's milkvetch (*Astragalus nelsonianus* a.k.a. *Astragalus pectinatus* var. *platyphyllus*)

1995 Five abandoned uranium mines, Gas Hills in Fremont County, Wyoming
Species: cedar rim thistle (*Cirsium aridum*), contracted Indian ricegrass (*Oryzopsis contracta*), Beaver Rim phlox (*Phlox pungens*), meadow pussytoes (*Antennaria arcuata*), Payson beardtongue (*Penstemon paysoniorum*), wild yellowcress (*Rorippa truncata*), Brandegee's Jacob's-ladder (*Polemonium brandegei*), swamp willow-herb (*Epilobium palustre* var *palustre*), bun milk-vetch (*Astragalus simplicifolius*), Nelson's milkvetch (*Astragalus nelsonianus* a.k.a. *Astragalus pectinatus* var. *platyphyllus*)

1995 One abandoned bentonite mine, Crook County, Wyoming
Species: Texas spreading loeflingia (*Loeflingia squarrosa* var. *texana*)

1995 Proposed Tribal Casino, Klamath Basin, Oregon
Species: Applegate's milk-vetch (*Astragalus applegatei*), Pumice grape-fern (*Botrychium pumicola*), long-bearded mariposa-lily (*Calochortus longebarbatus* var. *longebarbatus*),

pygmy monkeyflower (*Mimulus pygmaeus*), red-root yampah (*Perideridia erythrorhiza*), Columbia cress (*Rorippa columbiae*)

1995 Two proposed reservoir sites, Park County, Wyoming
Species: sand dropseed (*Sporobolus cryptandrus*), persistant sepal yellowcress (*Rorippa calycina*)

1994 Five abandoned coal mine sites near Hanna, Wyoming
Species: bun milk-vetch (*Astragalus simplicifolius*), bedstraw milkweed (*Asclepias subverticillata*

Klarissa Lawrence, *Wetland Specialist/Biologist*

PROFESSIONAL EXPERIENCE

2018-Present *Wetland Specialist/Biologist,* Western EcoSystems Technology, Inc., Fort Collins, Colorado

2006-2018 *Biological Field Technical,* Western EcoSystems Technology, Inc., Cheyenne, Wyoming

2017-2017 *Wetland Ecology Technician,* Center for Environmental Management of Military Lands (CEMML) Fort Greely, Delta Junction, Alaska

EDUCATION

B.A.
Metropolitan State University
Denver, Colorado
2004
Biology

A.S.
Metropolitan State University
Denver, Colorado
2004
Chemistry

SCIENTIFIC ORGANIZATION MEMBERSHIPS

California Native Plant Society

Colorado Native Plant Society

National Audubon Society

SPECIALTY AREAS

Klarissa Lawrence has over 13 years' experience in wetland and floristic surveys, including rare plant surveys, wetland delineations, and habitat mapping. Klarissa has had the opportunity to work in much of the Western United States and interior Alaska. Areas of focus include northern California, the high plains of Montana, Wyoming, and Colorado, and the northern plains of North and South Dakota. Her wide range experience includes energy pre- and post-construction, rare plant surveys, wetland delineations, habitat surveys, and species-specific surveys. Target species include eagles, bats, whooping cranes, lesser prairie chicken, Dakota skipper, Preble's meadow jumping mouse, Utes ladies'-tresses, Colorado butterfly plant, and numerous other plant species. She has worked on several interstate pipeline projects ranging from small collection lines to large-scale multi-state transmission lines; wind projects across the US with a focus in the plains states, rocky mountain region, and pacific northwest; and timber harvest projects.

SKILLS AND EXPERTISE

Rare plant surveys (Threatened and Endangered; State, USFS, and BLM specific)

Wetland delineations

Sensitive Species-Surveys, including big game, pigmy rabbits, black-footed ferrets, fishers, prairie dogs, whooping cranes, mountain plovers, burrowing owls, and northern spotted owls

Habitat mapping for sensitive plant and animal species

Post Construction Monitoring (Pipeline and Wind Turbine), including vegetation re-growth analysis, habitat monitoring, wetland plantings, erosion control, and bird & bat fatality counts

Pre-Construction Monitoring

Aerial Surveys (Fixed wing and helicopter)

Date Entry, collection, and organizational procedures

Field Coordination

Field Crew Management

Client Interactions

ADDITIONAL TRAINING & CERTIFICATION

Certified Hydric Soil Investigator, 2019, Swamp School, NC

1st Aid/CPR/AED Training, 2019, American Red Cross, CO

Lesser Prairie Chicken Vegetation Monitoring Training, 2014, WAFWA, KS

Wetland Delineation Course, 2008, Wetland Training Institute, CA

RARE PLANT SURVEYS CONDUCTED

Fountain Wind Project (2019) – Shasta County, California
Surveyed for 51 state and ESA listed plant species.

North Bakken Pipeline Expansion Project (2019) – McKenzie County, North Dakota
Surveyed for 14 USFS sensitive species on the Little Missouri National Grassland.

Zapata Wind Project (2018) – Zapata County, Texas
Surveyed for Zapata bladderpod, ashy dogweed, prostrate milkweed, and bushy Whitlow-wort

Roseburg Resource Timber Harvest (2016) – Siskiyou and Shasta Counties, California
Surveyed for 71 state listed plant species.

Sam's Creek Transmission Line (2015 - 2016) – Jackson and Josephine Counties, Oregon
Surveyed for 21 state listed plant species.

Bakken Natural Gas Liquids Pipeline Project (2012) – Laramie, Goshen, Niobrara, Weston, and Crook counties, Wyoming
Surveyed for Ute ladies'-tresses and Colorado butterfly plant.

Sunstone Pipeline Project (2008)— Elmore and Ada Counties, Idaho
Surveyed for slickspot peppergrass.

Overland Pass Pipeline Project (2007) – Larimer, Weld, Logan, Washington, and Yuma counties, Colorado; Albany, Carbon, Laramie, Lincoln, and Sweetwater counties, Wyoming
Surveyed for Ute ladies'-tresses, Colorado butterfly plant, dwarf milkweed, prairie moonwort, sandhills goosefoot, showy gentian, Wyoming feverfew, Nelson's milkvetch, Trelease's racemose milkvetch, Cedar Rim thistle, Ownbey's thistle, Gibben's penstemon, large-fuited bladderpod, prostrate bladderpod, tufted twinpod, persisitent sepal yellowcress, Laramie false sagebrush, and Green River greenthread

Hatchet Ridge Wind Energy Project (2007) – Shasta County, California
Surveyed for scabrid alpine tarplant, Butte County morning glory, long stolon sedge, western campion, northern clarkia, and Callihan's mariposa lily.

Appendix C. Plant Species Encountered within the Fountain Wind Project

Appendix C. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
ALLIACEAE	***Allium parvum***	dwarf onion
	***Allium* spp.**	onion
ANACARDIACEAE	***Toxicodendron diversilobum***	poison oak
APIACEAE	***Angelica breweri***	Brewer's angelica
	Heracleum lanatum	common cow parsnip
	Ligusticum californicum	California licorice root
	***Lomatium* spp.**	lomatium
	Osmorhiza berteroi	sweet cicely
APOCYNACEAE	***Apocynum androsaemifolium***	bitter dogbane
ARISTOLOCHIACEAE	***Asarum hartwegii***	Hartweg's wild ginger
	Asarum caudatum	creeping wild ginger
ASCLEPIADACEAE	***Asclepias cordifolia***	heart leaf milkweed
	Asclepias speciosa	showy milkweed
ASTERACEAE	***Achillea millefolium***	common yarrow
	Agoseris grandiflora	giant mountain dandelion
	Arnica cordifolia	heartleaf arnica
	Centaurea solstitialis	yellow star thistle
	Cichorium intybus	chicory
	Cirsium vulgare	bull thistle
	Ericameria nauseosa	gray rabbitbrush
	***Erigeron* spp.**	fleabane
	Eriophyllum lanatum	woolly sunflower
	Grindelia hirsutula	hairy gumweed
	Helenium bigelovii	Bigelow's sneezeweed
	Helianthella californica	California helianthella
	Hieracium nudicaule	naked-stemmed hawkweed
	Hypochaeris spp.	cat's ear
	Lactuca serriola	prickly lettuce
	Madia glomerata	mountain tarweed
	***Senecio* spp.**	groundsel
	***Solidago* spp.**	goldenrod
	Symphyotrichum bracteolatum	Eaton's aster
	Taraxacum officinale	common dandelion
	Wyethia mollis	mountain mule ear
	Tragopogon dubius	yellow salsify
BETULACEAE	***Alnus incana* ssp. *tenuifolia***	mountain alder
	Corylus cornuta* var. *californica	beaked hazelnut
BORAGINACEAE	***Cryptantha* spp.**	cryptantha
	Cynoglossum officinale	houndstongue
	Eriodictyon californicum	California yerba santa
	Eriodictyon lobbii	matted yerba santa
	Plagiobothrys stipitatus* var. *micranthus	stalked popcornflower
BRASSICACEAE	***Erysimum capitatum***	western wallflower
	Lepidium campestre	field pepperweed
	Nasturtium officinale	watercress
	Sisymbrium altissimum	tall tumblemustard
	Streptanthus tortuosus	mountain jewelflower
CAMPANULACEAE	***Asyneuma prenanthoides***	California harebell
CAPRIFOLIACEAE	***Lonicera involucrata***	twinberry honeysuckle
	Sambucus mexicana	blue elderberry
	Symphoricarpos mollis	creeping snowberry
CARYOPHYLLACEAE	*Dianthus deltoides*	maiden pink
	Silene bernardina	Palmer's catchfly

Appendix C. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
CELASTRACEAE	***Paxistima myrsinites***	Oregon boxleaf
CHENOPODIACEAE	*Chenopodium album*	lamb's quarters
CONVOLVULACEAE	*Convolvulus* spp.	morning glory
CORNACEAE	***Cornus nuttallii***	mountain dogwood
	Cornus sessilis	blackfruit dogwood
CUPRESSACEAE	***Calocedrus decurrens***	Incense-cedar
CYPERACEAE	***Carex densa***	dense sedge
	Carex inops* ssp. *inops	long-stoloned sedge
	Carex nebrascensis	Nebraska sedge
	Carex praegracilis	field sedge
	Carex subfusca	brown sedge
	Carex utriculata	beaked sedge
	Carex spp.	sedge
	Eleocharis acicularis	needle spikerush
	Eleocharis macrostachya	common spikerush
	Schoenoplectus acutus	tule
	Scirpus microcarpus	mountain bog bulrush
DENNSTAEDTIACEAE	***Pteridium aquilinum* var. *pubescens***	Western brackenfern
EQUISETACEAE	***Equisetum arvense***	common horsetail
	Equisetum hymale	Scouring-rush horsetail
ERICACEAE	***Arctostaphylos patula***	greenleaf manzanita
	Chimaphila menziesii	pipsissewa
	Pterospora andromedea	pinedrops
	Pyrola picta	whiteveined shinleaf
	Rhododendron occidentale	western azalea
FABACEAE	***Acmispon americanus***	Spanish clover
	Hosackia crassifolia	Broad-leaved lotus
	Hosackia pinnata	pinnate lotus
	Lathyrus lanszwertii	Nevada pea
	Trifolium pratense	red clover
FAGACEAE	***Chrysolepis sempervirens***	chinquapin
	Quercus kelloggii	California black oak
GROSSULARIACEAE	***Ribes roezlii***	Sierra gooseberry
	Ribes divaricatum	spreading gooseberry
HYDROPHYLLACEAE	***Phacelia* spp.**	phacelia
HYPERICACEAE	*Hypericum perforatum*	Klamath weed
IRIDACEAE	***Iris missouriensis***	western blue flag
	Iris tenuissima	slender iris
	Sisyrinchium bellum	western blue-eyed grass
JUNCACEAE	***Juncus balticus***	Baltic rush
	Juncus ensifolius	swordleaved rush
	Juncus tenuis	slender rush
	Juncus xiphiodes	iris leaved rush
LAMIACEAE	***Mentha arvensis***	field mint
	Prunella vulgaris	self-heal
	Stachys adjugoides* var. *rigida	rigid hedge nettle
	Scutellaria nana	little skullcap
LILIACEAE	***Calochortus tolmiei***	hairy star tulip
	Clintonia uniflora	bride's bonnet
	Fritillaria recurva	scarlet fritillary
	Lilium pardalinum	leopard lily
	Lilium washingtonianum	Washington lily
	Triteleia hyacinthina	wild hyacinth

Appendix C. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
	Triteleia ixioides	golden brodiaea
	Zigadenus venenosus	death camas
MALVACEAE	***Sidalcea malviflora***	checkermallow
	Sidalcea oregana* ssp. *spicata	Oregon checker mallow
MELANTHIACEAE	***Trillium albidum***	giant white wakerobin
	Trillium ovatum	Pacific trillium
	Veratrum californicum	California corn lily
MONTIACEAE	***Claytonia lanceolata***	lanceleaf springbeauty
	Claytonia perfoliata	miner's lettuce
MYRSINACEAE	***Lysimachia latifolia***	Pacific starflower
NYMPHACEAE	***Nuphar polysepala***	Rocky Mountain pond-lily
OLEACEAE	***Fraxinus latifolia***	Oregon ash
ONOGRACEAE	***Epilobium angustifolium***	fireweed
	Epilobium brachycarpum	tall annual willowherb
	Epilobium ciliatum	fringed willowherb
OPHIOGLOSSACEAE	***Sceptridium multifidum***	leather grapefern
ORCHIDACEAE	***Corallorhiza maculata***	spotted coralroot
	Corallorhiza striata	hooded coralroot
	Goodyera oblongifolia	rattlesnake plantain
	Listera convallarioides	broadlipped twayblade
	Platanthera dilitata* var. *leucostachys	Sierra bog orchid
	Spiranthes romanzoffiana	hooded lady's tresses
OROBANCHACEAE	***Boschniakia strobilacea***	California groundcone
	Castilleja tenuis	hairy Indian paintbrush
	Pedicularis densiflora	Indian warrior
PAPAVERACEAE	***Dicentra formosa***	bleeding heart
PINACEAE	***Abies concolor***	white fir
	Abies magnifica	red fir
	Pinus lambertiana	sugar pine
	Pinus jeffreyi	Jeffrey pine
	Pinus ponderosa	ponderosa pine
	Pseudotsuga menziesii	Douglas fir
PLANTAGINACEAE	*Plantago lanceolata*	English plantain
	Veronica anagallis-aquatica	water speedwell
PHRYMACEAE	***Mimulus breviflorus***	shortflower monkeyflower
	Mimulus guttatus	seep monkeyflower
POACEAE	***Agrostis scabra***	rough bent grass
	Agrostis stolonifera	bent grass
	Alopecurus aequalis	shortawn foxtail
	Alopecurus geniculatus	marsh foxtail
	Bromus carinatus	mountain brome
	Bromus tectorum	cheatgrass
	Calamagrostis canadensis	bluejoint reedgrass
	Cynosurus echinatus	annual dogtail grass
	Dactylis glomerata	orchardgrass
	Danthonia californica	California oatgrass
	Deschampsia cespitosa	tufted hairgrass
	Deschampsia danthonioides	annual hairgrass
	Elymus caput-medusae	medusahead
	Elymus elymoides	bottlebrush
	Elymus glaucus	blue wild rye
	Elymus trachycaulus	slender wheatgrass
	Festuca arundinacea	tall fescue

Appendix C. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
	Festuca occidentalis	western fescue
	Glyceria borealis	Northern mannagrass
	Glyceria striata	fowl mannagrass
	Phleum pratense	Timothy
	Poa bulbosa	bulbous bluegrass
	Poa palustris	fowl bluegrass
	Poa pratensis	Kentucky bluegrass
	Poa secunda	Sandberg bluegrass
	Stipa lemmonii	Lemmon's needlegrass
	Stipa nelsonii	mountain needle grass
POLEMONIACEAE	***Gilia aggregata***	scarlet gilia
	Navarretia divaricata	mountain navarretia
POLYGONACEAE	***Bistorta bistortoides***	American bistort
	Eriogonum lobbii	Lobb's wild buckwheat
	Eriogonum nudum	naked buckwheat
	***Eriogonum* spp.**	buckwheat
	Eriogonum umbellatum	sulfur buckwheat
	Eriogonum vimineum	wickerstem buckwheat
	Polygonum aviculare	prostrate knotweed
	Polygonum bistortoides	American bistort
	Rumex acetosella	field sorrel
	Rumex salicifolius	willow dock
PRIMULACEAE	***Primula hendersonii***	mosquito bill
PTERIDACEAE	***Myriopteris gracillima***	lace lip fern
RANUNCULACEAE	***Aconitum columbianum***	monkshood
	Aquilegia formosa	columbine
	Delphinium nudicaule	canyon larkspur
	Ranunculus aquatilis	White water crowfoot
	Thalictrum fendleri	meadow-rue
RHAMNACEAE	***Ceanothus cordulatus***	mountain whitethorn
	Ceanothus cuneatus	buckbrush
	Ceanothus integerrimus	deerbrush
	Ceanothus prostratus* var. *prostratus	Mahala mat
	Ceanothus velutinus	tobacco brush
	Frangula californica	California coffeeberry
ROSACEAE	***Amelanchier alnifolia***	Saskatoon serviceberry
	Cercocarpus betuloides	birch leaf mountain mahogany
	Fragaria virginiana	mountain strawberry
	Geum macrophyllum	Large-leaved avens
	Potentilla gracilis	Northwest cinquefoil
	Prunus emarginata	bitter cherry
	Rhamnus purshiana	cascara
	Rosa woodsii* var. *ultramontana	interior rose
	Rubus armeniacus	Himalayan blackberry
	Rubus parviflorus	thimbleberry
	Sorbus californica	mountain ash
	Spiraea douglasii	rose spirea
RUBIACEAE	***Galium aparine***	common bedstraw
RUSCACEAE	***Maianthemum racemosum***	feathery false lily of the valley
	Maianthemeum stellatum	starry false lily of the valley

Appendix C. Plant Species Encountered within the Fountain Wind Project.

Family	Scientific Name*	Common Name
SALICACEAE	***Populus tremuloides***	quaking aspen
	Salix scouleriana	Scouler's willow
	Salix lasiandra	Pacific willow
	Salix lasiolepis	arroyo willow
SAPINDACEAE	***Acer circinatum***	vine maple
	Acer glabrum	Rocky Mountain maple
	Acer macrophyllum	bigleaf maple
SAXIFRAGACEAE	***Heuchera* spp.**	alumroot
SCROPHULARIACEAE	***Castilleja* spp.**	paintbrush
	Mimulus torreyi	Torrey's monkeyflower
	***Pedicularis* spp.**	lousewort
	Penstemon neotericus	Plumas County beardtongue
	***Penstemon* spp.**	penstemon
	Verbascum thapsus	common mullein
URTICACEAE	***Urtica dioica***	stinging nettle
VALERIANACEAE	***Valeriana californica***	California valerian
VERBENACEAE	***Verbena lasiostachys***	western vervain
VIOLACEAE	***Viola adunca***	Western dog violet
	Viola glabella	stream violet
	Viola lobata	pine violet
	Viola purpurea	mountain violet

*Native plant species in bold.

Appendix D. Natural Vegetation Communities Mapped within the Fountain Wind Project Evaluation Area.

Pinus ponderosa Forest Alliance (Ponderosa pine forest)

Areas mapped as this vegetation community type cover a majority of the northern half of the Project (Figure 2) and were burned in the 1992 Fountain Fire. In the years following the fire millions of ponderosa pine, Douglas fir, and white fir seedlings were planted at 10-ft spacing. Thus, this forest alliance is composed of even-aged stands of mixed conifer forest, generally about 25 years old, featuring a partially open canopy. Ponderosa pine is the dominant overstory species but white fir and Douglas fir are common. Since the fire, forest thinning has occurred and much of the slash remains in place, particularly within areas mapped as this alliance on the south side of Highway 299.

Overall, woody and herbaceous understory vegetation is highly variable in composition and density, but typically includes some combination of the following woody species: Mahala mat (*Ceanothus prostratus* var. *prostratus*), greenleaf manzanita (*Arctostaphylos patula*), mountain whitethorn (*Ceanothus cordulatus*), Sierra gooseberry (*Ribes roezlii*), and creeping snowberry (*Symphoricarpos mollis*). Herbaceous vegetation is predominantly composed of the following herbaceous species: bracken (*Pteridium aquilinum* var. *pubescens*), bottlebrush (*Elymus elymoides*), Pacific starflower (*Lysimachia latifolia*), and mountain needle grass (*Achnatherum nelsonii*). Although not as common as the other conifers in the overstory, incense cedar is present throughout this alliance.

Pinus ponderosa Forest Alliance (Ponderosa pine forest) – Logged/Recently Logged

Logging operations are ongoing within the evaluation area, particularly south of Highway 299. Areas mapped as ponderosa pine forest–logged/recently logged have been harvested at various intervals within the last 10−15 years. Most logged sites featured planted seedlings and saplings of various age classes. Ponderosa pine and, to a lesser extent, white fir are the most common tree species planted within recently logged areas. The majority of logged areas include small patches of more mature trees that were presumably left to provide wildlife habitat. Understory vegetation is typically sparse in this alliance and, when present, is mostly composed of invasive, disturbance-tolerant herbaceous species such as mullein, bull thistle, Klamath weed, and houndstongue. Additionally, bottlebrush squirreltail, a native grass species, is often present.

Abies concolor – Pseudotsuga menziesii Forest Alliance (White fir – Douglas fir forest)

The white fir-Douglas fir forest alliance was primarily mapped in the east-central and southern portions of the Project, where it formed a mosaic with the logged/recently logged ponderosa pine forest community. Areas mapped as this alliance were not burned in the Fountain Fire. Within the Project this vegetation community featured a mostly-closed canopy of mature mixed conifer species, including white fir, Douglas fir, sugar pine, ponderosa pine, incense cedar, and red fir (*Abies magnifica*), with some California black oak (*Quercus kelloggii*), particularly in small forest openings. Largely because of the closed canopy, understory vegetation is sparse and mostly composed of herbaceous species, including bracken, Pacific starflower, coralroot (*Corallorhiza* spp.), whiteveined shinleaf (*Pyrola picta*), and pipsissewa (*Chimaphila menziesii*). Scattered seedlings and saplings of the overstory tree species are also present in the understory. On rockier

substrates, the white fir–Douglas fir forest alliance typically has a more open canopy and features a denser understory composed of a variety of the woody and herbaceous species observed in the ponderosa pine forest alliance. Both of these forested vegetation communities mapped within the evaluation area represent a managed (i.e., periodically disturbed) forest system. As such, most stands are even-aged, but because of the different intervals at which timber harvesting has occurred, a mosaic of different age-class even-aged stands exist within the Project and surrounding area.

***Quercus kelloggii* Forest Alliance (California black oak forest)**

California black oak forest typically occurs at lower elevations within the Project (e.g., the far western portion), or in previously burned areas where it forms a mosaic with the green leaf manzanita chaparral alliance. Within the Project the majority of this vegetation community features a mostly open canopy of black oak with scattered green leaf manzanita in the shrub strata and a dense herbaceous understory composed primarily of grasses. Common understory species include Lemmon's needlegrass (*Stipa lemmonii*), blue wild rye (*Elymus glaucus*), mountain brome (*Bromus carinatus*), and yarrow.

***Acer glabrum* Provisional Shrubland Alliance (Rocky Mountain maple thickets)**

Riparian areas, mostly dominated by Rocky Mountain maple, were mapped along ephemeral, intermittent, and perennial drainages throughout the Project. Creek alder (*Alnus incana* ssp. *tenuifolia*) is often a codominant, particularly along shaded stream corridors more common to the southern portion of the Project. Woody and herbaceous understory vegetation composition is highly variable and is dependent on moisture regime (e.g., dry, mesic) and overstory canopy cover. In the northern portion of the Project, primarily within areas burned in the Fountain Fire, plant species better adapted to drier conditions are more common. Although Rocky Mountain maple, and often Scouler's willow (*Salix scouleriana*), is still common immediately along the drainage, the streambanks and adjacent riparian habitat are dominated by more xeric species including ceanothus (*Ceanothus* spp.), green leaf manzanita, blue elderberry (*Sambucus mexicana*), mountain dogwood (*Cornus nuttallii*), and bitter cherry (*Prunus emarginata*). In the southern portion of the Project, primarily in areas that escaped the Fountain Fire, more mesic conditions exist within the Rocky Mountain shrubland alliance. Incense cedar and Douglas fir often create a well-shaded forest canopy above dense woody riparian habitat dominated by Rocky Mountain maple and creek alder. Other common shrub and tree species include blackfruit dogwood (*Cornus sessilis*), twinberry honeysuckle (*Lonicera involucrata*), vine maple (*Acer circinatum*), willow (*Salix* spp.), Oregon boxleaf (*Paxistima myrsinites*), western azalea (*Rhododendron occidentale*), and bigleaf maple (*Acer macrophyllum*). Although variable across the Project, understory herbaceous vegetation is relatively sparse and typically includes some combination of the following species: common bedstraw (*Galium aparine*), feathery false lily of the valley (*Maianthemum racemosum*), bride's bonnet (*Clintonia uniflora*), common cow parsnip (*Heracleum lanatum*), arrowleaf ragwort (*Senecio triangularis*), and sweet cicely (*Osmorhiza berteroi*).

***Arctostaphylos patula* Shrubland Alliance (Green leaf manzanita chaparral)**

Green leaf manzanita chaparral intergrades with almost all other vegetation communities within the Project. It occurs in areas receiving full sunlight, including rocky ridgetops, rocky slopes and flats, forest openings, and recently burned or logged areas. This vegetation community is characterized by the presence of dense, nearly impenetrable thickets dominated by green leaf manzanita. Additional shrub species that sometimes occur as co-dominants include bush chinquapin (*Chrysolepis sempervirens*), mountain whitethorn (*Ceanothus cordulatus*), deerbrush (*Ceanothus integerrimus*), tobacco brush (*Ceanothus velutinus*), and buckbrush (*Ceanothus cuneatus*). Because of the dense growth form of this shrubland alliance understory vegetation is virtually absent, except in small openings. Scattered herbaceous species observed in small, rocky openings within green leaf manzanita chaparral include Plumas County beardtongue (*Penstemon neotericus*), mountain jewelweed (*Streptanthus tortuosus*), lace lip fern (*Myriopteris gracillima*), sulfur buckwheat (*Eriogonum umbellatum*), buckwheat (*Eriogonum* sp.), and onion (*Allium* sp.).

Green leaf manzanita chaparral was also mapped along the transmission line corridor that extends across the central portion of the Project. Vegetation along this corridor is managed to discourage the establishment of tall shrub and tree species. In addition to other chaparral species (e.g., *Ceanothus* spp.), green leaf manzanita has established along much of the corridor. Portions of the transmission line where chaparral species have not established feature dense stands of Western brackenfern (*Pteridium aquilinum* var. *pubescens*), scattered shrubs, including Sierra gooseberry (*Ribes roezlii*), bitter cherry, creeping snowberry (*Symphoricarpos molllis*), and rose (*Rosa* spp.), and barren patches.

***Carex utriculata* Herbaceous Alliance (Beaked sedge meadows)**

Beaked sedge meadows were mapped throughout the Project in seasonally or permanently saturated areas adjacent to stream corridors and ponds. Generally, these meadows are composed of a wide diversity of hydrophytic species, including grasses, sedges, rushes, and forbs. Beaked sedge is typically the dominant plant species in these meadows, but commonly observed species include bluejoint reedgrass (*Calamagrostis canadensis*), marsh foxtail (*Alopecurus geniculatus*), Nebraska sedge (*C. nebrascensis*), brown sedge (*C. subfusca*), sword leaved rush (*Juncus ensifolius*), Baltic rush (*Juncus balticus*), common spikerush (*Eleocharis macrostachya*), tufted hairgrass (*Deschampsia cespitosa*), American bistort (*Polygonum bistortoides*), horsetail (*Equisetum* spp.), Bigelow's sneezeweed (*Helenium bigelovii*), and seep monkeyflower (*Mimulus guttatus*). Scattered shrubs, including rose spirea (*Spiraea douglasii*), willow, and thinleaf alder seedlings and saplings, occur in some of these meadows. Additional patches of beaked sedge meadow were observed along drainage channels within the two forest alliances in the Project but were too small to map independently, and were thus included in the larger riparian community mapping.

Agrostis (*gigantea*, *stolonifera*) – *Festuca arundinacea* Herbaceous Semi-Natural Alliance (Bent grass – tall fescue meadows)

Montane meadows dominated by bent grass and/or tall fescue were mapped in forest openings and adjacent some of the beaked sedge meadows within the Project. They are considered a semi-natural alliance because, although native species are present, both of the dominant species are non-natives. These meadows are typically somewhat disturbed and are not saturated during the growing season. They support mesic and/or upland herbaceous vegetation. Common grasses and forbs include common yarrow (*Achillea millefolium*), goldenrod (*Solidago* sp.), Timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), orchardgrass, and blue wildrye. Bent grass – tall fescue meadows occasionally include some of the herbaceous plant species found in the beaked sedge meadow vegetation community, particularly when they abut one another.

C6. Results of the Year 2 Avian Use Study at the Fountain Wind Project – Addendum to the Year 1 Avian Use Study Report and Risk Assessment

ENVIRONMENTAL & STATISTICAL CONSULTANTS

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TECHNICAL MEMORANDUM

DATE: September 5, 2019

TO: John Kuba – ConnectGen Operating LLC

FROM: Joel Thompson and Andrea Chatfield – Western EcoSystems Technology, Inc.

RE: Results of the Year 2 Avian Use Study at the Fountain Wind Project – Addendum to the Year 1 Avian Use Study Report and Risk Assessment.

INTRODUCTION

The Fountain Wind Project (Project), is a proposed renewable wind energy generation project under development in eastern Shasta County, California by Fountain Wind LLC (Fountain Wind), a subsidiary of Avangrid Renewables LLC. In August 2019, ConnectGen Operating LLC (ConnectGen) entered into agreement with Fountain Wind LLC to lead the continued development of the Project. To address potential impacts of Project development on birds, Western EcoSystems Technology, Inc. (WEST) was contracted to develop and implement a 2-year avian use study at the proposed Project. The study was conducted following the tiered approach outlined in the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012) and the USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013), while also collecting data to satisfy the intent of the more dated voluntary California Wind Energy Guidelines (California Energy Commission and California Department of Fish and Game 2007). The principle objectives of the avian use study were to assess the relative abundance and spatial and temporal distribution of birds throughout the Project area, and to evaluate the potential for significant adverse impacts to avian species, particularly eagles, other diurnal raptors, and species of regulatory or management concern.

WEST conducted the initial first-year study (Year 1) over a 14-month period, from April 2017 through May 2018, and prepared the *Avian Use Study Report and Risk Assessment* based on those surveys (Thompson et al. 2018). Following recommendations presented in the ECPG, WEST completed a second year (Year 2) of eagle/avian use surveys at the Project over a 10-month period from June 2018 through March 2019, resulting in a full 2-year survey effort extending from April 2017 – March 2019. The following report presents the results the Year 2 surveys, as well as a comparison of the results between the two study years. Additionally, the avian risk

assessment prepared as part of the Year 1 report was revisited, with a focus on potential risk to bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*), as well as any inter-annual variation in species composition or use documented during the Year 2 surveys that may influence the perceived risk to avian species at the Project based on the Year 1 study alone.

During Year 2 of the study, large and small bird surveys were conducted at the same 39 observation points surveyed in Year 1 (Figure 1). Field and statistical methods were also consistent between the two years of study; for a detailed description of the Project area and survey methods please refer to the Year 1 *Avian Use Study Report and Risk Assessment* (Thompson et al. 2018). While the Project layout has been modified several times between 2017 and 2019, these modifications, including the most recent September 2019 layout, fall entirely within the larger area evaluated during the Year 1 and Year 2 avian use surveys (i.e., “Project Boundary” in Figure 1).

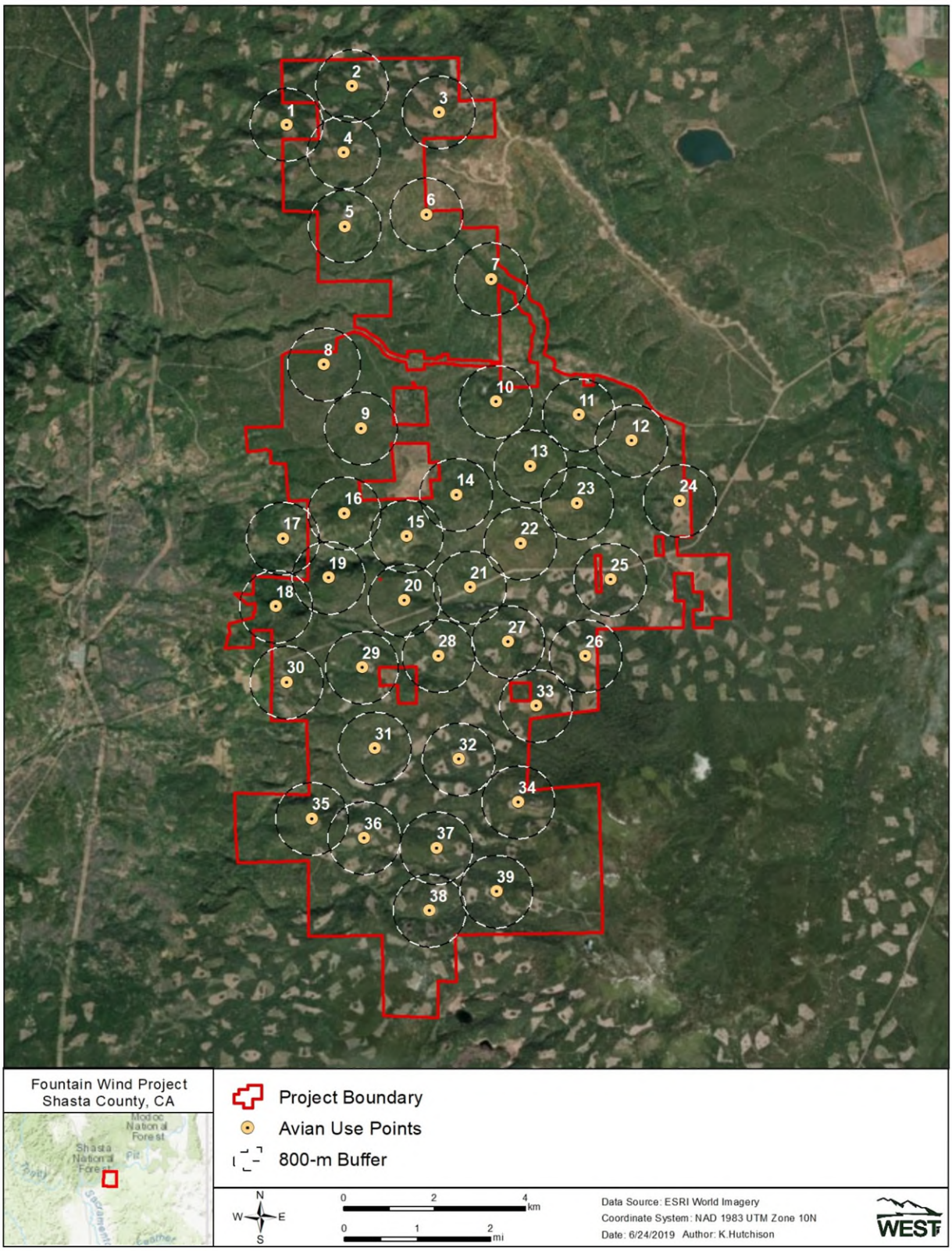


Figure 1. Location of survey plots used during fixed-point avian use surveys at the Fountain Wind Project, Shasta County, California, from 4 June 2018 – 31 March 2019.

YEAR 2 RESULTS

The Year 2 avian use surveys were conducted at the Project from 4 June 2018 through 31 March 2019. Results for large bird and small bird surveys are summarized in separate sections below, supplemented by appendices that present species-level detail on numbers of bird groups and observations observed during each season (Appendix A), species-level detail on seasonal use statistics (Appendix B), use by observation point for large and small bird types (Appendix C), and mapped flight paths for waterbirds, waterfowl, and diurnal raptor species (Appendix D).

Large Bird Surveys

During the Year 2 surveys, 383 60-minute (min) fixed-point large bird surveys were conducted at the Project over the course of 10 visits (Table 1). Not all points were surveyed each visit due to various constraints (e.g., inclement weather, limited access due to snow). Because the Year 1 survey period spanned approximately 14 months, the Year 2 surveys continued for a period of only 10 months, resulting in only a single visit completed in spring of Year 2.

Table 1. Summary of large bird species richness (species/800-meter plot/60-minute survey) and sample size by season and overall during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Season	Number of Visits	Number of Surveys Conducted	Number of Species	Large Bird Species Richness
Summer	3	117	14	1.36
Fall	2	78	11	1.59
Winter	4	156	14	0.51
Spring	1	32	12	1.31
Overall	**10**	**383**	**22**	**1.08**

800 meters = 2,625 feet

Species Richness and Species Composition

During 60-min large bird surveys, 8,459 observations were recorded among 706 separate groups (defined as one or more individuals), regardless of distance from the observer (Appendix A1). This included documentation of 22 separate large bird species (Table 1). Large bird species richness (mean number of species per plot per survey) was highest during fall (1.59), followed by summer (1.36), spring (1.31), and winter (0.51; Table 1).

Among the large bird types, waterfowl (7,170 observations in 39 groups) accounted for 84.8% of all large bird observations during the study period (Appendix A1). Most (98.6%) waterfowl observations comprised just two species: greater white-fronted geese (*Anser albifrons*; 5,457 observations) primarily recorded in fall, and snow geese (*Chen caerulescens*; 1,616 observations) primarily recorded in winter (Appendix A1). Other large bird types observed during surveys included vultures (469 observations), waterbirds (366 observations), doves/pigeons (147 observations), diurnal raptors (144 observations), large corvids (143 observations), upland game birds (11 observations), and goatsuckers (nine observations; Appendix A1).

Eleven diurnal raptor species were recorded during large bird surveys, the most common being red-tailed hawk (*Buteo jamaicensis*; 79 observations), sharp-shinned hawk (*Accipiter striatus*; 26 observations), and Cooper's hawk (*A. cooperii*; 16 observations; Appendix A1). A total of seven eagle observations were recorded during surveys, including six bald eagle observations and one golden eagle observation. Bald eagles were recorded primarily in winter (four observations), with only one bald eagle observation in each of summer and spring. The single golden eagle observation was recorded in spring (Appendix A1).

Bird Use, Percent of Use, and Frequency of Occurrence

Mean large bird use (birds per 800-meter [2,625-foot; ft] plot per 60-min survey), percent of use, and frequency of occurrence were calculated by season for all large bird types and species (Appendix B1). The highest overall large bird use occurred in fall (70.10), followed by spring (24.00), winter (11.44), and summer (3.75).

Waterbirds

Waterbird use, comprising two species, American white pelican (*Pelecanus erythrorhynchos*) and sandhill crane (*Antigone canadensis*), was highest in spring (9.88 birds/800-m plot/60-min survey), and much lower in fall (0.37) and winter (0.13); no waterbird use was recorded in summer (Appendix B1). Waterbirds accounted for 41.1% of overall large bird use in spring, all of which was attributed to sandhill crane. Waterbirds accounted for 1.2% of large bird use in winter and 0.5% in fall. Waterbirds were recorded during 9.4% of winter surveys, but only 2.6% and 1.3% of fall and winter surveys, respectively.

Waterfowl

Waterfowl use was highest in fall (65.71 birds/800-m plot/60-min survey), followed by spring (11.25), winter (10.69), and summer (0.15; Appendix B1). Use by four waterfowl species was documented during surveys, with greater white-fronted goose accounting for all (100%) waterfowl use in fall, and snow goose accounting for all (100%) waterfowl use in spring and the majority (75.3%) of use in winter. Other, less abundant waterfowl species recorded included Canada goose (*Branta canadensis*; summer and winter only) and tundra swan (*Cygnus columbianus*; winter only). Waterfowl accounted for over 90% of overall large bird use in fall and winter, and 46.9% in spring, but only 4.1% in summer. Waterfowl were observed most frequently during winter and fall (9.0% and 7.7% of surveys, respectively) and less often during spring and summer (3.1% and 0.9% of surveys, respectively; Appendix B1).

Diurnal Raptors

Diurnal raptor use was highest in fall (0.73 birds/800-m plot/60-min survey), followed by spring (0.53), summer (0.40), and winter (0.15; Appendix B1). Use by 11 diurnal raptor species was recorded during surveys, with red-tailed hawk having the highest use of any diurnal raptor species in all four seasons (range of 0.07 bird/800-m plot/60-min survey in winter to 0.35 in fall), accounting for 47.9% to 67.5% of diurnal raptor use in any given season. Among other diurnal raptor species, sharp-shinned hawk and Cooper's hawk had relatively higher use in fall (0.22 and

0.08 bird/800-m plot/60-min survey, respectively) and spring (0.06 and 0.09 bird/800-m plot/60-min survey, respectively). All other diurnal raptor species recorded during surveys had use estimates of 0.04 bird/800-m plot/60-min survey or less in any given season. Bald eagle use was 0.03 bird/800-m plot/60-min survey in both winter and spring, less than 0.01 in summer, and no use was reported in fall. Golden eagle use was recorded only in spring (0.03 bird/800-m plot/60-min survey). Diurnal raptors accounted for 10.7% of overall large bird use in summer, but only 1.0% to 2.2% in other seasons. Diurnal raptors were observed most frequently in fall (41.0% of fall surveys) and least frequently in winter (12.2% of winter surveys; Appendix B1).

Vultures

Use by vultures (i.e., turkey vulture [*Cathartes aura*]), was highest in summer (2.40 birds/800-m plot/60-min survey), followed by fall (1.90), spring (1.22), and winter (less than 0.01; Appendix B1). Vultures accounted for the majority (64.0%) of overall large bird use during summer, but less than 6.0% of large bird use in other seasons. Vultures were observed during 64.1% of summer surveys, 44.9% of fall surveys, 31.2% of spring surveys, and 0.6% of winter surveys (Appendix B1).

Upland Game Birds

Mountain quail (*Oreortyx pictus*) was the only upland game bird species observed during surveys (Appendix A1). Use by this species was recorded only in summer (0.09 bird/800-m plot/60-min survey) and spring (0.03; Appendix B1). Upland game birds accounted for 2.3% of overall large bird use in summer and 0.1% in spring, and were recorded during 7.7% of summer surveys and 3.1% of spring surveys (Appendix B1).

Doves/Pigeons

Band-tailed pigeon (*Patagioenas fasciata*) was the only dove/pigeon species recorded during surveys (Appendix A1). Use by this species was highest in fall (0.82 bird/800-m plot/60-min survey), followed by spring (0.66), summer (0.32), and winter (0.15). Doves/pigeons accounted for 8.7% of overall large bird use in summer, 2.7% in spring, 1.3% in winter, and 1.2% in fall. Doves/pigeons were recorded during 1.9% to 19.2% of surveys in any given season (Appendix B1).

Large Corvids

Common raven (*Corvus corax*) was the only large corvid species recorded during surveys (Appendix A1). Use by this species was highest in fall (0.58 bird/800-m plot/60-min survey), followed by spring (0.44), and summer and winter (each with 0.31). Large corvids accounted for 8.2% of overall large bird use in summer, but only 0.8% to 2.7% in other seasons. Large corvids were recorded during 15.4% to 23.1% of surveys in any given season (Appendix B1).

Goatsuckers

Use by goatsuckers (0.08 bird/800-m plot/60-min survey) was attributed to a single species, common nighthawk (*Chordeiles minor*), recorded only during summer (Appendix B1).

Goatsuckers accounted for 2.1% of overall large bird use in summer and were recorded during 3.4% of summer surveys (Appendix B1).

Flight Height Characteristics

Flight height characteristics, based on initial flight height observations and estimated use, were calculated for large bird types and raptor subtypes (Table 2). During the 60-min large bird surveys, 666 groups of large birds, totaling 8,411 observations, were observed flying within the 800-m radius plots. Overall, 9.9% of flying large birds were recorded within the rotor-swept heights (RSH) for turbine blades of 30-200 m (98-656 ft) above ground level, 89.3% were above the RSH, and 0.8% were below the RSH (Table 2). The large bird types most often recorded flying within the RSH were goatsuckers (100%), large corvids (96.7%), and vultures (77.1%; Table 2). Overall, diurnal raptors were recorded flying within the RSH during 71.8% of observations, with 23.2% recorded above the RSH and 4.9% below the RSH (Table 2). Among diurnal raptor subtypes, falcons were most often observed flying within the RSH (100%, but based only on a single observation), followed by accipiters 81.4%; Table 2). The majority of waterbirds and waterfowl were recorded above the RSH (74.6% and 99.1%, respectively; Table 2).

Table 2. Flight height characteristics by bird type and raptor subtype during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Type	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs Flying	% within Flight Height Categories*		
					0 - 30 m	30 - 200 m**	> 200 m
Waterbirds	10	366	350.00	100	0	25.4	74.6
Waterfowl	39	7,170	511.79	100	0	0.9	99.1
Diurnal Raptors	139	142	172.10	98.6	4.9	71.8	23.2
Accipiters	*43*	*43*	*107.14*	*97.7*	*14.0*	*81.4*	*4.7*
Buteos	*77*	*80*	*194.74*	*98.8*	*1.2*	*68.8*	*30.0*
Northern Harrier	*6*	*6*	*236.67*	*100*	*0*	*50.0*	*50.0*
Eagles	*7*	*7*	*220.00*	*100*	*0*	*71.4*	*28.6*
Falcons	*1*	*1*	*30.00*	*100*	*0*	*100*	*0*
Osprey	*4*	*4*	*207.50*	*100*	*0*	*75.0*	*25.0*
Other Raptors	*1*	*1*	*500.00*	*100*	*0*	*0*	*100*
Vultures	362	468	168.55	99.8	1.5	77.1	21.4
Upland Game Birds	0	0	-	0	-	-	-
Doves/Pigeons	44	134	40.82	91.2	36.6	63.4	0
Large Corvids	69	123	87.10	86.0	2.4	96.7	0.8
Goatsuckers	3	8	70.00	88.9	0	100	0
Overall	**666**	**8,411**	**174.79**	**99.4**	**0.8**	**9.9**	**89.3**

* Sums may not total 100% due to rounding

**The likely "rotor-swept height" for potential collision with a turbine blade, or 30-200 meters (m; 98-656 feet) above ground level

Obs = observations

Spatial Use

Mean use by point for all large birds, large bird types, and diurnal raptor subtypes is included in Appendix C1. For all large bird species combined, use (birds/60-min survey) was substantially higher at points 26 and 17 (459.70 and 109.10, respectively; Appendix C1). Use at points 26 and 17 was dominated by waterfowl, which accounted for 98.9% and 95.6% of large bird use at these points, respectively. Overall large bird use at other points varied widely, ranging from 0.40 bird/60-min survey at Point 22 to 39.80 at Point 10 (Appendix C1).

Waterfowl were observed across the Project area, with use recorded at 18 of the 39 observation points (Appendices C1 and D1). Alternatively, waterbird use was concentrated within the central portion of the Project area, with use recorded at just six of the 39 observation points, ranging from 0.80 to 15.50 birds/60-min survey (Appendices C1 and D1).

Diurnal raptor use (birds/60-min survey) was relatively consistent across the Project area, ranging from zero at points 23 and 35 to 1.00 bird/60-min survey at points 5, 17, and 26 (Appendix C1). Eagle use was recorded at six points, with use estimates ranging from 0.10 to 0.20 bird/60-min survey (Appendix C1). Obvious areas of concentrated use by eagles or other diurnal raptors or consistent flight patterns were not observed (Appendix D2 and D3). Vulture use was recorded at all 39 observation points, with use estimates ranging from 0.20 to 3.40 birds/60-min survey (Appendix C1).

Eagle Risk Minutes

Six bald eagle observations and one golden eagle observation were recorded within the Project area during 383 hours of large bird survey effort in Year 2 (Table 3). Bald eagles were observed in flight for a total of 16 minutes (Table 3). Of the 16 bald eagle minutes recorded during the study, five eagle risk minutes were recorded within the 800-m plots at flight heights of 200 m or less AGL (Table 3). The majority (80.0%) of bald eagle risk minutes were recorded in winter, with only a single bald eagle risk minute recorded in spring and no risk minutes recorded in summer or fall (Table 3). Bald eagle risk minutes per minute of survey were highest during spring (0.0312), followed by winter (0.0256; Table 3). The single golden eagle recorded during surveys was observed in flight for a total of five minutes, which resulted in a total of two golden eagle risk minutes recorded in spring (Table 3).

Bald eagle risk minutes were recorded at four of the 39 observation points (points 8, 20, 29, and 36; Appendix D4). Most of the bald eagle risk minutes were recorded at Point 20 (two risk minutes), with points 8, 29, and 36 contributing an additional one risk minute each. The two golden eagle risk minutes were recorded at Point 29 (Appendix D4).

Table 3. Bald eagle and golden eagle observations and risk minutes* (min) documented during 60-minute large bird surveys conducted at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Season	Survey Effort (Hours)	Observations	Total Flight Minutes	Risk Minutes	Risk Minutes per Minute Survey
Bald Eagle					
Summer (7/1 – 8/31)	117	1	6	0	0.0000
Fall (9/1 – 10/31)	78	0	0	0	0.0000
Winter (11/1 – 3/12)	156	4	9	4	0.0256
Spring (3/13 – 3/31)	32	1	1	1	0.0312
Total	**383**	**6**	**16**	**5**	**0.0131**
Golden Eagle					
Summer (7/1 – 8/31)	117	0	0	0	0.0000
Fall (9/1 – 10/31)	78	0	0	0	0.0000
Winter (11/1 – 3/12)	156	0	0	0	0.0000
Spring (3/13 – 3/31)	32	1	5	2	0.0625
Total	**383**	**1**	**5**	**2**	**0.0052**

* Risk minutes are defined as flying behavior at or below 200 meters (m; 656 feet [ft]) and within 800 m (2,625 ft) of the survey location.

Small Bird Surveys

During Year 2 surveys, 383 10-min fixed-point small bird surveys were completed at the Project during 10 visits, for a total of 63.8 hours of small bird survey effort (Table 4).

Table 4. Summary of small bird species richness (species/100-meter plot/10-minute survey), and sample size by season and overall during small bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Season	Number of Visits	Number of Surveys Conducted	Number of Species	Small Bird Species Richness
Summer	3	117	42	2.69
Fall	2	78	30	2.27
Winter	4	156	26	1.39
Spring	1	32	22	2.22
Overall	**10**	**383**	**50**	**2.05**

Species Richness and Species Composition

During 10-min small bird surveys, 1,711 small bird observations were recorded within 851 separate groups comprising 50 species (Table 4, Appendix A2). Small bird species richness was highest during summer (2.69 species per 100-m ([328-ft] plot per 10-min survey), followed by fall (2.27), spring (2.22), and winter (1.39; Table 4). Most (93.2%) small birds recorded were passerines (1,595 observations in 748 groups), with the most commonly observed species comprising mountain chickadee (*Poecile gambeli*; 166 observations), red-winged blackbird (*Agelaius phoeniceus*; 165 observations); western bluebird (*Sialia mexicana*; 142 observations), and Steller's jay (*Cyanocitta stelleri*; 133 observations; Appendix A2). Other small bird types recorded included woodpeckers (91 observations) and hummingbirds (25 observations; Appendix A2).

Bird Use, Percent of Use, and Frequency of Occurrence

Mean small bird use (birds/100-m plot/10-min survey), percent of use, and frequency of occurrence were calculated by season for all small bird species (Appendix B2). The highest small bird use was recorded in fall (7.54 birds/100-m plot/10-min survey), followed by spring (4.88), summer (4.84), and winter (2.50). Use by small birds was dominated by passerines during all four seasons. Higher small bird use in fall was primarily attributed to several large groups of red-winged blackbirds, resulting in a fall use estimate for this species of 2.12 birds/100-m plot/10-min survey (Appendix B2). The passerine species with the highest use in spring was western bluebird (1.91 birds/100-m plot/10-min survey), while dark-eyed junco (*Junco hyemalis*) had the highest use in summer (0.52), and mountain chickadee had the highest use in winter (0.51; Appendix B2). Use by woodpeckers was highest in fall (0.45 bird/100-m plot/10-min survey), followed by spring (0.22), summer (0.20), and winter (0.15; Appendix B2). Northern flicker (*Colaptes auratus*) had the highest use of any woodpecker species in summer (0.08 bird/100-m plot/10-min survey), fall (0.18), and spring (0.19), while white-headed woodpecker (*Picoides albolarvatus*) had the highest use in winter (0.06; Appendix B2). Hummingbird use was attributed to two identified species: Anna's hummingbird (*Calypte anna*) and rufous hummingbird (*Selasphorus rufus*), which together resulted in seasonal use ranging from 0.01 bird/100-m plot/10-min survey in fall to 0.14 in summer (Appendix B2).

Bird Flight Height and Behavior

During 10-min small bird surveys, 274 groups (977 observations) were recorded flying within the 100-m radius survey plots (Table 5). Of these, 42.4% were observed flying at heights within the estimated RSH and 57.6% were observed below the RSH; none were observed flying above the RSH (Table 5). Passerines were the small bird type most often observed flying within the RSH (44.2%; Table 5).

Table 5. Flight height characteristics by bird type during small bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Type	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs. Flying	% within Flight Height Categories		
					0 - 30 m	30 - 200 m*	> 200 m
Passerines	222	915	16.27	57.7	55.8	44.2	0
Swifts/Hummingbirds	24	25	12.00	100	92.0	8.0	0
Woodpeckers	28	37	19.00	42.0	78.4	21.6	0
Overall	**274**	**977**	**16.18**	**57.5**	**57.6**	**42.4**	**0**

*The likely "rotor-swept height" for potential collision with a turbine blade, or 30-200 meters (m; 98-656 feet) above ground level.

Obs = observations

Spatial Use

Small bird use varied among the 39 observation points. The highest small bird use was recorded at Point 32 (20.00 birds/10-min survey), while the lowest use was observed at points 34 and 15 (1.20 and 1.50, respectively). Small bird use at other points ranged from 1.60 to 9.22 birds/10-min survey (Appendix C2).

Incidental Observations

Twelve bird species and two mammal species were recorded incidentally during the Year 2 surveys (Table 6). Of the 12 bird species recorded incidentally, only three species, northern pygmy-owl (*Glaucidium gnoma*; one observation), wild turkey (*Meleagris gallopavo*; four observations), and mourning dove (*Zenaida macroura*; two observations), were not observed during standardized fixed-point surveys (Appendices A1 and A2).

Table 6. Summary of number of groups (grps) and observations (obs) of incidental wildlife observed while conducting surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Species	Scientific Name	# grps	# obs
northern goshawk	*Accipiter gentilis*	1	1
red-tailed hawk	*Buteo jamaicensis*	9	11
northern pygmy-owl	*Glaucidium gnoma*	1	1
turkey vulture	*Cathartes aura*	79	103
wild turkey	*Meleagris gallopavo*	2	4
mountain quail	*Oreortyx pictus*	11	11
band-tailed pigeon	*Patagioenas fasciata*	18	29
mourning dove	*Zenaida macroura*	2	2
common raven	*Corvus corax*	23	31
common nighthawk	*Chordeiles minor*	4	4
northern flicker	*Colaptes auratus*	13	14
pileated woodpecker	*Dryocopus pileatus*	11	11
Bird Total	**12 Species**	**174**	**222**
bobcat	*Lynx rufus*	1	1
black bear	*Ursus americanus*	1	1
Mammal Total	**2 Species**	**2**	**2**

Sensitive Species Observations

Ten bird species considered sensitive at the state and/or federal level were recorded during the Year 2 avian use surveys or incidentally (Table 7). At the state level, this included one state-endangered species (bald eagle), one state fully-protected species (golden eagle), and five state species of special concern (SSC; American white pelican, northern goshawk [*Accipiter gentilis*], northern harrier [*Circus hudsonius*], olive-sided flycatcher [*Contopus cooperi*], and yellow warbler [*Setophaga petechia*]; California Department of Fish and Wildlife [CDFW] 2018; Table 7). Additionally, sandhill crane was recorded during surveys; however, these observations were not identified to the subspecies level. The two subspecies potentially occurring at the Project include *Antigone canadensis tabida*, a state threatened species, and *A. c. canadensis*, a SSC (Table 7).

At the federal level, four species recorded during surveys are considered federal birds of conservation concern in the Sierra Nevada Bird Conservation Region (bald eagle, Cassin's finch [*Haemorhous cassinii*], Lewis's woodpecker [*Melanerpes lewis*], and olive-sided flycatcher; USFWS 2008). In addition, bald and golden eagles receive protection under the federal Bald and Golden Eagle Protection Act of 1940.

Table 7. Summary of sensitive species observed at the Fountain Wind Project during large bird and small bird surveys (LB/SB) and as incidental wildlife observations (Inc.) from 4 June 2018 to 31 March 2019.

			LB/SB		Inc.		Total	
Species	**Scientific Name**	**Status**	**#grps**	**# obs**	**# rps**	**# obs**	**#grps**	**#obs**
American white pelican	*Pelecanus erythrorhynchos*	SSC	4	42	0	0	4	42
bald eagle	*Haliaeetus leucocephalus*	EA; BCC; SE; FP	6	6	0	0	6	6
Cassin's finch	*Haemorhous cassinii*	BCC	4	9	0	0	4	9
golden eagle	*Aquila chrysaetos*	EA; FP	1	1	0	0	1	1
Lewis's woodpecker	*Melanerpes lewis*	BCC	2	10	0	0	2	10
northern goshawk	*Accipiter gentilis*	SSC	1	1	1	1	2	2
northern harrier	*Circus cyaneus*	SSC	6	6	0	0	6	6
olive-sided flycatcher	*Contopus cooperi*	BCC; SSC	6	6	0	0	6	6
sandhill crane	*Antigone canadensis*	ST/SSC**	6	324	0	0	6	324
yellow warbler	*Setophaga petechia*	SSC	3	3	0	0	3	3
Total	**10 Species**		**39**	**408**	**1**	**1**	**40**	**409**

*EA = Bald and Golden Eagle Protection Act of 1940, BCC = federal bird of conservation concern (USFWS 2008); SE = state endangered, ST = state threatened, FP = state fully protected, SSC = state species of special concern (California Department of Fish and Wildlife 2018).

**Observations of sandhill crane were not identified to subspecies level; greater sandhill crane (*A. c. tabida*) is a state-threatened species, while lesser sandhill crane (*A. c. canadensis*) is a state species of special concern.

Grps = groups, obs = observations

DISCUSSION

Following the tiered approach outlined in the WEG and ECPG, and consistent with the survey effort and methodologies recommended specifically for eagles in the ECPG, two full years of avian use surveys were conducted at the Project. Following the Year 1 surveys, conducted from April 2017 to May 2018, WEST prepared an avian use study report that included a detailed risk assessment (see Thompson et al. 2018). This risk assessment was based on the results of the Year 1 surveys that were reviewed in the context of existing publicly available data from post-construction fatality studies at wind energy facilities in the California and Pacific Northwest regions of the US (Thompson et al. 2018). The results of the Year 2 surveys presented herein were compared with the results from Year 1 to determine whether inter-annual variations in species composition or use, particularly for eagles and other sensitive species, warranted an update to the risk assessment presented in the Year 1 report.

In general, the results of the Year 2 surveys are consistent with those documented during Year 1 of the study. Overall use by large birds was higher in Year 2; however, this discrepancy was mainly attributed to the number and timing of several large groups of waterbirds and waterfowl, though species composition between the two years was nearly identical. Higher waterbird use in Year 2, specifically in spring, was attributed to several comparatively large groups of sandhill cranes (five groups totaling 316 observations), while higher waterfowl use in Year 2 was attributed to several large flocks of greater white-fronted geese (13 groups totaling 5,125 observations) recorded in fall. As a result of this increase in fall goose observations, waterfowl composed a much higher percentage of overall large bird use in Year 2 (85%) than in Year 1 (63%). However,

as in Year 1, the majority of waterfowl observations (about 99%) were recorded flying at heights well above the estimated RSH, and therefore, not considered to be at risk of collision with Project turbines.

Seasonal trends in diurnal raptor use (raptors/800-m plot/60-min survey) were very similar between years, with fall and spring having the highest use during both years. During Year 1, diurnal raptor use ranged from 0.23 to 0.56 raptor/800-m plot/60-min survey across seasons (Thompson et al. 2018), while in Year 2, diurnal raptor use ranged from 0.15 to 0.73. Species composition of raptors, was also similar between years with red-tailed hawk having the highest use during each season and overall for both Year 1 and Year 2, and sharp-shinned hawk having the second highest overall use during both years. Bald eagle use was somewhat lower during Year 2 of the study. Over the course of 383 hours of survey effort, only six bald eagle observations were recorded during Year 2 surveys, resulting in a total of five bald eagle risk minutes. In Year 1, over the course of 531 survey hours, 16 bald eagle observations were recorded, resulting in 35 bald eagle risk minutes during that year. During both survey years, the majority of bald eagle observations and risk minutes were recorded during winter. Golden eagle use of the Project was very low during both years of study (two observations in Year 1 and one observation in Year 2) and was limited to spring during both years. Vulture use was also consistent between years, with the lowest use occurring in winter and highest use occurring in summer for both Year 1 and Year 2.

Small bird species composition and use were also very similar between survey years, with the highest small bird use (birds/100-m plot/10-min survey) recorded in fall (5.61 in Year 1 and 7.54 in Year 2) and the lowest use recorded in winter (2.79 in Year 1 and 2.50 in Year 2). Higher fall use in Year 2 was primarily due to several relatively large flocks of red-winged blackbirds, which were not recorded in Year 1. Small bird species composing the majority of use during both study years included dark-eyed junco, mountain chickadee, western bluebird, and Steller's jay. In Year 2, the only sensitive species (including both large and small birds) recorded during surveys that was not also seen in Year 1 was Lewis's woodpecker, which is a federal BCC.

CONCLUSION

The results of the Year 2 surveys at the Project presented herein are consistent with the results of the initial year of study, both in species composition and seasonal and spatial trends in use. The avian risk assessment prepared as part of the Year 1 Avian Use Study Report (Thompson et al. 2018), therefore, remains a valid assessment of the potential impacts to avian species, including eagles and other special-status species, resulting from the development of the Project.

REFERENCES

Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code (USC) Section (§) 668-668d. Bald Eagle Protection Act of 1940, June 8, 1940, Chapter 278, § 2, 54 Statute (Stat.) 251; Expanded to include the related species of the golden eagle October 24, 1962, Public Law (PL) 87-884, 76 Stat. 1246. [as amended: October 23, 1972, PL 92-535, § 2, 86 Stat. 1065; November 8, 1978, PL 95-616, § 9, 92 Stat. 3114.].

California Department of Fish and Wildlife (CDFW). 2018. Special Animals List. California Natural Diversity Database. November 2018. Available online: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline

California Energy Commission (CEC) and California Department of Fish and Game (CDFG). 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. CEC, Renewables Committee, and Energy Facilities Siting Division, and CDFG, Resources Management and Policy Division. CEC-700-2007-008-CMF.

ESRI. 2019. World Imagery and Aerial Photos. (World Topo). ArcGIS Resource Center. Environmental Systems Research Institute (ESRI), producers of ArcGIS software. Redlands, California. Information online: http://www.arcgis.com/home/webmap/viewer.html?useExisting=1

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Thompson, J., A. Chatfield, and Q. Hays. 2018. Year 1 Avian Use Study Report and Risk Assessment for the Fountain Wind Project, Shasta County, California. Prepared for Pacific Wind Development LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon. October 2018.

US Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern 2008. December 2008. Division of Migratory Bird Management, Arlington, Virginia. Available online: https://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf

US Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf

US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Executive Summary and frontmatter + 103 pp. Available online: https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplan guidance.pdf

Appendix A. All Bird Types and Species Observed at the Fountain Wind Project during Fixed-Point Bird Use Surveys from 4 June 2018 – 31 March 2019

Appendix A1. Summary of number of groups (grps) and observations (obs) by bird type and species for 60-minute large bird surveys at the Fountain Wind Project* from 4 June 2018 – 31 March 2019.

		Summer		Fall		Winter		Spring		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Waterbirds		**0**	**0**	**3**	**29**	**2**	**21**	**5**	**316**	**10**	**366**
American white pelican	*Pelecanus erythrorhynchos*	0	0	3	29	1	13	0	0	4	42
sandhill crane	*Antigone canadensis*	0	0	0	0	1	8	5	316	6	324
Waterfowl		**1**	**18**	**13**	**5,125**	**24**	**1,667**	**1**	**360**	**39**	**7,170**
Canada goose	*Branta canadensis*	1	18	0	0	2	36	0	0	3	54
greater white-fronted goose	*Anser albifrons*	0	0	13	5,125	7	332	0	0	20	5,457
snow goose	*Chen caerulescens*	0	0	0	0	13	1,256	1	360	14	1,616
tundra swan	*Cygnus columbianus*	0	0	0	0	2	43	0	0	2	43
Diurnal Raptors		**45**	**47**	**56**	**57**	**23**	**23**	**17**	**17**	**141**	**144**
Accipiters		*9*	*9*	*24*	*24*	*6*	*6*	*5*	*5*	*44*	*44*
Cooper's hawk	*Accipiter cooperii*	4	4	6	6	3	3	3	3	16	16
northern goshawk	*Accipiter gentilis*	1	1	0	0	0	0	0	0	1	1
sharp-shinned hawk	*Accipiter striatus*	4	4	17	17	3	3	2	2	26	26
unidentified accipiter	*Accipiter* spp.	0	0	1	1	0	0	0	0	1	1
Buteos		*32*	*34*	*26*	*27*	*11*	*11*	*9*	*9*	*78*	*81*
ferruginous hawk	*Buteo regalis*	1	1	0	0	0	0	0	0	1	1
red-tailed hawk	*Buteo jamaicensis*	30	32	26	27	11	11	9	9	76	79
rough-legged hawk	*Buteo lagopus*	1	1	0	0	0	0	0	0	1	1
Northern Harrier		*0*	*0*	*3*	*3*	*2*	*2*	*1*	*1*	*6*	*6*
northern harrier	*Circus hudsonius*	0	0	3	3	2	2	1	1	6	6
Eagles		*1*	*1*	*0*	*0*	*4*	*4*	*2*	*2*	*7*	*7*
bald eagle	*Haliaeetus leucocephalus*	1	1	0	0	4	4	1	1	6	6
golden eagle	*Aquila chrysaetos*	0	0	0	0	0	0	1	1	1	1
Falcons		*0*	*0*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*
merlin	*Falco columbarius*	0	0	1	1	0	0	0	0	1	1
Osprey		*3*	*3*	*1*	*1*	*0*	*0*	*0*	*0*	*4*	*4*
osprey	*Pandion haliaetus*	3	3	1	1	0	0	0	0	4	4
Other Raptors		*0*	*0*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*
unidentified raptor		0	0	1	1	0	0	0	0	1	1
Vultures		**225**	**281**	**114**	**148**	**1**	**1**	**23**	**39**	**363**	**469**
turkey vulture	*Cathartes aura*	225	281	114	148	1	1	23	39	363	469

Appendix A1. Summary of number of groups (grps) and observations (obs) by bird type and species for 60-minute large bird surveys at the Fountain Wind Project* from 4 June 2018 – 31 March 2019.

		Summer		Fall		Winter		Spring		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Upland Game Birds		**9**	**10**	**0**	**0**	**0**	**0**	**1**	**1**	**10**	**11**
mountain quail	*Oreortyx pictus*	9	10	0	0	0	0	1	1	10	11
Doves/Pigeons		**20**	**38**	**22**	**64**	**3**	**24**	**6**	**21**	**51**	**147**
band-tailed pigeon	*Patagioenas fasciata*	20	38	22	64	3	24	6	21	51	147
Large Corvids		**26**	**36**	**20**	**45**	**35**	**48**	**7**	**14**	**88**	**143**
common raven	*Corvus corax*	26	36	20	45	35	48	7	14	88	143
Goatsuckers		**4**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**
common nighthawk	*Chordeiles minor*	4	9	0	0	0	0	0	0	4	9
Overall		**330**	**439**	**228**	**5,468**	**88**	**1,784**	**60**	**768**	**706**	**8,459**

* Regardless of distance from observer.

Appendix A2. Summary of number of groups (grps) and observations (obs) by bird type and species for 10-minute small bird surveys at the Fountain Wind Project* from 4 June 2018 – 31 March 2019.

		Summer		Fall		Winter		Spring		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Passerines		**314**	**533**	**161**	**553**	**206**	**364**	**67**	**145**	**748**	**1,595**
American robin	*Turdus migratorius*	12	28	3	6	12	46	0	0	27	80
Bewick's wren	*Thryomanes bewickii*	4	4	3	3	1	1	1	1	9	9
black-headed grosbeak	*Pheucticus melanocephalus*	1	1	0	0	0	0	0	0	1	1
black-tailed gnatcatcher	*Polioptila melanura*	1	1	0	0	0	0	0	0	1	1
black-throated gray warbler	*Setophaga nigrescens*	3	3	0	0	0	0	0	0	3	3
bushtit	*Psaltriparus minimus*	3	43	2	11	1	3	1	5	7	62
California scrub-jay	*Aphelocoma californica*	2	2	8	29	3	3	2	2	15	36
California towhee	*Melozone crissalis*	3	5	0	0	0	0	0	0	3	5
Cassin's finch	*Haemorhous cassinii*	0	0	1	1	1	1	2	7	4	9
Cassin's vireo	*Vireo cassinii*	4	4	0	0	0	0	0	0	4	4
Clark's nutcracker	*Nucifraga columbiana*	1	15	0	0	0	0	0	0	1	15
dark-eyed junco	*Junco hyemalis*	40	62	9	30	15	28	4	5	68	125
dusky flycatcher	*Empidonax oberholseri*	3	3	1	1	0	0	0	0	4	4
evening grosbeak	*Coccothraustes vespertinus*	1	7	1	25	0	0	0	0	2	32
fox sparrow	*Passerella iliaca*	10	11	0	0	1	1	1	1	12	13
golden-crowned kinglet	*Regulus satrapa*	1	1	10	17	26	43	6	17	43	78
green-tailed towhee	*Pipilo chlorurus*	1	1	0	0	0	0	0	0	1	1
hermit thrush	*Catharus guttatus*	2	2	1	1	1	1	0	0	4	4
Hutton's vireo	*Vireo huttoni*	2	2	0	0	3	4	1	1	6	7
lazuli bunting	*Passerina amoena*	3	4	0	0	0	0	0	0	3	4
lesser goldfinch	*Spinus psaltria*	2	5	0	0	0	0	0	0	2	5
mountain chickadee	*Poecile gambeli*	31	44	14	24	40	80	13	18	98	166
Nashville warbler	*Oreothlypis ruficapilla*	1	4	0	0	0	0	0	0	1	4
oak titmouse	*Baeolophus inornatus*	0	0	1	2	2	5	0	0	3	7
olive-sided flycatcher	*Contopus cooperi*	6	6	0	0	0	0	0	0	6	6
purple finch	*Haemorhous purpureus*	4	8	1	50	1	2	1	1	7	61
red-breasted nuthatch	*Sitta canadensis*	28	33	17	17	30	32	9	9	84	91
red-winged blackbird	*Agelaius phoeniceus*	0	0	3	165	0	0	0	0	3	165
ruby-crowned kinglet	*Regulus calendula*	0	0	5	5	10	13	1	1	16	19
song sparrow	*Melospiza melodia*	0	0	0	0	1	1	0	0	1	1
spotted towhee	*Pipilo maculatus*	30	31	10	10	6	6	1	1	47	48
Steller's jay	*Cyanocitta stelleri*	37	44	33	36	38	46	7	7	115	133
Townsend's solitaire	*Myadestes townsendi*	3	3	0	0	1	3	1	1	5	7
unidentified passerine		3	6	1	1	0	0	0	0	4	7
unidentified swallow		8	68	1	30	0	0	0	0	9	98

Appendix A2. Summary of number of groups (grps) and observations (obs) by bird type and species for 10-minute small bird surveys at the Fountain Wind Project* from 4 June 2018 – 31 March 2019.

		Summer		Fall		Winter		Spring		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
unidentified warbler		1	1	0	0	0	0	0	0	1	1
violet-green swallow	*Tachycineta thalassina*	0	0	1	20	0	0	1	4	2	24
western bluebird	*Sialia mexicana*	4	14	8	30	6	37	12	61	30	142
western tanager	*Piranga ludoviciana*	17	17	0	0	0	0	0	0	17	17
western wood-pewee	*Contopus sordidulus*	11	11	0	0	0	0	0	0	11	11
white-crowned sparrow	*Zonotrichia leucophrys*	0	0	1	1	0	0	0	0	1	1
wrentit	*Chamaea fasciata*	7	7	5	5	7	8	3	3	22	23
yellow warbler	*Setophaga petechia*	3	3	0	0	0	0	0	0	3	3
yellow-rumped warbler	*Setophaga coronata*	21	29	21	33	0	0	0	0	42	62
Swifts/Hummingbirds		**16**	**16**	**1**	**1**	**3**	**4**	**4**	**4**	**24**	**25**
Anna's hummingbird	*Calypte anna*	9	9	1	1	3	4	2	2	15	16
rufous hummingbird	*Selasphorus rufus*	0	0	0	0	0	0	2	2	2	2
unidentified hummingbird		7	7	0	0	0	0	0	0	7	7
Woodpeckers		**23**	**25**	**28**	**36**	**21**	**23**	**7**	**7**	**79**	**91**
northern flicker	*Colaptes auratus*	10	10	14	14	7	7	6	6	37	37
downy woodpecker	*Dryobates pubescens*	4	6	1	1	1	1	0	0	6	8
hairy woodpecker	*Dryobates villosus*	4	4	6	6	3	4	1	1	14	15
pileated woodpecker	*Dryocopus pileatus*	1	1	0	0	0	0	0	0	1	1
acorn woodpecker	*Melanerpes formicivorus*	0	0	1	1	0	0	0	0	1	1
Lewis's woodpecker	*Melanerpes lewis*	0	0	2	10	0	0	0	0	2	10
white-headed woodpecker	*Picoides albolarvatus*	3	3	3	3	9	10	0	0	15	16
red-breasted sapsucker	*Sphyrapicus ruber*	1	1	1	1	0	0	0	0	2	2
unidentified woodpecker		0	0	0	0	1	1	0	0	1	1
Overall		**353**	**574**	**190**	**590**	**230**	**391**	**78**	**156**	**851**	**1,711**

* Regardless of distance from observer.

Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Large Birds and Small Birds Observed during Fixed-Point Bird Use Surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019

Appendix B1. Mean large bird use (number of large birds/800-meter plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

	Mean Use				% of Use				% Frequency			
Type/Species	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**
Waterbirds	**0**	**0.37**	**0.13**	**9.88**	**0**	**0.5**	**1.2**	**41.1**	**0**	**2.6**	**1.3**	**9.4**
American white pelican	0	0.37	0.08	0	0	0.5	0.7	0	0	2.6	0.6	0
sandhill crane	0	0	0.05	9.88	0	0	0.4	41.1	0	0	0.6	9.4
Waterfowl	**0.15**	**65.71**	**10.69**	**11.25**	**4.1**	**93.7**	**93.4**	**46.9**	**0.9**	**7.7**	**9.0**	**3.1**
Canada goose	0.15	0	0.23	0	4.1	0	2.0	0	0.9	0	1.3	0
greater white-fronted goose	0	65.71	2.13	0	0	93.7	18.6	0	0	7.7	3.8	0
snow goose	0	0	8.05	11.25	0	0	70.4	46.9	0	0	4.5	3.1
tundra swan	0	0	0.28	0	0	0	2.4	0	0	0	1.3	0
Diurnal Raptors	**0.40**	**0.73**	**0.15**	**0.53**	**10.7**	**1.0**	**1.3**	**2.2**	**26.5**	**41.0**	**12.2**	**31.2**
Accipiters	*0.08*	*0.31*	*0.04*	*0.16*	*2.1*	*0.4*	*0.3*	*0.7*	*6.0*	*25.6*	*3.2*	*12.5*
Cooper's hawk	0.03	0.08	0.02	0.09	0.9	0.1	0.2	0.4	3.4	7.7	1.9	9.4
northern goshawk	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
sharp-shinned hawk	0.03	0.22	0.02	0.06	0.9	0.3	0.2	0.3	2.6	20.5	1.3	6.2
unidentified accipiter	0	0.01	0	0	0	<0.1	0	0	0	1.3	0	0
Buteos	*0.29*	*0.35*	*0.07*	*0.28*	*7.7*	*0.5*	*0.6*	*1.2*	*21.4*	*26.9*	*7.1*	*21.9*
red-tailed hawk	0.27	0.35	0.07	0.28	7.3	0.5	0.6	1.2	19.7	26.9	7.1	21.9
rough-legged hawk	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
ferruginous hawk	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
Northern Harrier	*0*	*0.04*	*0.01*	*0.03*	*0*	*<0.1*	*0.1*	*0.1*	*0*	*3.8*	*1.3*	*3.1*
northern harrier	0	0.04	0.01	0.03	0	<0.1	0.1	0.1	0	3.8	1.3	3.1
Eagles	*<0.01*	*0*	*0.03*	*0.06*	*0.2*	*0*	*0.2*	*0.3*	*0.9*	*0*	*2.6*	*3.1*
bald eagle	<0.01	0	0.03	0.03	0.2	0	0.2	0.1	0.9	0	2.6	3.1
golden eagle	0	0	0	0.03	0	0	0	0.1	0	0	0	3.1
Falcons	*0*	*0.01*	*0*	*0*	*0*	*<0.1*	*0*	*0*	*0*	*1.3*	*0*	*0*
merlin	0	0.01	0	0	0	<0.1	0	0	0	1.3	0	0
Osprey	*0.03*	*0.01*	*0*	*0*	*0.7*	*<0.1*	*0*	*0*	*2.6*	*1.3*	*0*	*0*
osprey	0.03	0.01	0	0	0.7	<0.1	0	0	2.6	1.3	0	0
Other Raptors	*0*	*0.01*	*0*	*0*	*0*	*<0.1*	*0*	*0*	*0*	*1.3*	*0*	*0*
unidentified raptor	0	0.01	0	0	0	<0.1	0	0	0	1.3	0	0
Vultures	**2.40**	**1.90**	**<0.01**	**1.22**	**64.0**	**2.7**	**<0.1**	**5.1**	**64.1**	**44.9**	**0.6**	**31.2**
turkey vulture	2.40	1.90	<0.01	1.22	64.0	2.7	<0.1	5.1	64.1	44.9	0.6	31.2

Appendix B1. Mean large bird use (number of large birds/800-meter plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

	Mean Use				% of Use				% Frequency			
Type/Species	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**
Upland Game Birds	**0.09**	**0**	**0**	**0.03**	**2.3**	**0**	**0**	**0.1**	**7.7**	**0**	**0**	**3.1**
mountain quail	0.09	0	0	0.03	2.3	0	0	0.1	7.7	0	0	3.1
Doves/Pigeons	**0.32**	**0.82**	**0.15**	**0.66**	**8.7**	**1.2**	**1.3**	**2.7**	**12.8**	**19.2**	**1.9**	**18.8**
band-tailed pigeon	0.32	0.82	0.15	0.66	8.7	1.2	1.3	2.7	12.8	19.2	1.9	18.8
Large Corvids	**0.31**	**0.58**	**0.31**	**0.44**	**8.2**	**0.8**	**2.7**	**1.8**	**15.4**	**23.1**	**21.8**	**18.8**
common raven	0.31	0.58	0.31	0.44	8.2	0.8	2.7	1.8	15.4	23.1	21.8	18.8
Goatsuckers	**0.08**	**0**	**0**	**0**	**2.1**	**0**	**0**	**0**	**3.4**	**0**	**0**	**0**
common nighthawk	0.08	0	0	0	2.1	0	0	0	3.4	0	0	0
Overall*	**3.75**	**70.10**	**11.44**	**24.00**	**100**	**100**	**100**	**100**				

* Sums may not total values shown due to rounding.

Appendix B2. Mean small bird use (number of small birds/100-meter plot/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season during small bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

	Mean Use				% of Use				% Frequency			
Type/Species	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**
Passerines	**4.50**	**7.08**	**2.33**	**4.53**	**93.1**	**93.9**	**93.1**	**92.9**	**91.5**	**80.8**	**64.7**	**75.0**
American robin	0.23	0.08	0.29	0	4.8	1	11.8	0	8.5	3.8	7.7	0
Bewick's wren	0.03	0.03	<0.01	0.03	0.7	0.3	0.3	0.6	3.4	2.6	0.6	3.1
black-headed grosbeak	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
black-tailed gnatcatcher	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
black-throated gray warbler	0.03	0	0	0	0.5	0	0	0	2.6	0	0	0
bushtit	0.37	0.14	0.02	0.16	7.6	1.9	0.8	3.2	2.6	2.6	0.6	3.1
California scrub-jay	0.02	0.37	0.02	0.06	0.4	4.9	0.8	1.3	1.7	9	1.3	6.2
California towhee	0.04	0	0	0	0.9	0	0	0	2.6	0	0	0
Cassin's finch	0	0.01	<0.01	0.22	0	0.2	0.3	4.5	0	1.3	0.6	6.2
Cassin's vireo	0.03	0	0	0	0.7	0	0	0	3.4	0	0	0
Clark's nutcracker	0.13	0	0	0	2.7	0	0	0	0.9	0	0	0
dark-eyed junco	0.52	0.38	0.18	0.16	10.8	5.1	7.2	3.2	29.1	11.5	9	12.5
dusky flycatcher	0.03	0.01	0	0	0.5	0.2	0	0	2.6	1.3	0	0
evening grosbeak	0.06	0.32	0	0	1.2	4.3	0	0	0.9	1.3	0	0
fox sparrow	0.09	0	<0.01	0.03	1.9	0	0.3	0.6	6.8	0	0.6	3.1
golden-crowned kinglet	<0.01	0.22	0.28	0.53	0.2	2.9	11	10.9	0.9	12.8	16	18.8
green-tailed towhee	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
hermit thrush	0.02	0.01	<0.01	0	0.4	0.2	0.3	0	0.9	1.3	0.6	0
Hutton's vireo	0.02	0	0.03	0.03	0.4	0	1	0.6	1.7	0	1.9	3.1
lazuli bunting	0.03	0	0	0	0.7	0	0	0	2.6	0	0	0
lesser goldfinch	0.04	0	0	0	0.9	0	0	0	1.7	0	0	0
mountain chickadee	0.38	0.31	0.51	0.56	7.8	4.1	20.5	11.5	23.9	16.7	25	34.4
Nashville warbler	0.03	0	0	0	0.7	0	0	0	0.9	0	0	0
oak titmouse	0	0.03	0.03	0	0	0.3	1.3	0	0	1.3	1.3	0
olive-sided flycatcher	0.05	0	0	0	1.1	0	0	0	5.1	0	0	0
purple finch	0.07	0.64	0.01	0.03	1.4	8.5	0.5	0.6	3.4	1.3	0.6	3.1
red-breasted nuthatch	0.27	0.22	0.21	0.28	5.7	2.9	8.2	5.8	23.1	21.8	17.3	25
red-winged blackbird	0	2.12	0	0	0	28.1	0	0	0	2.6	0	0
ruby-crowned kinglet	0	0.06	0.08	0.03	0	0.9	3.3	0.6	0	6.4	5.8	3.1
song sparrow	0	0	<0.01	0	0	0	0.3	0	0	0	0.6	0
spotted towhee	0.26	0.13	0.04	0.03	5.5	1.7	1.5	0.6	22.2	11.5	3.2	3.1
Steller's jay	0.35	0.46	0.29	0.22	7.2	6.1	11.5	4.5	26.5	37.2	22.4	18.8
Townsend's solitaire	0.03	0	0.02	0.03	0.5	0	0.8	0.6	2.6	0	0.6	3.1
unidentified passerine	0.05	0.01	0	0	1.1	0.2	0	0	2.6	1.3	0	0

Appendix B2. Mean small bird use (number of small birds/100-meter plot/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season during small bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

	Mean Use				% of Use				% Frequency			
Type/Species	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**
unidentified swallow	0.58	0.38	0	0	12	5.1	0	0	6.8	1.3	0	0
unidentified warbler	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
violet-green swallow	0	0.26	0	0.12	0	3.4	0	2.6	0	1.3	0	3.1
western bluebird	0.12	0.38	0.24	1.91	2.5	5.1	9.5	39.1	3.4	10.3	3.8	34.4
western tanager	0.15	0	0	0	3	0	0	0	12.8	0	0	0
western wood-pewee	0.09	0	0	0	1.9	0	0	0	9.4	0	0	0
white-crowned sparrow	0	0.01	0	0	0	0.2	0	0	0	1.3	0	0
wrentit	0.06	0.06	0.05	0.09	1.2	0.9	2.1	1.9	5.1	5.1	4.5	6.2
yellow warbler	0.03	0	0	0	0.5	0	0	0	2.6	0	0	0
yellow-rumped warbler	0.25	0.42	0	0	5.1	5.6	0	0	15.4	24.4	0	0
Swifts/Hummingbirds	**0.14**	**0.01**	**0.03**	**0.12**	**2.8**	**0.2**	**1.0**	**2.6**	**12.8**	**1.3**	**1.3**	**12.5**
Anna's hummingbird	0.08	0.01	0.03	0.06	1.6	0.2	1.0	1.3	7.7	1.3	1.3	6.2
rufous hummingbird	0	0	0	0.06	0	0	0	1.3	0	0	0	6.2
unidentified hummingbird	0.06	0	0	0	1.2	0	0	0	6.0	0	0	0
Woodpeckers	**0.20**	**0.45**	**0.15**	**0.22**	**4.1**	**6.0**	**5.9**	**4.5**	**12.8**	**30.8**	**12.8**	**18.8**
northern flicker	0.08	0.18	0.04	0.19	1.6	2.4	1.8	3.8	6.8	17.9	4.5	15.6
downy woodpecker	0.05	0.01	<0.01	0	1.1	0.2	0.3	0	3.4	1.3	0.6	0
hairy woodpecker	0.03	0.08	0.03	0.03	0.7	1.0	1.0	0.6	3.4	7.7	1.9	3.1
pileated woodpecker	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
Lewis's woodpecker	0	0.13	0	0	0	1.7	0	0	0	2.6	0	0
white-headed woodpecker	0.02	0.04	0.06	0	0.4	0.5	2.6	0	1.7	3.8	5.8	0
red-breasted sapsucker	<0.01	0.01	0	0	0.2	0.2	0	0	0.9	1.3	0	0
unidentified woodpecker	0	0	<0.01	0	0	0	0.3	0	0	0	0.6	0
Overall*	**4.84**	**7.54**	**2.50**	**4.88**	**100**	**100**	**100**	**100**				

* Sums may not total values shown due to rounding.

Appendix C. Mean Use by Point for All Birds, Major Bird Types, and Diurnal Raptor Subtypes during Fixed-Point Surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019

Appendix C1. Mean use (number of birds/800-meter plot/60-minute survey) by point for all large birds, major bird types, and diurnal raptor subtypes observed at the Fountain Wind Project during large bird surveys from 4 June 2018 – 31 March 2019.

Obs. Pt.	Waterbirds	Waterfowl	Diurnal Raptors	*Accipiters*	*Buteos*	*Northern Harrier*	*Eagles*	*Falcons*	*Osprey*	Other Raptors	Vultures	Upland Game Birds	Doves/ Pigeons	Large Corvids	Goatsuckers	All Large Birds*
1	0	0	0.22	*0.11*	*0*	*0*	*0.11*	*0*	*0*	0	0.78	0	0.33	0.22	0	**1.56**
2	0	0	0.22	*0*	*0.22*	*0*	*0*	*0*	*0*	0	0.67	0	0	0.78	0	**1.67**
3	0	22.44	0.33	*0*	*0.22*	*0.11*	*0*	*0*	*0*	0	0.33	0	0	0	0	**23.11**
4	0	0	0.22	*0.11*	*0.11*	*0*	*0*	*0*	*0*	0	0.44	0	0.22	0.22	0.11	**1.22**
5	0	3.33	1.00	*0.56*	*0.33*	*0*	*0*	*0*	*0.11*	0	1.33	0	0.67	0.44	0	**6.78**
6	0	0	0.33	*0.11*	*0.22*	*0*	*0*	*0*	*0*	0	0.56	0	1.22	0.44	0	**2.56**
7	0	0	0.11	*0*	*0.11*	*0*	*0*	*0*	*0*	0	0.67	0	0	0.56	0	**1.33**
8	0	0	0.10	*0*	*0*	*0*	*0.10*	*0*	*0*	0	0.40	0	0.10	0	0	**0.60**
9	0	5.70	0.30	*0.10*	*0.20*	*0*	*0*	*0*	*0*	0	0.70	0	0.10	0.30	0	**7.10**
10	0	38.20	0.20	*0*	*0.20*	*0*	*0*	*0*	*0*	0	1.00	0	0	0.40	0	**39.80**
11	0	4.00	0.30	*0.10*	*0.20*	*0*	*0*	*0*	*0*	0	1.60	0	0.10	0.40	0.20	**6.60**
12	0	1.50	0.10	*0*	*0.10*	*0*	*0*	*0*	*0*	0	1.10	0	0	0.20	0	**2.90**
13	0	0	0.20	*0*	*0.20*	*0*	*0*	*0*	*0*	0	0.50	0.10	1.00	0.30	0	**2.10**
14	0	0	0.40	*0*	*0.40*	*0*	*0*	*0*	*0*	0	1.10	0	0	0.30	0	**1.80**
15	0	0	0.40	*0.20*	*0.10*	*0.10*	*0*	*0*	*0*	0	1.00	0	0.80	0.50	0	**2.70**
16	0	0	0.10	*0*	*0.10*	*0*	*0*	*0*	*0*	0	0.70	0.20	1.50	0.10	0	**2.60**
17	0	104.30	1.00	*0.60*	*0.40*	*0*	*0*	*0*	*0*	0	3.40	0	0	0.40	0	**109.10**
18	0	2.00	0.50	*0.20*	*0.30*	*0*	*0*	*0*	*0*	0	3.30	0.10	1.10	0.30	0	**7.30**
19	0	0	0.50	*0*	*0.50*	*0*	*0*	*0*	*0*	0	0.80	0	0	0	0	**1.30**
20	0	0	0.60	*0.10*	*0.30*	*0.10*	*0.10*	*0*	*0*	0	0.60	0.10	0.70	0.30	0	**2.30**
21	0	1.80	0.10	*0.10*	*0*	*0*	*0*	*0*	*0*	0	2.90	0.20	0.10	0.20	0.20	**5.50**
22	0	0	0.20	*0.10*	*0.10*	*0*	*0*	*0*	*0*	0	0.20	0	0	0	0	**0.40**
23	0	7.40	0	*0*	*0*	*0*	*0*	*0*	*0*	0	0.80	0	1.00	0.10	0	**9.30**
24	0	14.40	0.40	*0.30*	*0.10*	*0*	*0*	*0*	*0*	0	2.70	0	0.10	0.80	0	**18.40**
25	0.80	3.10	0.50	*0.10*	*0.20*	*0.10*	*0.10*	*0*	*0*	0	1.90	0	0	0.70	0	**7.00**
26	0	454.80	1.00	*0.60*	*0.40*	*0*	*0*	*0*	*0*	0	3.00	0	0	0.90	0	**459.70**
27	0	36.00	0.20	*0.10*	*0.10*	*0*	*0*	*0*	*0*	0	0.90	0	0.80	0.40	0	**38.30**
28	4.00	16.30	0.40	*0.10*	*0.10*	*0*	*0*	*0*	*0.20*	0	0.90	0	0	0.10	0	**21.70**
29	12.30	0	0.50	*0*	*0.30*	*0*	*0.20*	*0*	*0*	0	1.40	0	0.30	0.20	0	**14.70**
30	2.70	0	0.50	*0.20*	*0.30*	*0*	*0*	*0*	*0*	0	2.00	0.30	0.40	0.30	0	**6.20**
31	1.30	0.80	0.10	*0*	*0.10*	*0*	*0*	*0*	*0*	0	0.80	0	0.30	0.20	0	**3.50**
32	15.50	0	0.70	*0*	*0.70*	*0*	*0*	*0*	*0*	0	0.90	0	0.40	0.20	0	**17.70**

Appendix C1. Mean use (number of birds/800-meter plot/60-minute survey) by point for all large birds, major bird types, and diurnal raptor subtypes observed at the Fountain Wind Project during large bird surveys from 4 June 2018 – 31 March 2019.

Obs. Pt.	Waterbirds	Waterfowl	Diurnal Raptors	*Accipiters*	*Buteos*	*Northern Harrier*	*Eagles*	*Falcons*	*Osprey*	Other Raptors	Vultures	Upland Game Birds	Doves/ Pigeons	Large Corvids	Goatsuckers	All Large Birds*
33	0	0	0.30	*0.10*	*0.20*	*0*	*0*	*0*	*0*	0	0.70	0	0	0.30	0.40	**1.70**
34	0	0	0.80	*0.30*	*0.40*	*0.10*	*0*	*0*	*0*	0	0.90	0	0.40	0.20	0	**2.30**
35	0	0	0	*0*	*0*	*0*	*0*	*0*	*0*	0	1.30	0	0.50	0.20	0	**2.00**
36	0	2.30	0.10	*0*	*0*	*0*	*0.10*	*0*	*0*	0	1.70	0.10	0.20	0.10	0	**4.50**
37	0	1.20	0.60	*0.10*	*0.30*	*0*	*0*	*0.10*	*0.10*	0	0.90	0	0.20	0.40	0	**3.30**
38	0	0	0.80	*0.10*	*0.60*	*0*	*0*	*0*	*0*	0.10	0.90	0	2.40	1.80	0	**5.90**
39	0	0	0.30	*0.10*	*0.10*	*0.10*	*0*	*0*	*0*	0	1.60	0	0	1.30	0	**3.20**

Obs. Pt. = observation point.

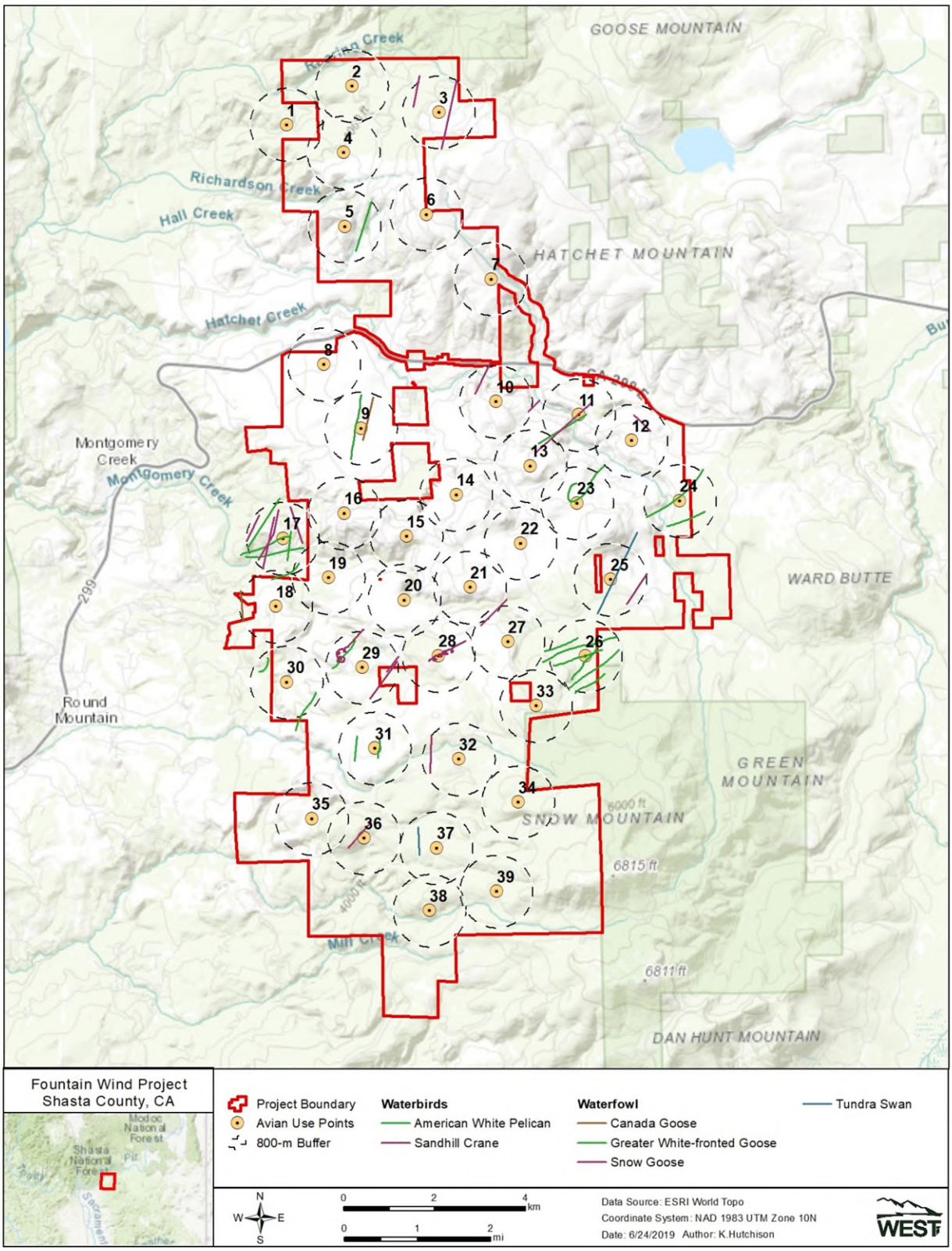
* Sums may not total values shown due to rounding.

Appendix C2. Mean use (number of birds/100-meter plot/10-minute survey) by point for all small birds and major small bird types observed at the Fountain Wind Project during small bird surveys from 4 June 2018 – 31 March 2019.

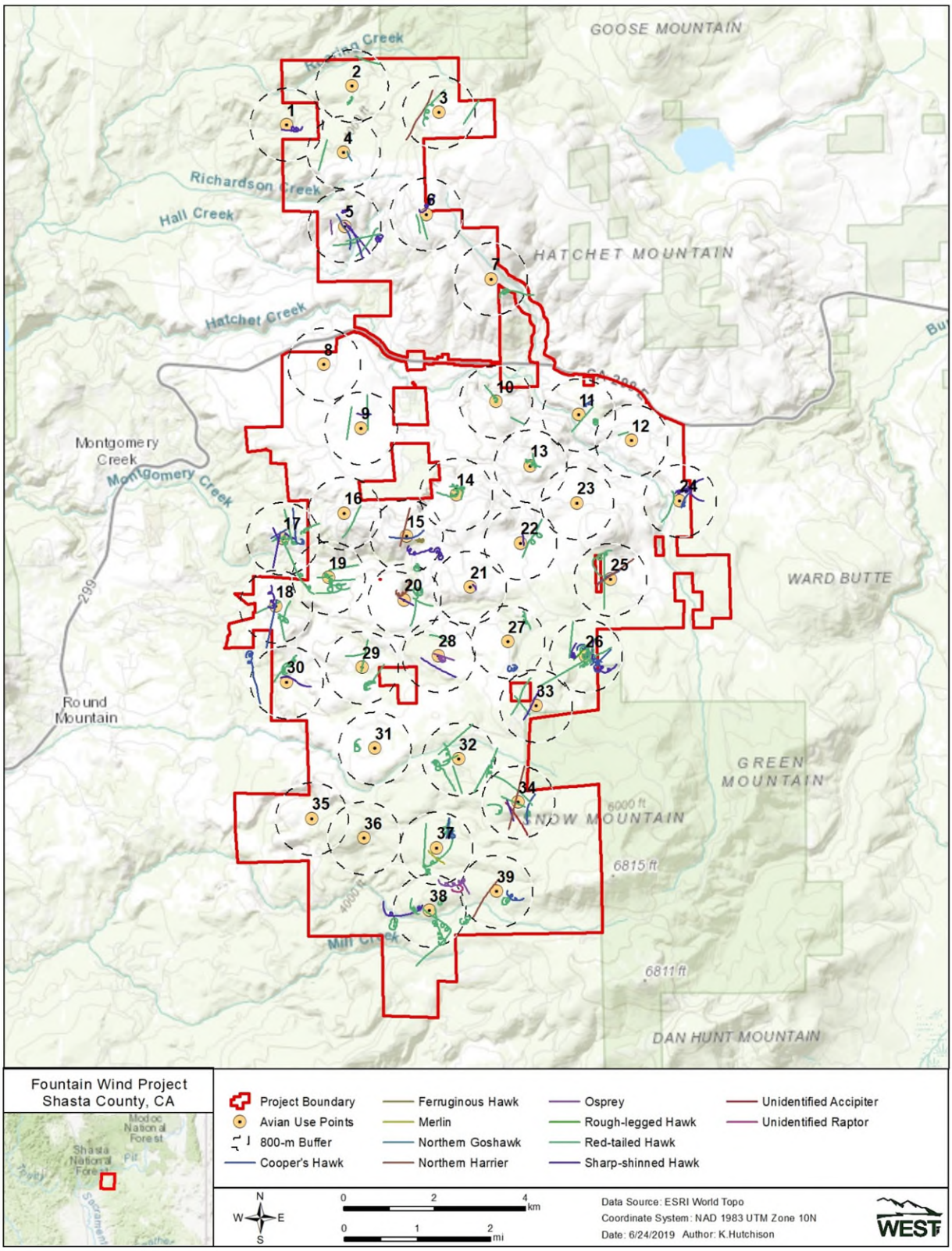
Observation Point	Passerines	Swifts/ Hummingbirds	Woodpeckers	All Small Birds*
1	3.89	0	0.11	**4.00**
2	2.56	0.11	0.22	**2.89**
3	6.33	0.22	0.56	**7.11**
4	8.56	0	0.67	**9.22**
5	7.56	0.44	0.56	**8.56**
6	2.00	0.22	0	**2.22**
7	2.44	0	0.11	**2.56**
8	2.20	0.10	0	**2.30**
9	4.40	0	0.10	**4.50**
10	6.00	0	0	**6.00**
11	3.90	0.20	0.30	**4.40**
12	2.60	0	0.20	**2.80**
13	2.60	0	0.20	**2.80**
14	2.20	0	0	**2.20**
15	1.40	0.10	0	**1.50**
16	3.20	0.10	0.20	**3.50**
17	8.00	0.30	0.30	**8.60**
18	3.00	0	0.20	**3.20**
19	3.10	0	0	**3.10**
20	4.80	0	0.10	**4.90**
21	3.40	0	0.30	**3.70**
22	1.60	0	0	**1.60**
23	3.00	0	0.20	**3.20**
24	5.60	0	0.10	**5.70**
25	3.10	0.10	0.20	**3.40**
26	7.30	0	0.30	**7.60**
27	3.50	0	0.70	**4.20**
28	5.50	0	0.30	**5.80**
29	1.30	0.10	0.30	**1.70**
30	2.70	0.30	0.60	**3.60**
31	2.80	0.10	0.30	**3.20**
32	19.70	0	0.30	**20.00**
33	2.80	0	0.30	**3.10**
34	1.10	0	0.10	**1.20**
35	4.40	0.10	0.40	**4.90**
36	5.20	0	0.30	**5.50**
37	3.90	0	0.50	**4.40**
38	2.50	0	0	**2.50**
39	1.90	0.10	0	**2.00**

* Sums may not total values shown due to rounding.

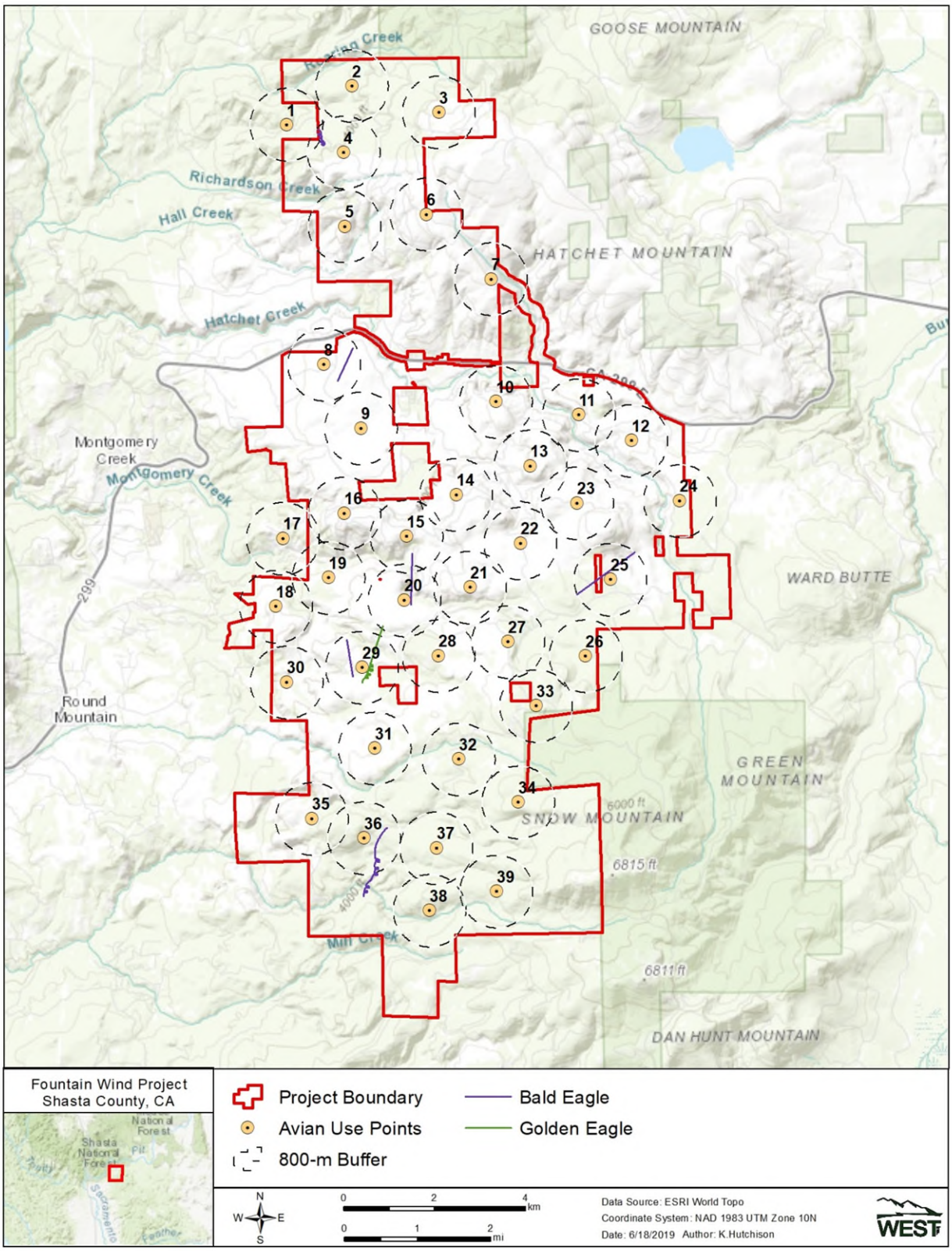
Appendix D. Flight Paths of Waterbirds, Waterfowl, Diurnal Raptors (Non-Eagle), and Eagles Recorded during Fixed-Point Avian Use Surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019



Appendix D1. Waterbird and waterfowl flight paths recorded during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.



Appendix D2. Diurnal raptor (non-eagle) flight paths recorded during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.



Appendix D3. Eagle flight paths recorded during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

C7. Year 1 Avian Use Study Report and Risk Assessment for the Fountain Wind Project

Year 1 Avian Use Study Report and Risk Assessment for the Fountain Wind Project

Shasta County, California

Prepared for:

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Privileged and Confidential – Not for Distribution

EXECUTIVE SUMMARY

In April 2017, Western EcoSystems Technology, Inc. (WEST) initiated an avian use study at the proposed Fountain Wind Project (Project) in Shasta County, California. The study was conducted following the tiered approach outlined in the US Fish and Wildlife Service (USFWS) Land-Based Wind Energy Guidelines and USFWS Eagle Conservation Plan Guidance (ECPG), and included the following principle objectives: 1) to assess the relative abundance and spatial and temporal distribution of birds throughout the Project area and 2) to evaluate the potential for adverse impacts to avian species, particularly eagles, other diurnal raptors, and species of regulatory or management concern. This report includes methods and results for the Year 1 avian use study at the Project, as well as an assessment of potential risk to avian species resulting from Project development.

Fixed-point avian use surveys were conducted at 39 observation points located throughout the Project area from 19 April 2017 through 22 May 2018. Two separate surveys were conducted at each point every month: a 10-minute (min) small bird survey followed immediately by a 60-min large bird survey. Over the course of the study, 531 large bird surveys were completed and a total of 3,267 large bird observations including 25 species were recorded. Large bird use was highest in winter, largely due to high use by waterfowl. Diurnal raptor use was highest during the fall (0.56 birds/plot/60-min survey) and lowest during summer (0.23). The most common raptor species observed in the Project was red-tailed hawk (148 observations), which composed 69% of overall diurnal raptor observations. This was followed by sharp-shinned hawk (18 observations), bald eagle (16 observations), and Cooper's hawk (nine observations). Diurnal raptors were observed at all 39 points with the highest use occurring at Point 30 (1.92 birds/60-min survey).

Over the course of the 531 small bird surveys conducted during the Year 1 study, a total of 2,408 small bird observations, comprising 71 separate species, were recorded. Six species (dark-eyed junco, mountain chickadee, western bluebird, red-breasted nuthatch, Steller's jay, and yellow-rumped warbler) accounted for nearly half (49.2%) of all small bird observations. The highest small bird use was recorded in fall (5.61 birds/plot/10-min survey), followed by summer (4.23), spring (3.56), and winter (2.79). Small bird use varied among the 39 observation points, with the highest use recorded at points 17 and 7 (8.77 and 7.14 birds/10-min survey, respectively), and the lowest use at points 39 and 15 (2.15 and 2.29).

During surveys or incidentally, 10 bird species considered sensitive at the state and/or federal level were recorded within the Project area. At the state level this included two state fully protected species (bald eagle and golden eagle), and six state species of special concern (American white pelican, northern goshawk, northern harrier, olive-sided flycatcher, Vaux's swift, and yellow warbler). Additionally, sandhill crane was recorded during surveys. Depending on the subspecies of sandhill crane observed, these were either state-threatened or state species of special concern; identification to subspecies level was not possible. Species considered sensitive at the federal level included four bird species of conservation concern in

the Sierra Nevada Bird Conservation Region (bald eagle, Cassin's finch, northern goshawk, and olive-sided flycatcher). Additionally, bald and golden eagles receive protection under the federal Bald and Golden Eagle Protection Act.

To date, overall fatality rates for birds at wind energy facilities in California and the Pacific Northwest have ranged from 0.16 to 17.44 fatalities/MW/year, while diurnal raptor fatality rates at these same facilities have ranged from zero to 1.06 fatalities/MW/year. However, the forested habitats covering the majority of the Project area are unique to wind energy facilities in the western US, which are more typically composed of desert scrub, grassland, and shrub-steppe vegetation communities, potentially limiting the inference from studies conducted at most other facilities. The one exception to this is the Hatchet Ridge Wind Energy Facility (Hatchet Ridge), located adjacent the Project and having similar ecological characteristics. Because of the proximity and similarity of Hatchet Ridge to the Project, Hatchet Ridge represents the most relevant source of information for assessing potential risk to avian species at the Project. The results of pre-construction avian use surveys conducted at Hatchet Ridge were largely consistent with those documented at the Project during this study, and based on post-construction monitoring data collected at Hatchet Ridge, all bird, small bird, and diurnal raptor fatality rates have all been low and within the range of other facilities in California and the Pacific Northwest. Given the similarity in species composition and temporal use patterns reported at Hatchet Ridge and observed at the Project, it is reasonable to expect that fatality rates and species composition of fatalities at the Project would be similar to that documented at Hatchet Ridge. Following recommendations presented in the ECPG, a second year of large bird/eagle use surveys is currently underway at the Project and because field studies were being conducted to gather a second year of large bird/eagle use data, Pacific Wind opted to capitalize on the efficiency of being in the field and is also completing a second year of small bird use surveys. An updated risk assessment will be prepared following the completion of the second year of surveys, in early summer 2019. The updated risk assessment will focus on risk to bald and golden eagles, as well as any inter-annual variations in species composition or use documented during the Year 2 surveys that may influence perceived risk to avian species at the Project.

STUDY PARTICIPANTS

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REPORT REFERENCE

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INTRODUCTION

In 2016, Pacific Wind Development, LLC contracted Western EcoSystems Technology, Inc. (WEST) to conduct an avian use study at the proposed Fountain Wind Project (Project) to evaluate the potential impacts of Project construction and operation on birds. Agency guidelines regarding the study of wildlife and how to assess potential impacts of wind energy on wildlife have evolved over the past 10 years, with the most current guidance from the USFWS provided in the Land-based Wind Energy Guidelines (WEG; USFWS 2012) and Eagle Conservation Plan Guidance (ECPG; USFWS 2013). The study was designed to address the questions posed under Tier 3 of the WEG (USFWS 2012) and Stage 2 of the ECPG (USFWS 2013), while also collecting data comparable to those recommended in the more dated California Wind Energy Guidelines (CEC Guidelines; CEC and CDFG 2007). Similar to the WEG, the CEC Guidelines identify modified point counts surveys (i.e., bird use counts) as the primary survey technique to collect data on bird species composition, relative abundance, and bird behavior that might influence vulnerability to collisions with wind turbines (see top of page 44 of the CEC/CDFG Guidelines). Recommendations in the WEG, ECPG, and CEC Guidelines all result in data sufficient to document species composition, relative abundance, and behavior; therefore, to reconcile the slightly differing protocols as presented in the various guidelines, implementation of the more current ECPG (and WEG) were given precedent over strict interpretation of the CEC Guidelines.

The primary objectives of the study were to: 1) assess the relative abundance and spatial and temporal distribution of birds throughout the Project area and 2) evaluate the potential for adverse impacts to avian species, particularly eagles, other diurnal raptors, and species of regulatory or management concern. This document provides the results of fixed-point avian use surveys conducted at the Project from April 2017 to May 2018, which represents the first 13 months (Year 1) of the two-year study. In addition to a detailed description of survey methodology and results, this document presents an assessment of potential risk to avian species at the Project based on the Year 1 survey results.

STUDY AREA

The Project area includes approximately 32,000 acres (ac; 12,950 hectares [ha]) within Shasta County in northern California, northeast of the community of Redding (Figure 1). The Project is located within the Cascades Ecological Region (ecoregion; Griffith et al. 2016), which is a Level III Ecoregion primarily covering parts of Oregon and Washington but also including a discontinuous land area near Mount Shasta in California. This ecoregion is marked by a generally mesic, temperate climate which supports productive coniferous forests. At higher elevations, subalpine meadows provide habitat for unique flora and fauna. The land cover types within the Project area are predominantly coniferous forest (54.7%) and shrub/scrub (38.3%), with the shrub/scrub mostly comprising recently harvested stands of coniferous forest that have been replanted with conifer trees but also have a high shrub component (Figure 2, Table 1). Small areas of mixed montane chaparral and herbaceous vegetation (i.e., grassland) are

scattered throughout the Project area (Figure 2, Table 1). Wetlands occur within the Project area primarily as riverine habitats, with much smaller areas of wet montane meadow and open water (Figure 2, Table 1). Remaining land cover within the Project is composed of very small areas of barren land, mixed forest, developed areas, and cultivated cropland (Table 1, Figure 2).

Table 1. Land cover types within the Fountain Wind Project area according to National Land Cover Data (US Geological Survey [USGS] National Land Cover Database [NLCD] 2011, Homer et al. 2015).

Land Cover	Acres	% Composition
Coniferous Forest	17,786.16	54.7
Shrub/Scrub	12,430.51	38.3
Herbaceous	1,516.25	4.7
Deciduous Forest	344.15	1.1
Barren Land	205.18	0.6
Mixed Forest	95.09	0.3
Developed, Open Space	74.90	0.2
Emergent Herbaceous Wetlands	21.26	0.1
Developed, Low Intensity	8.13	<0.01
Cultivated Crops	5.71	<0.01
Total	**32,487.34**	**100**

Dominant overstory species within the Project area include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*). A number of permanent and intermittent streams run throughout the Project area, flowing primarily to the west and northwest. The primary drainages in the north are Hatchet Creek and Montgomery Creek (north and south forks), while Cedar Creek and Little Cow Creek drain the southern portions of the Project area. Riparian vegetation along these creeks includes various willow species (*Salix* spp.), thinleaf alder (*Alnus incana* ssp. *tenuifolia*), several species of maple (*Acer* spp.), mountain dogwood (*Cornus nuttallii*), and California hazel (*Corylus cornuta* var. *californica*).

The Project area is entirely privately owned and actively managed for commercial timber production. In 1992 the Fountain Fire burned approximately 64,000 ac (25,900 ha) in and around the Project, including an area encompassing the north-central half of the Project area. Post-fire management included salvage logging, site preparation, and planting in the year following the fire. As of 2018, the burned portion of the Project area comprises mostly contiguous stands of roughly 25-30 year old timber. As a result of the Fountain Fire, merchantable timber is primarily confined to the southern half of the Project area, where ongoing harvest operations are regularly occurring (Figure 3). Given that the Project area is privately owned and managed for timber production, current and future commercial timber operations will continue to alter the landscape within the Project area, with older forests being harvested and replanted with conifer seedlings that eventually transition from a shrub-scrub cover type to densely treed early- seral forests over the following 10-20 years. As timber management changes the landscape within the Project area, bird communities will also change spatially within the Project area.

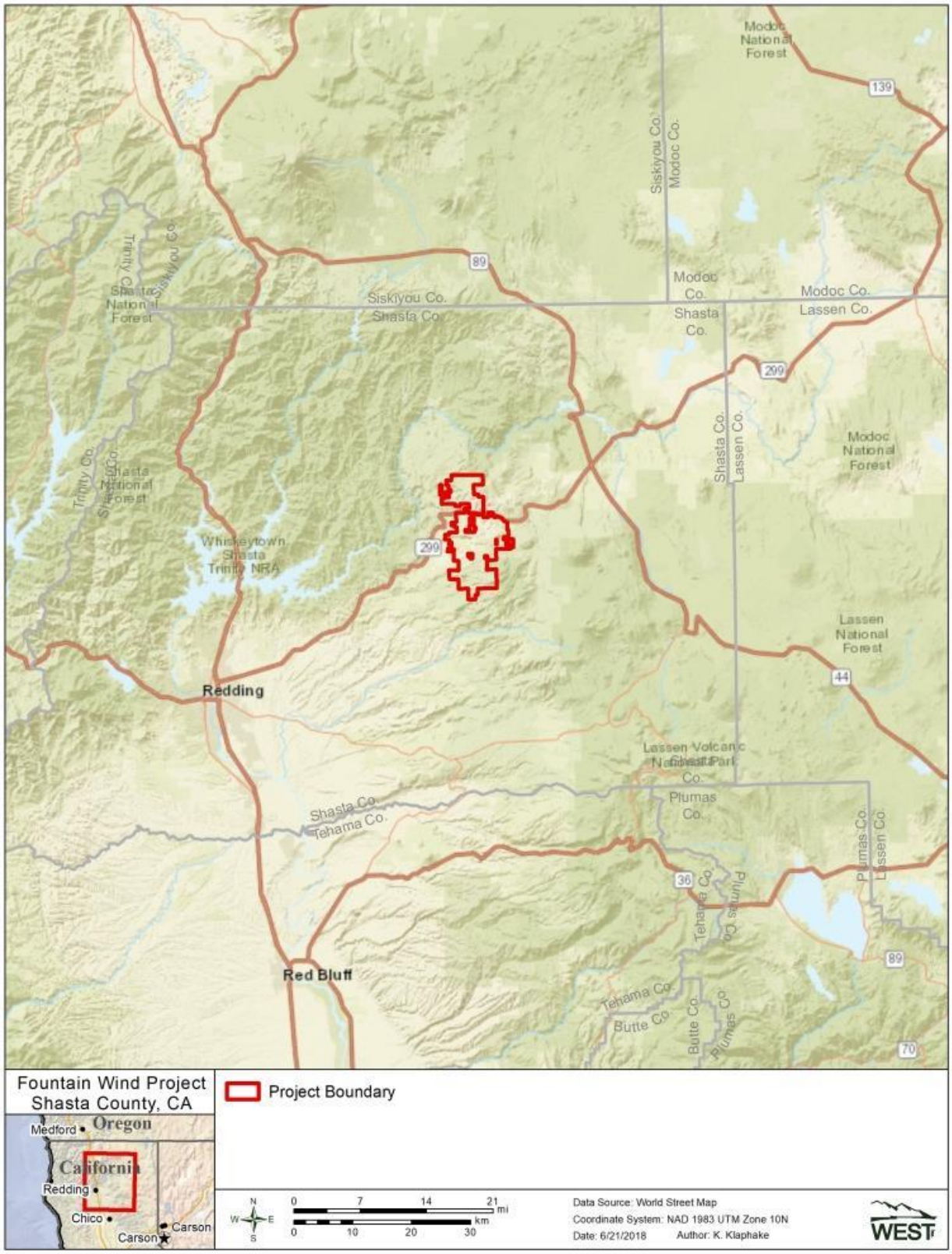


Figure 1. Location of the Fountain Wind Project, Shasta County, California

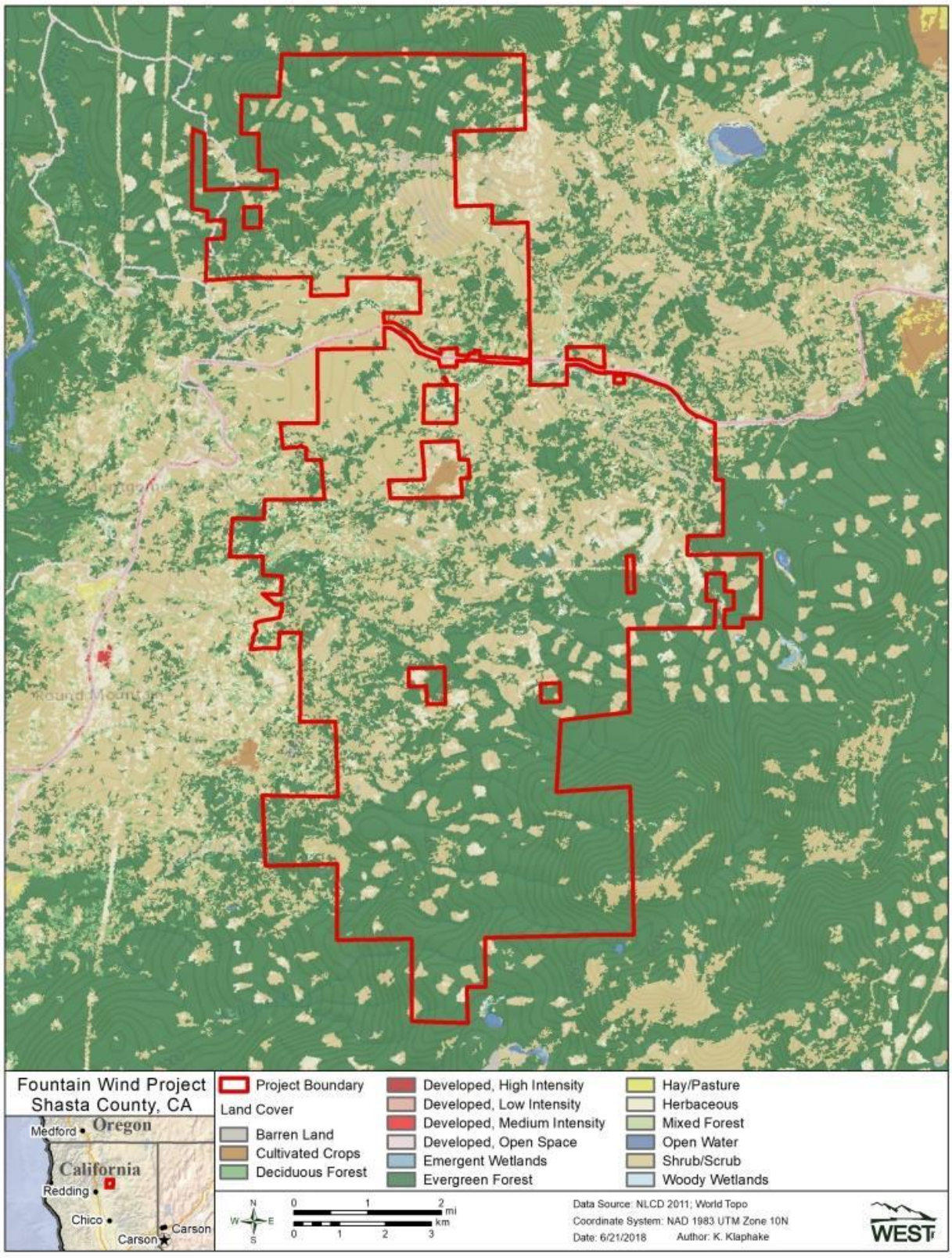


Figure 2. The land cover types and coverages within the Fountain Wind Project, Shasta County, California (US Geological Survey National Land Cover Database 2011, Homer et al. 2015).

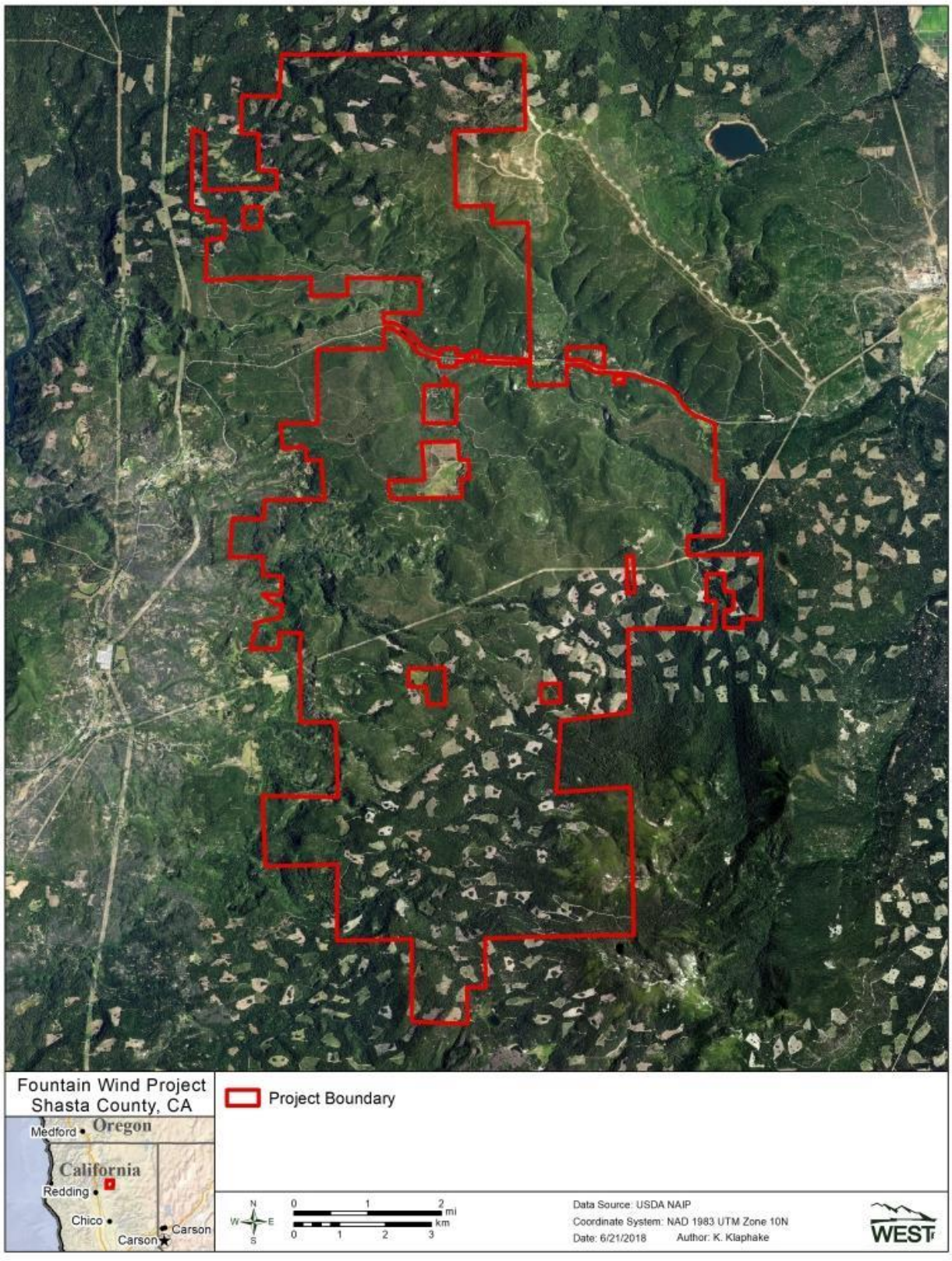


Figure 3. Aerial imagery of the Fountain Wind Project, Shasta County, California.

METHODS

Point-count surveys are the most widely used methodology for pre-construction avian use characterization and risk analyses (e.g., USFWS "Tier 3" studies [USFWS 2012]) because of their effectiveness and efficiency for characterizing use of selected sites by a broad spectrum of diurnally active birds (Ralph et al. 1993, Strickland et al. 2011). Fixed-point avian use surveys for both large and small birds were conducted using the field methods described by Reynolds et al. (1980). Survey methodologies were generally comparable to those used at other wind energy sites in California and the Pacific Northwest and were consistent with methods and survey effort recommended in the WEG and ECPG (USFWS 2012, 2013), as well as the CEC Guidelines (CEC and CDFG 2007). Separate surveys were conducted for large and small birds.

Large Bird Surveys

The primary objective of the large bird surveys was to estimate the seasonal and spatial use of the Project area by large birds, with an emphasis on eagles and other diurnal raptors (e.g., *Accipiter* spp., *Buteo* spp.).

Survey Plots

Thirty-nine observation points were located throughout the Project area with each observation point centered in an 800-meter (m; 2,625-foot [ft]) radius survey plot (Figure 4). Plots were selected for viewshed and to survey representative habitats and topography within the Project area, while meeting ECPG spatial sampling recommendations of at least 30% survey coverage of areas within 1.0 kilometer (km; 1.6 miles [mi]) of proposed turbine locations (USFWS 2013).

Field Methods

The survey duration at each point was 60 minutes (min), during which time only large birds were recorded. Large birds were defined as waterbirds, waterfowl, shorebirds, diurnal raptors, vultures, upland game birds, doves and pigeons, and large corvids (e.g., magpies, crows, and ravens). While all large birds, regardless of distance from the observer, were recorded during each survey, only birds within the 800-m radius plot were used for quantitative analysis and other comparative metrics.

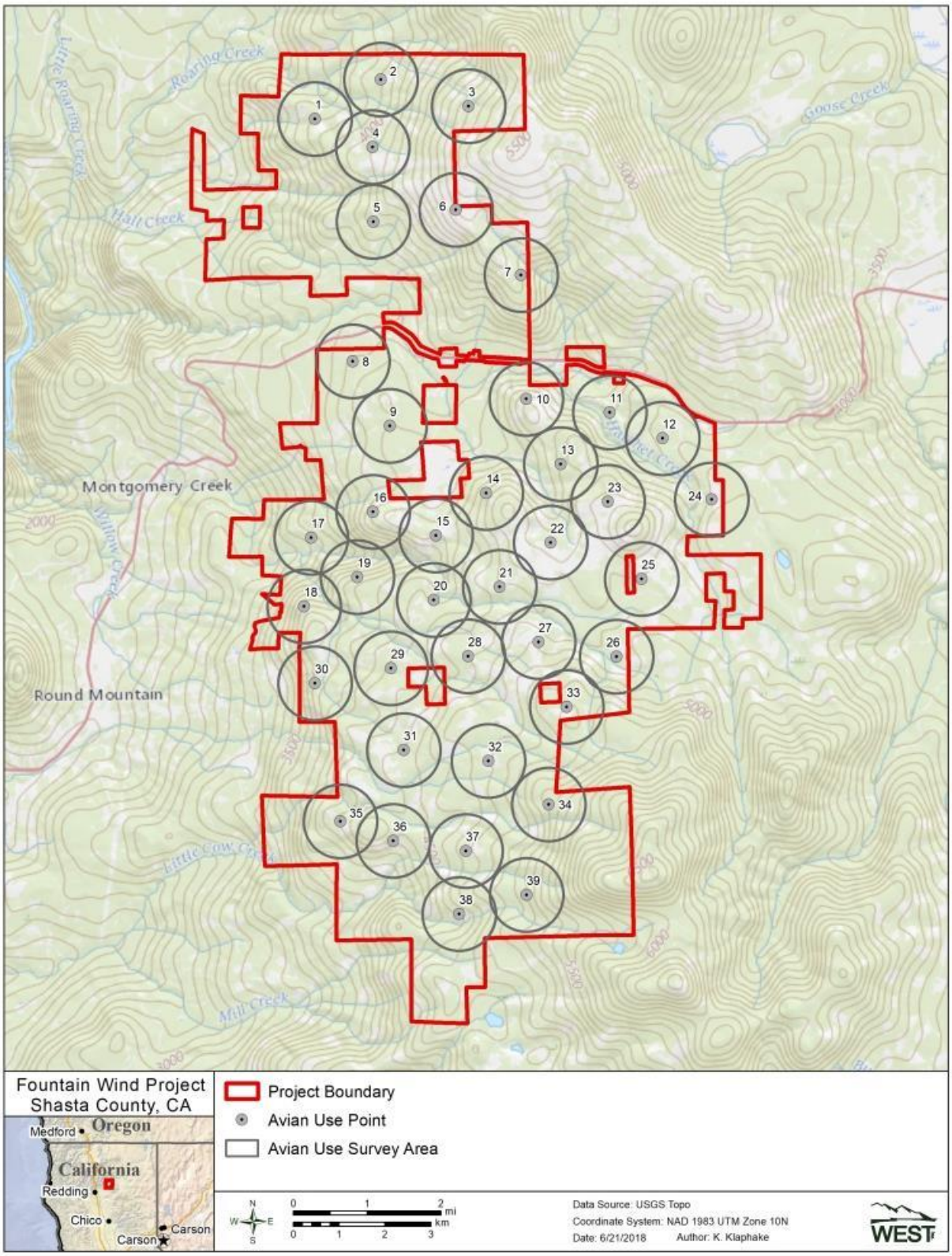


Figure 4. Location of survey plots used during fixed-point avian use surveys at the Fountain Wind Project, Shasta County, California.

Date, start and end time of the survey period, and weather information (e.g., temperature, wind speed and direction, cloud cover) were recorded for each survey. Every bird group observed during a survey was recorded and identified by a unique observation number. Information collected for each observation included: species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center when first observed, closest distance, height above ground level (AGL), activity (behavior), and habitat(s). Bird behavior and habitat type were recorded based on the point of first observation. Approximate flight height AGL and distance from plot center at first observation were recorded to the nearest 5-m (16-ft) interval. Other information collected included whether or not the observation was auditory only, as well as the 10-min interval of the survey during which the detection first occurred. Topographic inset maps centered on each observation point were used to more accurately estimate flight height, distance from observer, and map flight paths during large bird observations. Additionally, data were collected following ECPG methodology to record eagle risk minutes, including minute by minute flight height AGL, distance from observer, and behavioral data for the entirety of each eagle observation (USFWS 2013).

Locations of all diurnal raptors observed during surveys were recorded on field maps. Flight paths and perch locations were digitized using ArcGIS 10.0; comments were recorded in the comments section of the data sheet.

Observation Schedule

Sampling intensity was designed to document large bird use and behavior by habitat and season within the Project area. Large bird surveys were conducted approximately once per month at each of the 39 observation points, with approximately 9-10 points surveyed each week of the study period. Seasons were defined as spring (March 1 – May 16), summer (May 17 – August 31), fall (September 1 – November 30), and winter (December 1 – February 28). Surveys were carried out during daylight hours and survey periods were varied to approximately cover all daylight hours during a season. To the extent practical, each point was surveyed roughly the same number of times. During each survey round, to the extent practicable, the order in which points were surveyed was randomized to ensure surveys occurred during different times of day among visits.

Small Bird Surveys

In addition to the large bird surveys described above, surveys were conducted to document the spatial and temporal use of the Project area by small birds. The ECPG recommends conducting surveys of this sort separately from eagle/large bird use surveys in order to increase detection probability and avoid observer distraction (USFWS 2013). Assessment of small bird use of the Project area is important as it may allow detection of previously unknown occurrence of sensitive species, identification of high use periods (e.g., migration windows, breeding seasons), or specific sites within the larger Project area that may be particularly important to small birds (e.g., reproductive habitats, stopover sites).

Survey Plots

Small bird surveys were conducted at the same 39 observation points used for the large bird surveys described above (Figure 4). Survey plots for small bird surveys consisted of a 100-m (328-ft) radius circle centered on the observation point.

Field Methods

The survey duration at each point was 10 min, during which time only small birds (e.g., cuckoos, hummingbirds, swifts, woodpeckers, and passerines) were recorded. Only small birds observed within the 100-m radius plot were used for quantitative analysis and other comparative metrics.

The date, start and end time of the survey period, and weather information (e.g., temperature, wind speed and direction, and cloud cover) were recorded for each survey. Every bird group (i.e., one or more individuals) recorded during a survey was recorded and identified by a unique observation number. Information collected for each observation included: species or best possible identification, number of individuals, sex and age class (if identifiable), distance from plot center when first observed, closest distance, activity (behavior), habitat(s), and whether or not the observation was auditory only. Bird behavior and habitat type were recorded based on the point of first observation. Approximate flight height and distance from plot center at first observation were recorded to the nearest 5-m (16-ft) interval.

Observation Schedule

As with the large bird surveys, small bird surveys were conducted at each of the 39 points approximately once per month with 9-10 points surveyed each week during the study period. The 10-min small bird surveys were conducted immediately prior to the 60-min large bird surveys to maximize efficiency.

Incidental Observations

Incidental wildlife observations provide records of wildlife seen outside of the standardized surveys. All diurnal raptors, unusual or unique birds, sensitive species, large mammals, reptiles, and amphibians were recorded in a similar fashion to standardized surveys. Observation number, date, time, species, number of individuals, sex/age class, distance from observer, activity, height above ground (for bird species) and habitat were recorded. The location of any sensitive species observed was recorded by Universal Transverse Mercator coordinates using a hand-held Global Positioning System unit.

Data Management

A Microsoft® ACCESS or SQL Server database was developed to store, organize, and retrieve survey data. Data were keyed into the electronic database using a pre-defined protocol to facilitate subsequent quality assurance and quality control (QA/QC) and data analyses. All data forms, field notebooks (if provided), and electronic data files were retained for reference.

At all stages of the study, including in the field, during data entry and analysis, and report writing, QA/QC measures were utilized. Following surveys, observers were responsible for

inspecting data forms for completeness, accuracy, and legibility. Potentially erroneous data were identified using a series of database queries. Irregular codes or data suspected as being questionable were discussed with the observer and/or project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes in all steps were made.

Statistical Analysis

For analytical purposes, a visit was defined as the required length of time, in days, to survey all of the plots within the Project once, as possible given logistical constraints (i.e., site conditions may have prevented access to certain points during a particular visit). Visits were assigned according to the following criteria: 1) a single visit had to be completed in a single season, and 2) a visit could be spread across multiple dates, but a single date could not contain surveys from multiple visits. Under certain circumstances, such as extreme weather conditions or access issues, plots were not surveyed during some visits. In these cases, a visit might not have constituted a survey of all plots.

Species Composition and Species Richness

The total number of species observed was calculated by season and overall for both large and small bird surveys. Species lists (with the number of observations and the number of groups) were generated by season and included all observations of birds detected. In some cases, the tally may represent repeated sightings of the same individual. For example, a sum of 20 observations of red-tailed hawk (*Buteo jamaicensis*) may be 20 separate birds, or may be one bird observed on 20 separate visits. Species richness by season was calculated by averaging the total number of species observed within each plot (800 m for large birds and 100-m for small birds) during a visit, then averaging across plots within each visit, followed by averaging across visits within the season. Overall species richness was calculated as an average of seasonal values weighted by the number of days in each season. Species richness was compared among seasons for both large and small birds.

Bird Use, Percent of Use, and Frequency of Occurrence

Estimates of bird use were calculated as the number of observations per plot per survey (i.e., number of large birds per 800-m plot per 60-min survey and number of small birds per 100-m plot per 10-min survey). These standardized estimates of bird use were used to compare differences among bird types, seasons, survey points, and other studies where similar methods were used. Mean use by season was calculated by summing the total number of birds seen within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within the season. Overall bird use was calculated as an average of seasonal values weighted by the number of calendar days in each season (as defined by the season dates). Percent of use was calculated as the proportion of large bird use that was attributable to a particular bird type or species, and frequency of occurrence was calculated as the percent of surveys in which a particular bird type or species was observed.

Bird Flight Height and Behavior

Bird flight was used to calculate the percentage of birds observed flying within rotor-swept heights (RSH) that encompass the full range of turbines with potential to be used at the Project. A RSH for potential collision with a turbine blade of 30-200 m (98-656 ft) AGL was used, which is a conservative estimate that covers the RSH of the smallest and largest turbines that may be used at the Project. The flight height recorded during the initial observation was used to calculate the percentage of birds flying within the RSH and mean flight height. The percentage of birds flying within the RSH at any time was calculated using the lowest and highest flight height recorded.

Spatial Use

Spatial use was evaluated by comparing large bird and small bird use among plots. In addition, flight paths for eagles and other diurnal raptors were mapped to qualitatively assess spatial use of the Project, including in relation to study area characteristics (e.g., topographic features). The objective of mapping locations and flight paths was to identify areas of concentrated use by diurnal raptors and other large birds, and/or consistent flight patterns within the Project.

Eagle Risk Minutes

Eagle risk minutes are defined as the number of minutes (rounded to the next highest integer) an eagle is observed flying within 800-m of the observer at or below 200 m (656 ft) AGL during the survey period (USFWS 2013). For example, a 30-second observation is rounded to one minute and an observation of one minute 10 seconds is rounded to two minutes. Eagle risk minutes were tallied for bald eagles and golden eagles separately by season. These data are provided for use in future eagle risk analyses, as appropriate and applicable once the second year of eagle use surveys has been completed.

Risk Assessment

The risk assessment uses the results of the Year 1 avian use surveys to evaluate the potential for impacts to birds from the construction and operation of the Project. The intent of the risk assessment is not to predict the number of fatalities, but rather to provide a contextual risk assessment based on the pre-construction avian use data collected at the Project to date. To assess the potential risk to birds at the Project, information on spatial and temporal patterns of bird use, abundance, and species composition collected during surveys was reviewed in the context of existing publicly available data from post-construction fatality studies at wind energy facilities in the California and Pacific Northwest regions of the US. These wind energy facilities exhibit a wide range of topographical and vegetative characteristics, and avian assemblages, which likely contribute to the wide range of fatality rates documented. The forested habitats that cover the majority of the Project are atypical of wind energy facilities in the western US which are more commonly composed of desert scrub, grassland, and shrub-steppe vegetation communities, potentially limiting the inference from other projects. Among wind energy facilities in California and the Pacific Northwest with publicly available mortality data, only the Hatchet Ridge Wind Energy Facility (Hatchet Ridge) is located in proximity to the Project and has similar forested habitats and mountainous terrain. As such, Hatchet Ridge likely provides the most

relevant source of information for forecasting risk to birds at the proposed Project. While general trends in avian mortality at wind energy facilities throughout North America and the Western US, including the species and species groups most impacted, were considered, the risk assessment relies most heavily on the results of the post-construction fatality monitoring conducted at Hatchet Ridge from 2010-2013 (Tetra Tech 2014). Additionally, the results of pre-construction avian use data collected at Hatchet Ridge in 2006-2007 (Young et al. 2007a) were compared to the results of the Year 1 avian use surveys conducted at the Project in order to identify similarities or differences in avian species composition, use, and abundance that may influence relative risk to species or species groups at the two sites.

RESULTS

Avian use surveys were conducted at the Project from 19 April 2017 through 22 May 2018. Survey results for large bird and small bird surveys are summarized in separate sections below, supplemented by appendices that present species-level detail on numbers of bird groups and observations observed during each season (Appendix A), species-level detail on seasonal use statistics (Appendix B), use by observation point for large and small bird types (Appendix C), and mapped flight paths for diurnal raptor species (Appendix D).

Large Bird Surveys

A total of 531 60-min fixed-point large bird surveys were conducted at the Project over the course of 14 visits (Table 2).

Table 1. Summary of large bird species richness (species/800-meter plot/60-minute survey) and sample size by season and overall during large bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

Season	Number of Visits	Number of Surveys Conducted	Number of Species	Large Bird Species Richness
Spring	3	102	18	1.19
Summer	5	195	12	0.91
Fall	3	117	17	0.96
Winter	3	117	11	0.59
Overall	**14**	**531**	**25**	**0.90**

Species Richness and Species Composition

During 60-min large bird surveys, a total of 3,267 observations were recorded among 864 separate groups, regardless of distance from the observer (Appendix A1). This included observation of 25 separate species: 18 in spring, 17 in fall, 12 in summer, and 11 in winter (Table 2). Large bird species richness (mean number of species per plot per survey) was highest during spring (1.19), followed by fall (0.96), summer (0.91), and winter (0.59; Table 2).

Among the large bird types, waterfowl (2,063 observations in 25 groups) accounted for 63.1% of large bird observations during the study period (Appendix A1). Most waterfowl observations were of snow geese (*Chen caerulescens*) recorded in fall and winter (582 and 702 observations,

respectively; Appendix A1). Other large bird types observed during surveys included vultures (587 observations), large corvids (228 observations), diurnal raptors (216 observations), waterbirds (144 observations), doves/pigeons (27 observations), upland game birds (nine observations), and owls (two observations; Appendix A1).

Eleven diurnal raptor species were recorded during large bird surveys; the most common were red-tailed hawk (148 observations), sharp-shinned hawk (*Accipiter striatus*; 18 observations), bald eagle (*Haliaeetus leucocephalus;* 16 observations), and Cooper's hawk (*A. cooperii*; nine observations; Appendix A1). The number of diurnal raptor observations was similar across seasons, ranging from 49 observations in summer to 65 observations in fall (Appendix A1). Bald eagles were recorded during all four seasons, with the majority (nine of 16 observations) recorded in winter. Only one bald eagle was observed in summer. Two golden eagles (*Aquila chrysaetos*) were observed during surveys, both in spring (Appendix A1).

Bird Use, Percent of Use, and Frequency of Occurrence

Mean large bird use (birds/800-m plot/60-min survey), percent of use, and frequency of occurrence were calculated by season for all large bird types (Table 3) and species (Appendix B1). The highest overall large bird use occurred during winter (9.74), followed by fall (8.38), spring (4.17), and summer (3.39; Table 3).

Waterbirds

Waterbird use, comprising two species, American white pelican (*Pelecanus erythrorhynchos*) and sandhill crane (*Antigone canadensis*), was highest in winter (0.78), followed by fall (0.28), and spring (0.17). No waterbird use was recorded in summer (Table 3; Appendix B1). Waterbirds accounted for 8.0% of overall large bird use in winter, but only 4.1% in spring and 3.4% in fall. Waterbirds were recorded during 4.3% of winter surveys and 0.9% of both spring and fall surveys (Table 3).

Waterfowl

Waterfowl use was considerably higher in winter and fall (8.02 and 6.53, respectively), than during spring and summer (1.38 and 1.03, respectively; Table 3). Five species of waterfowl were recorded during surveys, with snow goose accounting for the majority of use in winter and fall (6.00 and 4.97, respectively), greater white-fronted goose (*Anser albifrons*) accounting for nearly all spring use (1.37), and unidentified goose composing all summer use (1.03; Appendix B1). Waterfowl accounted for 82.4% of overall large bird use in winter, 78.0% in fall, 33.0% in spring, and 30.2% in summer. Waterfowl were observed most frequently during winter (8.5% of winter surveys) and were rarely observed during summer (0.5% of summer surveys; Table 3).

Diurnal Raptors

Diurnal raptor use was highest during fall (0.56), followed by spring (0.46), winter (0.44), and summer (0.23; Table 3). Eleven diurnal raptor species were recorded during surveys; however, red-tailed hawk had the highest use of any diurnal raptor species during all four seasons (0.18 to 0.33), accounting for between 55.4% and 78.3% of seasonal diurnal raptor use (Appendix

B1). Among other diurnal raptor species, sharp-shinned hawk had relatively higher use in fall (0.13) and bald eagle had relatively higher use in winter (0.08; Appendix B1). Bald eagle use during other seasons ranged from <0.01 in summer to 0.03 in fall. Golden eagle use was recorded only during spring (0.02; Appendix B1). All other diurnal raptor species recorded during surveys had use estimates of 0.03 or less in any given season (Appendix B1).

Diurnal raptors accounted for 11.0% of overall large bird use in the spring, 6.8% in summer, 6.6% in fall, and 4.5% in winter (Table 3). Diurnal raptors were observed more frequently during fall and spring (32.5% and 31.2% of surveys, respectively) than during summer and winter (17.4% and 17.9% of surveys, respectively; Table 3).

Owls

Use by owls was recorded only during spring and was attributed to two species: great horned owl (*Bubo virginianus*) and northern pygmy-owl (*Glaucidium gnoma*), each with a use of <0.01 (Table 3, Appendix B1). Owls accounted for only 0.4% of overall large bird use in spring and were observed during 1.7% of spring surveys (Table 3).

Vultures

Use by vultures (i.e., turkey vultures [*Cathartes aura*]), was highest in summer and spring (1.82 and 1.39, respectively), and lower in fall and winter (0.41 and 0.13, respectively; Table 3, Appendix B1). Vultures accounted for over half (53.5%) of overall large bird use during summer, but only 1.3% of overall large bird use in winter. Vultures were observed during 54.4% of summer surveys, 45.6% of spring surveys, 22.2% of fall surveys, and 6.8% of winter surveys (Table 3).

Upland Game Birds

Mountain quail (*Oreortyx pictus*) was the only upland game bird species observed during surveys (Appendix B1). Use by this species was greatest in spring (0.04), followed by summer (0.02), and fall (<0.01); no upland game bird use was recorded in winter (Table 3). Upland game birds accounted for 1.0% of overall large bird use in spring, 0.5% in summer, and 0.1% in fall, and were recorded during less than 4.0% of surveys during each season (Table 3).

Doves/Pigeons

Band-tailed pigeon (*Patagioenas fasciata*) was the only dove/pigeon species recorded during surveys (Appendix B1). Use by this species was highest in summer (0.11), followed by spring (0.04), and fall (<0.01); no doves/pigeons were recorded in winter (Table 3). Doves/pigeons accounted for 3.2% of overall large bird use in summer, 1.0% in spring, and 0.1% in fall, and were recorded during less than 3.0% of survey during each season (Table 3).

Table 3. Mean large bird use (number of birds/800-meter plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each bird type and diurnal raptor subtype by season during large bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

Type	Mean Use				Percent of Use				Percent Frequency			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Waterbirds	0.17	0	0.28	0.78	4.1	0	3.4	8.0	0.9	0	0.9	4.3
Waterfowl	1.38	1.03	6.53	8.02	33.0	30.2	78.0	82.4	2.6	0.5	5.1	8.5
Diurnal Raptors	0.46	0.23	0.56	0.44	11.0	6.8	6.6	4.5	31.2	17.4	32.5	17.9
Accipiters	0.07	0.02	0.16	<0.01	1.6	0.6	1.9	<0.1	6.0	2.1	12.0	0.9
Buteos	0.31	0.18	0.32	0.33	7.4	5.4	3.9	3.4	22.1	15.4	20.5	12.0
Northern Harrier	<0.01	0	0.02	<0.01	0.2	0	0.2	<0.1	0.9	0	1.7	0.9
Eagles	0.03	<0.01	0.03	0.08	0.8	0.2	0.4	0.8	2.6	0.5	3.4	6.8
Falcons	0.02	0.01	0.02	0	0.5	0.3	0.2	0	2.2	1.0	1.7	0
Other Raptors	0.02	0.01	0	<0.01	0.4	0.3	0	<0.1	1.7	1.0	0	0.9
Owls	0.02	0	0	0	0.4	0	0	0	1.7	0	0	0
Vultures	1.39	1.82	0.41	0.13	33.4	53.5	4.9	1.3	45.6	54.4	22.2	6.8
Upland Game Birds	0.04	0.02	<0.01	0	1.0	0.5	0.1	0	3.4	1.5	0.9	0
Doves/Pigeons	0.04	0.11	<0.01	0	1.0	3.2	0.1	0	1.7	2.1	0.9	0
Large Corvids	0.67	0.20	0.58	0.38	16.0	5.9	6.9	3.9	27.6	12.8	23.1	16.2
Overall	**4.17**	**3.39**	**8.38**	**9.74**	**100**	**100**	**100**	**100**	**-**	**-**	**-**	**-**

Large Corvids

Large corvid use was highest in spring (0.67), followed by fall (0.58), winter (0.38), and summer (0.20; Table 3). Nearly all large corvid use was attributed to common raven (*Corvus corax*), with the exception of a single American crow (*Corvus brachyrhynchos*) recorded in summer (Appendix A1). Large corvids accounted for 16.0% of overall large bird use in spring, but only between 3.9% and 6.9% in other seasons. Large corvids were recorded during 12.3% to 27.6% of surveys during each season (Table 3).

Flight Height Characteristics

Flight height characteristics, based on initial flight height observations and estimated use, were calculated for large bird types and raptor subtypes (Table 4). During 60-min large bird surveys, 790 groups of large birds were observed flying within the 800-m plots, totaling 3,184 observations. Overall, 24.2% of flying large birds were recorded within the RSH for turbine blades of 30-200 m AGL, 71.7% were above the RSH, and 4.1% were flying below the RSH (Table 4). The large bird type most often recorded flying with the RSH was large corvids (76.2%; Table 4). Over half (63.4%) of all diurnal raptor observations were recorded flying within the RSH, with 27.8% recorded above the RSH, and 8.8% recorded below (Table 4). Among diurnal raptor subtypes, northern harriers (*Circus cyaneus*) and eagles were most often observed flying within the RSH (100% and 83.3%, respectively; Table 4). The majority of waterbirds and waterfowl were recorded above the RSH (78.5% and 97.1%, respectively; Table 4).

Table 4. Flight height characteristics by bird type and raptor subtype during large bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

Type	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs Flying	% within Flight Height Categories		
					0 - 30 m	30 - 200 m*	> 200 m
Waterbirds	10	144	284.00	100	0	21.5	78.5
Waterfowl	24	2060	408.96	99.9	0	2.9	97.1
Diurnal Raptors	186	194	171.58	91.5	8.8	63.4	27.8
Accipiters	*31*	*31*	*150.84*	*96.9*	*19.4*	*61.3*	*19.4*
Buteos	*124*	*132*	*187.98*	*89.8*	*4.5*	*62.1*	*33.3*
Northern Harrier	*4*	*4*	*107.50*	*100*	*0*	*100*	*0*
Eagles	*18*	*18*	*128.33*	*100*	*5.6*	*83.3*	*11.1*
Falcons	*6*	*6*	*22.83*	*100*	*66.7*	*33.3*	*0*
Other Raptors	3	3	350.00	60.0	0	33.3	66.7
Owls	0	0	0	0	0	0	0
Vultures	447	568	143.92	100	11.4	69.5	19
Upland Game Birds	0	0	0	0	0	0	0
Doves/Pigeons	8	25	40.62	92.6	48	52	0
Large Corvids	115	193	91.29	84.6	19.2	76.2	4.7
Overall	**790**	**3,184**	**151.55**	**97.9**	**4.1**	**24.2**	**71.7**

*The likely "rotor-swept height" for potential collision with a turbine blade, or 30-200 meters (m; 98-656 feet) above ground level (AGL).

Spatial Use

Mean use by point for all large birds, major large bird types, and diurnal raptor subtypes is included in Appendix C1). For all large bird species combined, use (birds/800-m plot/60-min

survey) was substantially higher at points 3 and 18 (44.14 and 37.62, respectively; Appendix C1). Use at these two points was dominated by waterfowl, which accounted for 96.7% and 93.9% of large bird use at these points, respectively. Overall large bird use at other points varied widely, ranging from 0.43 (birds/800-m plot/60-min survey) at Point 10 to 17.69 (birds/800-m plot/60-min survey) at Point 17 (Appendix C1). Diurnal raptor use was generally more consistent across observation points, ranging from 0.07 at Point 23 to 1.92 at Point 30 (Appendix C1). The higher diurnal raptor use at Point 30 was largely attributed to use by red-tailed hawk (see Appendix D1). Eagle use was recorded at 13 points with use estimates ranging from 0.07 to 0.23 (Appendix C1).

Diurnal raptor use was spread across the Project with no obvious areas of concentrated use or consistent flight patterns evident, with the exception of observation Point 30, which had a larger number of mapped red-tailed hawk flight paths (Appendix D1). Point 30 is adjacent to a large incised drainage where the landscape transitions from forest to shrub/scrub, and offers ideal habitat for soaring birds. Eagle activity was generally low and was recorded across the Project with no clear spatial use patterns evident (Appendix D2).

Eagle Risk Minutes

Sixteen bald eagle observations and two golden eagle observations were recorded within the Project area during 531 hours of large bird use survey effort (Tables 5a and 5b). Bald eagles were observed in flight for a total of 47 min, with 27 of those min recorded during winter, 10 in the fall, six in spring, and four in summer (Table 5a). Of the 47 bald eagle minutes recorded during the study, 35 eagle risk minutes were recorded within the 800-m plots at flight heights of 200 m or less AGL (Table 5a). The majority (68.6%) of bald eagle risk minutes were recorded in winter, with no bald eagle risk minutes recorded in spring (Table 5a). Bald eagle risk minutes per minute of survey were highest during winter (0.2051), followed by fall (0.0684), and summer (0.0154; Table 5a). Golden eagles were observed in flight for a total of four min, all of which were recorded in spring (Table 5a). For golden eagles, all four minutes of flight were within 800-m plots at flight heights of 200 m or less AGL (Table 5a).

Bald eagle risk minutes were recorded at 12 of the 39 observation points (points 1, 4, 7, 8, 12, 18, 19, 24, 26, 27, 35, and 39; Table 6b). The observation point with the greatest number of bald eagle risk minutes was Point 7 (six risk min), with points 18, 19, and 35 contributing an additional four risk minutes each (Table 5b). All four golden eagle risk minutes were recorded at Point 35 (Table 5b).

Table 5a. Bald eagle and golden eagle observations and risk minutes* (min) documented during 60-minute large bird surveys conducted at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

Season	Survey Effort (Hours)	Observations	Flight Min.	Risk Min.	Risk Min. per Min. Survey
Bald Eagle					
Spring (03/01 – 05/16)	102	2	6	0	0
Summer (05/17 – 08/31)	195	1	4	3	0.0154
Fall (09/01 – 11/30)	117	4	10	8	0.0684
Winter (12/01 – 02/28)	117	9	27	24	0.2051
Total	**531**	**16**	**47**	**35**	**0.0659**
Golden Eagle					
Spring (03/01 – 05/16)	102	2	4	4	0.0392
Summer (05/17 – 08/31)	195	0	0	0	0
Fall (09/01 – 11/30)	117	0	0	0	0
Winter (12/01 – 02/28)	117	0	0	0	0
Total	**531**	**2**	**4**	**4**	**0.0075**

* Risk minutes are defined as flying behavior at or below 200 meters (m; 656 feet [ft]) and within 800 m (2,625 ft) of the survey location.

Table 5b. Bald eagle (BAEA) and golden eagle (GOEA) observations (obs) and risk minutes* (min) by survey location documented during 60-minute large bird surveys conducted at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

Survey Location	Survey Effort (Hours)	BAEA Obs	BAEA Risk Min.	GOEA Obs	GOEA Risk Min.
1	14	1	2	0	0
2	14	0	0	0	0
3	14	0	0	0	0
4	14	1	3	0	0
5	14	0	0	0	0
6	14	0	0	0	0
7	14	2	6	0	0
8	14	1	1	0	0
9	14	0	0	0	0
10	14	0	0	0	0
11	14	0	0	0	0
12	14	1	1	0	0
13	14	0	0	0	0
14	14	0	0	0	0
15	14	0	0	0	0
16	14	0	0	0	0
17	13	0	0	0	0
18	13	3	4	0	0
19	13	1	4	0	0
20	13	1	0	0	0
21	14	0	0	0	0
22	14	0	0	0	0
23	14	0	0	0	0
24	14	1	2	0	0
25	14	0	0	0	0
26	14	1	2	0	0
27	14	1	3	0	0
28	13	0	0	0	0

Table 5b. Bald eagle (BAEA) and golden eagle (GOEA) observations (obs) and risk minutes* (min) by survey location documented during 60-minute large bird surveys conducted at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

Survey Location	Survey Effort (Hours)	BAEA Obs	BAEA Risk Min.	GOEA Obs	GOEA Risk Min.
29	14	0	0	0	0
30	13	0	0	0	0
31	13	0	0	0	0
32	13	0	0	0	0
33	13	0	0	0	0
34	13	0	0	0	0
35	13	1	4	2	4
36	13	0	0	0	0
37	13	0	0	0	0
38	13	0	0	0	0
39	13	1	3	0	0
Total	**531**	**16**	**35**	**2**	**4**

* Risk minutes are defined as flying behavior at or below 200 meters (m; 656 feet [ft]) and within 800 m (2,625 ft) of the survey location.

Small Bird Surveys

A total of 531 10-min fixed-point small bird surveys were completed at the Project during 14 visits for a total of 88.5 hours of small bird survey effort (Table 6).

Table 6. Summary of small bird species richness (species/100-meter plot/10-minute survey), and sample size by season and overall during small bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

Season	Number of Visits	Number of Surveys Conducted	Number of Species	Small Bird Species Richness
Spring	3	102	33	2.19
Summer	5	195	56	2.85
Fall	3	117	37	2.24
Winter	3	117	25	1.07
Overall	**14**	**531**	**71**	**2.12**

Species Richness and Species Composition

During 10-min small bird surveys, 2,408 small bird observations were recorded within 1,475 separate groups comprising 71 species (Table 6, Appendix A2). Small bird species richness was highest during summer (2.85 species/plot/survey), followed by fall (2.24), spring (2.19), and winter (1.07; Table 6). Most (90.4%) small birds recorded were passerines (2,177 observations in 1,289 groups), with the majority of these observations comprising dark-eyed junco (*Junco hyemalis*; 303 observations), mountain chickadee (*Poecile gambeli*; 245 observations), and western bluebird (*Sialia mexicana*; 209 observations; Appendix A2). Other small bird types recorded included woodpeckers (170 observations) and swifts/hummingbirds (59 observations; Appendix A2).

Bird Use, Percent of Use, and Frequency of Occurrence

Mean small bird use (birds/100-m plot/10-min survey), percent of use, and frequency of occurrence were calculated by season for all small bird species (Appendix B2). The highest small bird use was recorded in fall (5.61), followed by summer (4.23), spring (3.56), and winter (2.79).

Passerines

Use by passerines was highest during the fall (5.21), followed by summer (3.93), spring (2.92), and winter (2.59; Appendix B2). In fall and winter, western bluebird had the highest use by any passerine species (0.78 and 0.67, respectively), while dark-eyed junco had the highest use in spring and summer (0.47 and 0.72, respectively; Appendix B2). Passerines accounted for between 82.0% and 93.1% of small bird use during each season, and were observed during 89.7% of summer surveys, 81.7% of spring surveys, 80.3% of fall surveys, and 59.0% of winter surveys (Appendix B2).

Swifts/Hummingbirds

Use by swifts/hummingbirds was highest in spring (0.34), followed by winter (0.07), fall (0.03), and summer (0.02; Appendix B2). Swifts/hummingbirds composed 9.6% of overall small bird use in spring, and consisted primarily of use by Vaux's swift (*Chaetura vauxi*) during this season (0.30; Appendix B2). Swift/hummingbird use during other seasons represented between 0.4% and 2.5% of overall small bird use (Appendix B2). The only other identified swift/hummingbird species recorded during surveys were Anna's hummingbird (*Calypte anna*) and rufous hummingbird (*Selasphorus rufus*; Appendix B2).

Woodpeckers

Use by woodpeckers was highest in fall (0.37), followed by summer (0.28), spring (0.27), and winter (0.13; Appendix B2). Northern flicker (*Colaptes auratus*) had the highest use of any woodpecker species in fall (0.19), summer (0.16), and spring (0.13), while white-headed woodpecker (*Picoides albolarvatus*) had the highest use in winter (0.05; Appendix B2). Woodpeckers accounted for between 4.6% and 7.6% of overall small bird use in any given season. Woodpeckers were recorded during 26.5% of fall surveys, 22.1% of summer surveys, 20.6% of spring surveys, and 9.4% of winter surveys (Appendix B2).

Bird Flight Height and Behavior

During 10-min small bird surveys, 431 groups (1,091 observations) were recorded flying within the 100-m radius survey plots (Table 7). Of these, 28.9% were observed flying at heights within the estimated RSH (Table 7). The majority (70.9%) of small birds were recorded flying below the RSH, and only 0.2% were recorded above the RSH (Table 7). The small bird type most often observed flying within the RSH was swift/hummingbird (70.6%; Table 7).

Table 7. Flight height characteristics by bird type during small bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

Type	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs. Flying	% within Flight Height Categories		
					0 - 30 m	30 - 200 m*	> 200 m
Passerines	367	989	12.39	49.5	72.2	27.6	0.2
Swifts/Hummingbirds	16	51	10.69	92.7	29.4	70.6	0
Woodpeckers	48	51	14.15	36.4	88.2	11.8	0
Overall	**431**	**1,091**	**12.52**	**49.7**	70.9	28.9	0.2

*The likely "rotor-swept height" for potential collision with a turbine blade, or 30-200 meters (m; 98-656 feet) above ground level.

Spatial Use

Small bird use varied among the 39 observation points. The highest small bird use was recorded at points 17 and 7 (8.77 and 7.14, respectively), while the lowest use was observed at points 39 and 15 (2.15 and 2.29, respectively; Appendix C2).

Incidental Observations

Eleven bird species and three mammal species were recorded incidentally during the study (Table 8). Of the 11 bird species recorded incidentally, only one species, sooty grouse (*Dendragapus fuliginosus*; one observation), was not also observed during standardized fixed-point surveys (Appendices A1 and A2). Evidence of gray wolf (*Canis lupus*) presence was also documented via tracks observed in February 2018 along a snow-covered road between avian survey points 22 and 26, in the east-central portion of the Project area. Gray wolves have been seen or heard by WEST staff and no other evidence of wolves has been documented during studies conducted to date.

Table 8. Summary of number of groups (grps) and observations (obs) of incidental wildlife observed while conducting surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

Species	Scientific Name	# grps	# obs
sandhill crane	*Antigone canadensis*	1	12
bald eagle	*Haliaeetus leucocephalus*	1	1
northern goshawk	*Accipiter gentilis*	2	2
red-shouldered hawk	*Buteo lineatus*	1	1
red-tailed hawk	*Buteo jamaicensis*	8	8
sharp-shinned hawk	*Accipiter striatus*	5	5
great horned owl	*Bubo virginianus*	1	1
turkey vulture	*Cathartes aura*	4	4
sooty grouse	*Dendragapus fuliginosus*	1	1
band-tailed pigeon	*Patagioenas fasciata*	1	11
pileated woodpecker	*Dryocopus pileatus*	1	1
Bird Total	**11 Species**	**27**	**47**
bobcat	*Lynx rufus*	1	1
fisher	*Martes pennanti*	1	1
gray wolf (tracks only)*	*Canis lupus*	1	1
Mammal Total	**3 Species**	**3**	**3**

* Tracks consistent with size and gait of a single wolf documented in snow.

Sensitive Species Observations

A total of 10 bird species considered sensitive at the state and/or federal level were recorded during fixed-point avian use surveys or incidentally during the study (Table 9). At the state level, this included two state fully-protected species (bald eagle and golden eagle), and six state species of special concern (SSC; American white pelican, northern goshawk [*Accipiter gentilis*], northern harrier, olive-sided flycatcher [*Contopus cooperi*], Vaux's swift, and yellow warbler [*Setophaga petechia*]; Table 9). Additionally, sandhill crane was recorded during surveys and incidentally; however, these observations were not identified to the subspecies level. The two subspecies potentially occurring at the Project include *Antigone canadensis tabida*, a state threatened species, and *A. c. candadensis*, a state species of special concern (Table 9). Evidence of two sensitive mammal species was also recorded incidentally within the Project are during the study, visual observation of a single fisher (*Pekania pennanti*), which is considered a species of special concern in California, and tracks of a single wolf, which is listed as endangered at both the state and federal level (Table 9).

At the federal level, four species recorded during surveys are considered federal birds of conservation concern in the Sierra Nevada Bird Conservation Region (bald eagle, Cassin's finch [*Haemorhous cassinii*], northern goshawk, and olive-sided flycatcher; USFWS 2008). In addition, bald and golden eagles receive protection under the federal Bald and Golden Eagle Protection Act (1940).

Table 9. Summary of sensitive species observed at the Fountain Wind Project during large bird surveys (LB), small bird surveys (SB), and as incidental wildlife observations from 19 April 2017 to 22 May 2018.

			LB		SB		Inc.		Total	
Species	**Scientific Name**	**Status***	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
American white pelican	*Pelecanus erythrorhynchos*	SSC	2	28	0	0	0	0	2	28
bald eagle	*Haliaeetus leucocephalus*	EA; BCC; FP	16	16	0	0	1	1	17	17
Cassin's finch	*Haemorhous cassinii*	BCC	0	0	2	2	0	0	2	2
golden eagle	*Aquila chrysaetos*	EA; FP	2	2	0	0	0	0	2	2
northern goshawk	*Accipiter gentilis*	BCC; SSC	3	3	0	0	2	2	5	5
northern harrier	*Circus cyaneus*	SSC	4	4	0	0	0	0	4	4
olive-sided flycatcher	*Contopus cooperi*	BCC; SSC	0	0	5	5	0	0	5	5
sandhill crane	*Antigone canadensis*	ST/SSC**	8	116	0	0	1	12	9	128
Vaux's swift	*Chaetura vauxi*	SSC	0	0	1	35	0	0	1	35
yellow warbler	*Setophaga petechia*	SSC	0	0	30	35	0	0	30	35
fisher	*Martes pennanti*	SSC	0	0	0	0	1	1	1	1
gray wolf	*Canis lupus*	SE, FE								
Total	**11 Species**		**35**	**169**	**38**	**77**	**5**	**16**	**78**	**262**

*EA = Bald and Golden Eagle Protection Act (BGEPA 1940), BCC = federal bird of conservation concern (USFWS 2008), ST = state threatened; SE = state endangered, FP = state fully protected; SSC = state species of special concern (CDFW 2018), FE = federally endangered.

**Observations of sandhill crane were not identified to subspecies level; greater sandhill crane (*A. c. tabida*) is a state-threatened species, while lesser sandhill crane (*A. c. canadensis*) is a state species of special concern.

Grps = groups, obs = observations

DISCUSSION AND RISK ASSESSMENT

Over the first 13 months of the two-year avian use study at the Project, approximately 620 hours of avian use surveys were completed and 5,675 bird observations comprising 96 separate species were recorded. Overall, large bird use varied substantially across the Project area; however, most of this variability was the result of large groups of waterfowl observed passing over the Project area, particularly at observation points 3 and 18 (Figure 4; Appendix C1). Most (97.1%) of these waterfowl observations were flying at heights well above the RSH of proposed turbines and not at risk of collision. Use by diurnal raptors was more consistent across observation points, with the exception of observation Point 30 which had a larger number of mapped red-tailed hawk flight paths (see Appendix D1). Point 30 is adjacent to a large incised drainage where the landscape transitions from forest to shrub/scrub, and offers ideal habitat for soaring birds. Eagle activity was generally low and was recorded across the Project area with no clear spatial use patterns evident (see Appendix D2); however, higher eagle use was recorded during winter suggesting temporal patterns in eagle use may exist. Large bird use was approximately twice as high in fall and winter than in summer and spring, and was again primarily the result of relatively few but relatively large (compared to other species observed during surveys) groups of waterfowl (up to about 250 individuals) passing over the Project area in fall and winter. Alternatively, diurnal raptor use was similar across seasons, while vulture use was substantially higher in summer and spring than during other seasons. Small bird use was relatively consistent across the Project area and across seasons with no clear concentration of use at any one observation point or season.

Although this document provides results for all bird species observed during surveys, the following discussion and risk assessment focuses on a smaller group of species, namely waterfowl, vultures, diurnal raptors, and passerines. The risk assessment was limited to these four bird types because: 1) they exhibited relatively higher seasonal or year-round use of the Project area than the other bird types documented during the Year 1 surveys, 2) they contained species that are considered sensitive at the state or federal level, and/or 3) they have shown susceptibility to the potentially adverse impact of wind energy development. In addition, potential impacts to state or federal species of conservation or regulatory concern documented during the surveys are addressed separately for individual species.

Potential Direct Impacts to Birds

Project construction could affect birds directly through loss of habitat or fatalities from construction equipment. Impacts from decommissioning of the facility are anticipated to be similar to construction in terms of noise, disturbance, and equipment used. Potential mortality from construction equipment is expected to be low, as equipment used in wind energy facility construction generally moves at slow rates or is stationary for long periods (e.g., cranes). The highest risk of direct mortality to birds during construction or decommissioning is most likely the potential destruction of nests during initial site clearing, although this risk can be minimized through best management practices that include use of existing roads or previously cleared lands during the construction phase (USFWS 2012). The most probable direct impact to birds at

wind energy facilities is mortality resulting from collisions with turbines (Strickland et al. 2011, Marques et al. 2014). Collisions may occur with resident birds foraging and flying within the Project area, or with migrant birds seasonally moving through the Project area (Ferrer et al. 2012, Erickson et al. 2014, Watson et al. 2018, Welcker et al. 2018). Because collision with turbines is likely the primary direct impact to birds at the Project, publicly available information from post-construction fatality monitoring studies at regional wind energy facilities was used to evaluate the potential for avian fatalities at the Project in the context of the species composition and abundance documented during the Year 1 avian use surveys.

Avian Mortality at Regional Wind Energy Facilities

To date, overall fatality rates for birds at wind energy facilities in California and the Pacific Northwest with publicly available data have been variable, ranging from 0.16 to 17.44 birds/MW/year (Figure 5, Appendix E). These facilities are geographically dispersed throughout the western US and exhibit a wide range of ecological characteristics, potentially limiting the strength of inference from these facilities. The only wind energy facility in the western US with habitats and topography similar to the Project is Hatchet Ridge, located less than 3.2 km (2.0 mi) northeast of the Project. At Hatchet Ridge, direct impacts to birds have been low relative to other facilities in the western US. During three years of post-construction fatality monitoring conducted at Hatchet Ridge from 2011-2013, annual all bird fatality rates ranged from 0.84-2.50 birds/MW/year (Tetra Tech 2014). Given the Project's proximity to Hatchet Ridge and similar habitats and mountainous terrain, it is anticipated that overall direct impacts to avian species at the Project would be similar to those documented at Hatchet Ridge. Mortality information for several focal bird types (waterfowl, vultures, diurnal raptors, and passerines), based on data from local and regional wind energy facilities, is presented in greater detail below.

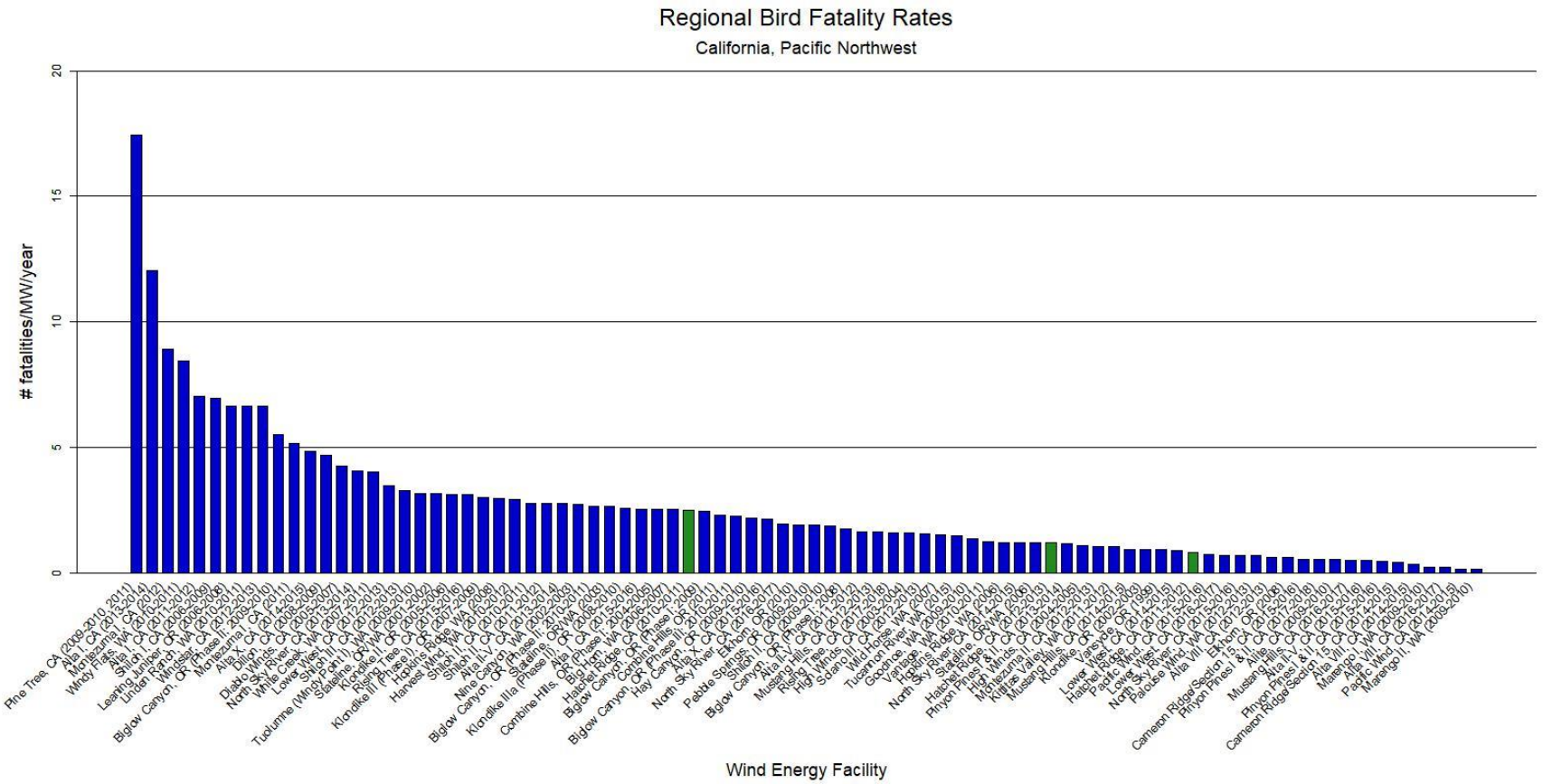


Figure 5. Fatality rates for all birds (number of birds per megawatt per year) from publicly available wind energy facilities in the California and Pacific Northwest regions of North America. Annual all bird fatality rates at the Hatchet Ridge Wind Energy Facility are indicated in green.

Figure 5 (*continued*). Fatality rates for all birds (number of birds per megawatt per year) from publicly available wind energy facilities in the California and Pacific Northwest regions of North America.

Data from the following sources:

Wind Energy Facility	Reference	Wind Energy Facility	Reference	Wind Energy Facility	Reference
Pine Tree, CA (09-10, 11)	BCR 2012	Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012a	Hatchet Ridge, CA (12-13)	Tetra Tech 2014
Alta I, CA (13-14)	Chatfield et al. 2014	Stateline, OR/WA (03)	Erickson et al. 2004	Pinyon Pines, CA (12-14)	Chatfield and Russo 2014
Montezuma I, CA (12)	ICF International 2013	Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011	High Winds, CA (04-05)	Kerlinger et al. 2006
Windy Flats, WA (10-11)	Enz et al. 2011	Alta I, CA (15-16)	Thompson et al. 2016	Montezuma II, CA (12-13)	Harvey & Associates 2013
Alta I, CA (11-12)	Chatfield et al. 2012	Combine Hills, OR (Phase I; 04-05)	Young et al. 2006	Kittitas Valley, WA (11-12)	Stantec 2012
Shiloh I, CA (06-09)	Kerlinger et al. 2009	Big Horn, WA (06-07)	Kronner et al. 2008	Mustang Hills, CA (14-15)	WEST 2016c
Leaning Juniper, OR (06-08)	Gritski et al. 2008	Hatchet Ridge, CA (10-11)	Tetra Tech 2013	Klondike, OR (02-03)	Johnson et al. 2003
Linden Ranch, WA (10-11)	Enz and Bay 2011	Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Vanscycle, OR (99)	Erickson et al. 2000
Windstar, CA (12-13)	Levenstein and Bay 2013b	Combine Hills, OR (11)	Enz et al. 2012	Lower West, CA (14-15)	Levenstein and DiDonato 2015
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011b	Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012b	Hatchet Ridge, CA (11-12)	Tetra Tech 2013
Montezuma I, CA (11)	ICF International 2012	Hay Canyon, OR (09-10)	Gritski and Kronner 2010b	Pacific Wind, CA (15-16)	WEST 2017a
Alta X, CA (14-15)	Chatfield et al. 2015	Alta X, CA (15-16)	Thompson et al. 2016	Lower West, CA (16-17)	WEST 2017b
Dillon, CA (08-09)	Chatfield et al. 2009	North Sky River, CA (16-17)	WEST 2017c	North Sky River, CA (15-16)	WEST 2016d
Diablo Winds, CA (05-07)	WEST 2006, 2008	Elkhorn, OR (10)	Enk et al. 2011a	Palouse Wind, WA (12-13)	Stantec 2013a
North Sky River, CA (13-14)	Levenstein et al. 2014	Pebble Springs, OR (09-10)	Gritski and Kronner 2010a	Alta VIII, CA (12-13)	Chatfield and Bay 2014
White Creek, WA (07-11)	Downes and Gritski 2012a	Shiloh II, CA (09-10)	Kerlinger et al. 2010, 2013a	Elkhorn, OR (08)	Jeffrey et al. 2009b
Lower West, CA (12-13)	Levenstein and Bay 2013a	Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a	Cameron Ridge/Section15, CA (15-16)	Rintz and Thompson 2017
Shiloh III, CA (12-13)	Kerlinger et al. 2013b	Alta II-V, CA (11-12)	Chatfield et al. 2012	Pinyon Pines, CA (17-18)	Rintz and Pham 2018
Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010	Mustang Hills, CA (12-13)	Chatfield and Bay 2014	Alite, CA (09-10)	Chatfield et al. 2010
Stateline, OR/WA (01-02)	Erickson et al. 2004	Rising Tree, CA (17-18)	Chatfield et al. 2018	Mustang Hills, CA (16-17)	WEST 2018
Klondike II, OR (05-06)	NWC and WEST 2007	High Winds, CA (03-04)	Kerlinger et al. 2006	Alta II-V, CA (15-16)	Thompson et al. 2016
Rising Tree, CA (15-16)	Rintz et al. 2016	Solano III, CA (12-13)	AECOM 2013	Pinyon Pines, CA (15-16)	Rintz and Starcevich 2016
Klondike III (Phase I), OR (07-09)	Gritski et al. 2010	Wild Horse, WA (07)	Erickson et al. 2008	Cameron Ridge/Section15, CA (14-15)	WEST 2016b
Hopkins Ridge, WA (08)	Young et al. 2009a	Tucannon River, WA (15)	Hallingstad et al. 2016	Alta VIII, CA (14-15)	WEST 2016c
Harvest Wind, WA (10-12)	Downes and Gritski 2012b	Goodnoe, WA (09-10)	URS Corporation 2010a	Marengo I, WA (09-10)	URS Corporation 2010c
Shiloh II, CA (10-11)	Kerlinger et al. 2013a	Vantage, WA (10-11)	Ventus 2012	Alta VIII, CA (16-17)	WEST 2018
Shiloh II, CA (11-12)	Kerlinger et al. 2013a	Hopkins Ridge, WA (06)	Young et al. 2007b	Pacific Wind, CA (14-15)	WEST 2016a
Alta II-V, CA (13-14)	Chatfield et al. 2014	North Sky River, CA (14-15)	Levenstein et al. 2015	Marengo II, WA (09-10)	URS Corporation 2010b
Nine Canyon, WA (02-03)	Erickson et al. 2003	Stateline, OR/WA (06)	Erickson et al. 2007		

Waterfowl

Waterfowl were the most common large bird type recorded during the Year 1 avian use surveys at the Project (2,061 observations among 25 separate groups), accounting for 63.1% of large bird observations recorded. The majority of waterfowl observations (about 78%) comprised three species: snow goose, greater white-fronted goose, and Canada goose, all of which are abundant species in the Pacific flyway (NatureServe 2018). Additionally, the overwhelming majority (97.1%) of waterfowl observations were recorded flying above the estimated RSH, and therefore were not as risk of collision with turbines. Waterfowl were also the most abundant large bird type recorded during pre-construction surveys at Hatchet Ridge in 2005-2006 (Young et al. 2007a), and the most common bird type documented among fatalities during the post-construction monitoring at Hatchet Ridge, composing between 18% and 50% of all bird fatalities recorded annually (Tetra Tech 2014).

Despite accounting for the majority of large bird fatalities at Hatchet Ridge, annual waterfowl fatality rates at Hatchet Ridge were still comparatively low for the region and nationally, ranging from 0.27 to 0.39 birds/MW/year (Tetra Tech 2014). The most common waterfowl fatality at Hatchet Ridge was snow goose (10 fatalities over three years), followed by northern shoveler (*Anas clypeata*; six fatalities), and green-winged teal (*Anas crecca*; three fatalities). Most of these waterfowl fatalities were recorded in the spring and were primarily detected after storms moved through the area. As such, waterfowl fatalities at Hatchet Ridge were primarily attributed to species making localized movements under high wind and/or low visibility conditions (Tetra Tech 2014). Given the similar patterns of waterfowl use observed during pre-construction surveys at both projects, it is reasonable to anticipate similarly low levels of waterfowl mortality at the Project as that estimated at Hatchet Ridge.

Vultures

Vulture (i.e., turkey vulture; 578 observations in 453 separate groups) was the second most common large bird type recorded during surveys at the Project, accounting for 17.7% of all large bird observations. The majority (89.1%) of vulture observations were recorded in spring and summer. Similarly, during pre-construction avian use surveys at Hatchet Ridge, turkey vultures were routinely observed, accounting for 13.4% of all large bird observations (Young et al. 2007a); however, only one turkey vulture fatality was reported over the course of the three-year post-construction monitoring study (Tetra Tech 2014). During 239 post-construction fatality monitoring studies at modern wind energy facilities in North America, turkey vultures (165 fatalities) accounted for 1.6% of all bird fatalities documented (n=10,681; see Appendix E for a list of facilities and references), suggesting generally low risk of collision for this species. Based on the similarities in pre-construction survey data for vultures at Hatchet Ridge and the Project, and the low level of post-construction fatalities at Hatchet Ridge, which is supported by the available data at facilities across North America, impacts to turkey vultures are anticipated to be low at the Project, and similar to impacts documented at Hatchet Ridge.

Diurnal Raptors

Diurnal raptors were observed regularly at the Project, composing 6.6% of all large bird observations recorded during the Year 1 study (216 of 3,267 total large bird observations).

Eleven diurnal raptor species were recorded, the most common being red-tailed hawk (148 observations), sharp-shinned hawk *(*18 observations), bald eagle (16 observations), and Cooper's hawk (nine observations). Diurnal raptor use documented during the Year 1 surveys was fairly consistent across seasons, with the highest use observed in fall (0.56 raptors/800-m plot/60-min survey), followed by spring (0.46), winter (0.44), and summer (0.23), suggesting no obvious increase in diurnal raptor use during migration seasons.

Based on publicly available data from 30 wind energy facilities in California and the Pacific Northwest, diurnal raptor fatality rates have ranged from zero to 1.06 fatalities/MW/year, with a mean of 0.20 fatalities/MW/year (Figure 6). At these facilities, a total of 1,029 diurnal raptors representing 15 species have been documented as fatalities (Table 10; see Appendix E for a list of facilities and references). Red-tailed hawk was the diurnal raptor species most often found as a fatality (551 fatalities; 53.5% of diurnal raptor fatalities), followed by American kestrel (*Falco sparverius*; 261; 25.4%) and golden eagle (100; 9.7%; Table 10).

As mentioned above, the Project differs dramatically in topography and vegetation from other wind energy facilities in California and the Pacific Northwest. As such, species composition of diurnal raptor fatalities may differ somewhat from those found at other regional facilities. Again, Hatchet Ridge is likely the more relevant source of information to inform potential risk to diurnal raptors at the Project. During post-construction fatality monitoring at Hatchet Ridge, raptor fatality rates were not calculated due to low sample size (i.e., less than five fatalities found per year); however, over the three years of monitoring, seven diurnal raptor fatalities were documented: four red-tailed hawks, two sharp-shinned hawks, and one Cooper's hawk (Tetra Tech 2014). During pre-construction avian use surveys conducted at Hatchet Ridge in 2005-2006, red-tailed hawk was the most commonly recorded diurnal raptor species, accounting for 50.7% of all diurnal raptor observations (Young et al. 2007a). American kestrel (15.5%), bald eagle (8.5%), and Cooper's hawk (7.7%) represented the next three most common diurnal raptor species (Young et al. 2007a). The composition of diurnal raptor species recorded during Year 1 avian use surveys at the Project was similar to that recorded at Hatchet Ridge, with slightly higher red-tailed hawk and sharp-shinned hawk use at the Project, and slightly higher American kestrel and bald eagle use at Hatchet Ridge (Young et al. 2007a). Based on the results of pre- and post-construction studies at Hatchet Ridge, as well as the Year 1 avian use surveys conducted at the Project, it is reasonable to assume that diurnal raptor fatality rates at the Project will be similar to Hatchet Ridge.

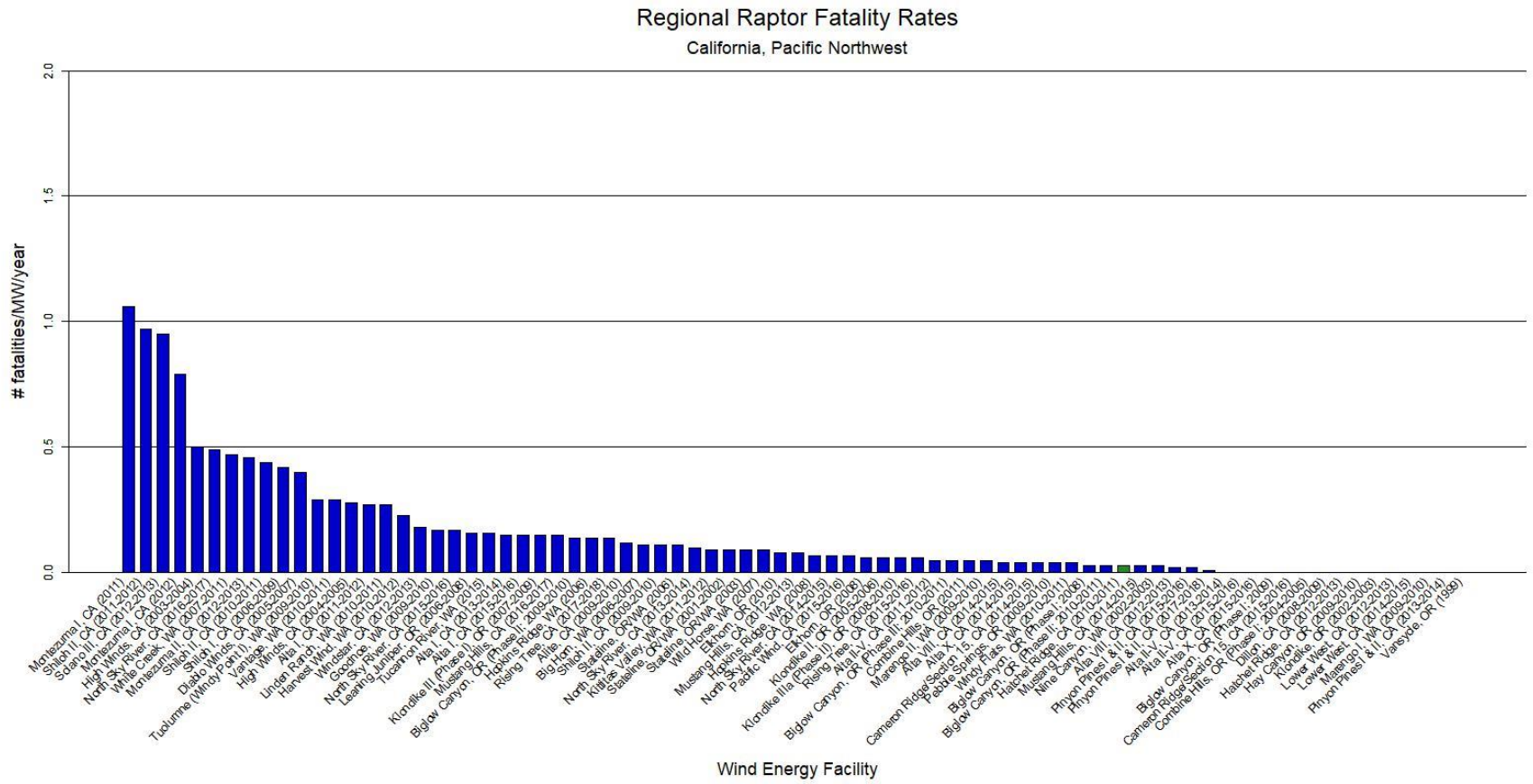


Figure 6. Fatality rates for diurnal raptors (number of raptors per megawatt per year) from publicly available wind energy facilities in the California and Pacific Northwest regions of North America.

Figure 6 (*continued*). Fatality rates for diurnal raptors (number of raptors per megawatt per year) from publicly available wind energy facilities in the California and Pacific Northwest regions of North America.

Data from the following sources:

Wind Energy Facility	Reference	Wind Energy Facility	Reference	Wind Energy Facility	Reference
Montezuma I, CA (11)	ICF International 2012	Rising Tree, CA (17-18)	Chatfield et al. 2018	Pebble Springs, OR (09-15)	Gritski and Kronner 2010a
Shiloh II, CA (11-12)	Kerlinger et al. 2013a	Alite, CA (09-10)	Chatfield et al. 2010	Windy Flats, WA (10-11)	Enz et al. 2011
Solano III, CA (12-13)	AECOM 2013	Big Horn, WA (06-07)	Kronner et al. 2008	Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a
Montezuma I, CA (12)	ICF International 2013	Shiloh II, CA (09-10)	Kerlinger et al. 2010, 2013a	Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012a
High Winds, CA (03-04)	Kerlinger et al. 2006	Stateline, OR/WA (06)	Erickson et al. 2007	Hatchet Ridge, CA (10-11)	Tetra Tech 2013
North Sky River, CA (16-17)	WEST 2017c	North Sky River, CA (13-14)	Levenstein et al. 2014	Mustang Hills, CA (14-15)	WEST 2016c
White Creek, WA (07-11)	Downes and Gritski 2012a	Kittitas Valley, WA (11-12)	Stantec 2012	Nine Canyon, WA (02-03)	Erickson et al. 2003
Montezuma II, CA (12-13)	Harvey & Associates 2013	Stateline, OR/WA (01-02)	Erickson et al. 2004	Alta VIII, CA (12-13)	Chatfield and Bay 2014
Shiloh II, CA (10-11)	Kerlinger et al. 2013a	Stateline, OR/WA (03)	Erickson et al. 2004	Pinyon Pines, CA (15-16)	Rintz and Starcevich 2016
Shiloh I, CA (06-09)	Kerlinger et al. 2009	Wild Horse, WA (07)	Erickson et al. 2008	Pinyon Pines, CA (17-18)	Rintz and Pham 2018
Diablo Winds, CA (05-07)	WEST 2006, 2008	Elkhorn, OR (10)	Enk et al. 2011a	Alta II-V, CA (13-14)	Chatfield et al. 2014
Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010	Mustang Hills, CA (12-13)	Chatfield and Bay 2014	Alta II-V, CA (15-16)	Thompson et al. 2016
Vantage, WA (10-11)	Ventus 2012	Hopkins Ridge, WA (06)	Young et al. 2007b	Alta X, CA (15-16)	Thompson et al. 2016
High Winds, CA (04-05)	Kerlinger et al. 2006	North Sky River, CA (14-15)	Levenstein et al. 2015	Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010
Alta I, CA (11-12)	Chatfield et al. 2012	Pacific Wind, CA (15-16)	WEST 2017a	Cameron Ridge/Section15, CA (15-16)	Rintz and Thompson 2017
Linden Ranch, WA (10-11)	Enz and Bay 2011	Elkhorn, OR (08)	Jeffrey et al. 2009b	Combine Hills, OR (Phase I; 04-05)	Young et al. 2006
Harvest Wind, WA (10-12)	Downes and Gritski 2012b	Klondike II, OR (05-06)	NWC and WEST 2007	Dillon, CA (08-09)	Chatfield et al. 2009
Windstar, CA (12-13)	Levenstein and Bay 2013b	Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011	Hatchet Ridge, CA (11-12)	Tetra Tech 2013
Goodnoe, WA (09-10)	URS Corporation 2010a	Rising Tree, CA (15-16)	Rintz et al. 2016	Hay Canyon, OR (09-10)	Gritski and Kronner 2010b
Leaning Juniper, OR (06-08)	Gritski et al. 2008	Alta II-V, CA (11-12)	Chatfield et al. 2012	Klondike, OR (02-03)	Johnson et al. 2003
Tucannon River, WA (15)	Hallingstad et al. 2016	Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012b	Lower West, CA (12-13)	Levenstein and Bay 2013a
Alta I, CA (13-14)	Chatfield et al. 2014	Combine Hills, OR (11)	Enz et al. 2012	Lower West, CA (14-15)	Levenstein and DiDonato 2015
Alta I, CA (15-16)	Thompson et al. 2016	Marengo II, WA (09-10)	URS Corporation 2010b	Marengo I, WA (09-10)	URS Corporation 2010c
Klondike III (Phase I), OR (07-09)	Gritski et al. 2010	Alta VIII, CA (14-15)	WEST 2016c	Pacific Wind, CA (14-15)	WEST 2016a
Mustang Hills, CA (16-17)	WEST 2018	Alta X, CA (14-15)	Chatfield et al. 2015	Pinyon Pines, CA (13-14)	Chatfield and Russo 2014
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011b	Cameron Ridge/Section 15, CA (14-15)	WEST 2016b	Vanscycle, OR (99)	Erickson et al. 2000
Hopkins Ridge, WA (06)	Young et al. 2007b				

Table 10. Raptor fatalities, by species, recorded at new-generation wind energy facilities in the California and the Pacific Northwest regions of North America.

Species	Scientific Name	Number of Raptor Fatalities[1]	Percent Composition of Raptor Fatalities
red-tailed hawk	*Buteo jamaicensis*	551	53.5
American kestrel	*Falco sparverius*	261	25.4
golden eagle	*Aquila chrysaetos*	100	9.7
northern harrier	*Circus cyaneus*	19	1.8
Swainson's hawk	*Buteo swainsoni*	16	1.6
unidentified raptor		14	1.4
ferruginous hawk	*Buteo regalis*	14	1.4
rough-legged hawk	*Buteo lagopus*	12	1.2
Cooper's hawk	*Accipiter cooperii*	8	0.8
unidentified buteo		8	0.8
prairie falcon	*Falco mexicanus*	7	0.7
sharp-shinned hawk	*Accipiter striatus*	5	0.5
white-tailed kite	*Elanus leucurus*	4	0.4
merlin	*Falco columbarius*	4	0.4
unidentified hawk		2	0.2
peregrine falcon	*Falco peregrinus*	1	0.1
unidentified accipiter		1	0.1
bald eagle	*Haliaeetus leucocephalus*	1	0.1
red-shouldered hawk	*Buteo lineatus*	1	0.1
Total		**1,029**	**100**

[1] These are raw data and are not corrected for searcher efficiency or scavenging.

Cumulative fatalities and species from data compiled by Western EcoSystems Technology, Inc. from publicly available fatality documents (see Appendix E for a list of facilities and references).

Passerines and Other Small Birds

During the Year 1 avian use surveys at the Project, 71 small bird species were observed, most (90.4%) of which were passerines. Small bird species richness (species/plot/survey) was highest in the summer (56 species) and lowest in the winter (25 species). Over a third (34.8%) of passerine observations at the Project was attributed to just three species: dark-eyed junco, mountain chickadee, and western bluebird. Although small bird use varied among the 39 observation points, ranging from 2.15 to 8.77 birds/plot/survey, the data are not suggestive of any areas of concentrated small bird use, such as important reproductive habitats or migration stopover sites. Furthermore, seasonal small bird use estimates ranged from a low of 2.79 birds/survey in winter to a high of 4.23 birds/survey in summer, with more moderate use in spring and fall, suggesting no substantial increase in small bird use during migration seasons.

During the three-year fatality monitoring study at Hatchet Ridge (2010-2013), annual small bird fatality rates ranged from 0.31 to 2.03 fatalities/MW/year (Tetra Tech 2014). Of the 129 bird fatalities documented during the study, only 47 (36.4%), comprising 17 species, were passerines (Tetra Tech 2014). The most common passerine species found as fatalities at Hatchet Ridge were dark-eyed junco (five fatalities), golden-crowned kinglet (*Regulus satrapa*; four fatalities), and Steller's jay (*Cyanocitta stelleri*; three fatalities; Tetra Tech 2014). Of the 129 bird fatalities documented at Hatchet Ridge, 33 (25.6%) were potential nocturnal migrants (i.e., small bird fatalities documented in spring and fall comprising species known to be nocturnal migrants in the region). However, this is a conservative estimate, as most of the 17 passerine

species documented as fatalities at Hatchet Ridge are also known summer or year-round residents in the area and it is likely that at least some of these fatalities were local resident birds rather than migrating birds.

The results of post-construction monitoring at Hatchet Ridge suggest low impacts to passerines and other small bird species at the facility, and no apparent disproportionate impacts to nocturnal migrants. Given the proximity of the Project to Hatchet Ridge, as well as similar topographic and habitat characteristics and species assemblages at the two sites, impacts to passerines and other small birds at the Project, including nocturnal migrants, are expected to be similarly low.

Potential Indirect Impacts

In addition to direct effects through collision mortality, wind energy development can indirectly affect wildlife resources, causing a loss of habitat where infrastructure is placed and loss of habitat through behavioral avoidance and perhaps habitat fragmentation (e.g., Leddy et al. 1999, Strickland et al. 2011, Pearce-Higgins et al. 2012, Marques et al. 2014; Shaffer and Buhl 2016). Loss of habitat from installation of wind energy facility infrastructure (i.e., turbines, access roads, maintenance buildings, substations and overhead transmission lines) can be long-term or temporary. Estimates of temporary construction impacts range from 0.2 to 1.0 ha (0.5 to 2.5 ac) per turbine (Strickland and Johnson 2006, Denholm et al. 2009), while long-term infrastructure generally occupies only 5% to 10% of the entire development area (Bureau of Land Management 2005). Behavioral displacement (avoidance) may lead to decreased habitat suitability for local populations (e.g., Stevens et al. 2013, Shaffer and Buhl 2016) and birds displaced by wind energy development may move to lower quality habitat with fewer disturbances, with an overall effect of reducing breeding success (Loesch et al. 2013, LeBeau et al. 2017). Behavioral avoidance may render much larger areas unsuitable or less suitable for some species of wildlife, depending on how far each species is displaced from wind energy facilities. Indirect effects also include habitat fragmentation (e.g., more habitat edges due to roads and smaller areas of contiguous habitat) which could provide more generalized habitats and resistance-free travel lanes for predators and competitors in, for example, large grasslands and in-tact forests. This may impact the survivorship and reproductive ability of birds in the vicinity of the wind energy facility. The greatest concern for indirect impacts of wind energy facilities on wildlife resources is where these facilities have been constructed in native vegetation communities that provide comparatively rare, high-quality habitat for some bird species and species of concern (USFWS 2012).

The Project area is predominantly coniferous forest which is heavily managed for timber production. This has resulted in a highly fragmented landscape with no large contiguous tracts of undisturbed wildlife habitat. Commercial timber operations currently and will continue to alter the landscape within the Project area, with areas of mature forest being harvested and replanted with conifer seedlings that eventually transition from a scrub-shrub cover type to densely treed early-seral forest over 10-20 years. As timber management changes the landscape, species composition and spatial distribution of bird communities will also change within the Project area. While small-scale displacement may occur for some species, particularly

in areas cleared for turbines pads or roads, it is not expected to be different than that caused by the timber harvest operations currently occurring and that will continue to occur throughout the Project area. Siting Project facilities on previously disturbed land and using existing roads will help reduce the potential for increased habitat fragmentation and species displacement (USFWS 2012).

Potential Impacts to Species of Concern

Bald Eagle

During 531 hours of survey effort at the Project during the Year 1 surveys, a total of 16 bald eagles were observed. These 16 observations amounted to 35 bald eagle risk minutes, the majority (68.6%) of which was recorded in winter. Bald eagle risk minutes were recorded at 12 of the 39 observations points. Use of the Project area by bald eagles was lower than bald eagle use documented during pre-construction avian use surveys conducted at Hatchet Ridge, although seasonal patterns of use were relatively consistent. During 135 hours of survey effort at Hatchet Ridge, 12 bald eagle observations were recorded, the majority (75%) of which were recorded in fall and winter (Young et al. 2007a), yet no bald eagle fatalities were documented during the three years of post-construction monitoring at Hatchet Ridge (Tetra Tech 2014). Based on information compiled by the USFWS, there have been 49 documented bald eagle fatalities or injuries at wind energy facilities in the US between 2013 and 2018 (Kritz et al. 2018). The majority of bald eagle casualties occurred in the Upper Midwest, Intermountain West, and Alaska, with only single bald eagle fatalities documented in each of California, Oregon, and Washington (Kritz et al. 2018).

While bald eagle nesting habitat is generally absent from the Project area, the species is known to nest in areas adjacent to rivers and lakes in the surrounding landscape. During eagle nest surveys conducted within a 10-mi radius of the Project area, 11 occupied bald eagle nests were documented, with the closest nests to the Project area located at Lake Margaret, approximately 4.7 km (2.9 mi) east of the Project, and along the Pit River approximately 6.8 km (4.2 mi) north of the Project (Thompson 2018). Despite a number of occupied bald eagle nests in the vicinity of the Project, only three of the 16 bald eagle observations documented during the Year 1 surveys were recorded in the spring and summer nesting season, suggesting even lower use of the Project area by breeding eagles than migrating or wintering bald eagles. Based on the generally low direct impacts to bald eagles documented in the Pacific Northwest, including at Hatchet Ridge, as well as the relatively low use of the Project by bald eagles documented during the Year 1 study, risk of collision at the Project is anticipated to be low.

Golden Eagle

During 531 hours of survey effort at the Project, only two golden eagle observations were recorded, both during spring. These two observations totaled four golden eagle risk minutes. This is consistent with the pre-construction avian use data collected at Hatchet Ridge which included a single golden eagle observation recorded in winter (Young et al. 2007a). No golden eagle fatalities have been documented at Hatchet Ridge (Tetra Tech 2014). Typical golden eagle nesting habitat (e.g., cliffs, rocky outcrops) is absent from the Project area, and during

eagle nest surveys conducted for the Project in 2017, no occupied golden eagle nests were identified within 10 mi of the Project (Thompson 2018). Based on the results of the Year 1 surveys which indicate very low use of the Project area by golden eagles, as well as pre- and post-construction information from Hatchet Ridge, risk of collision for golden eagles at the Project is anticipated to be low.

Northern Goshawk and Northern Harrier

Northern goshawk and northern harrier, both designated as California SSC, were recorded in low numbers (four northern harriers and three northern goshawks) during the Year 1 avian use surveys at the Project. Northern harriers generally prefer more open meadow and grassland habitats, and are not likely to frequent the forested habitats present throughout the majority of the Project area. Northern goshawk is a forest raptor; however, dense stands of older forest preferred as nesting habitat by this species are limited within the Project area as a result of management for timber production.

No northern goshawk fatalities have been reported among publicly available fatality data from 239 wind energy facilities throughout North America (see Appendix E for a list of study sites and references). While these data may suggest that northern goshawks are not vulnerable to collision with turbine blades, it may also reflect an absence of wind energy facilities constructed in areas of mature forest habitat used by goshawks. Given the generally low use of the area by goshawks documented during avian use surveys to date, the limited extent of mature forest stands within the Project area, and the absence of known goshawk fatalities at wind energy facilities across North America, potential impacts to the species resulting from collision with Project turbines is anticipated to be low, but cannot be entirely ruled out.

Relatively few northern harrier fatalities have been reported in publicly available fatality studies, despite the fact that they are commonly observed during fixed-point bird counts at wind energy facilities (Erickson et al. 2001, Whitfield and Madders 2006, Smallwood and Karas 2009). Among the 1,029 diurnal raptor fatalities in California and the Pacific Northwest, 19 northern harrier fatalities have been documented, representing 1.9% of all diurnal raptor fatalities (Table 10). Northern harriers typically fly close to the ground (MacWhirter and Bildstein 1996), with some studies reporting up to 97% of flights below 20 m (66 ft; Whitfield and Madders 2006); therefore, risk of collision with turbine blades is considered low for this species (Whitfield and Madders 2005, 2006). Given low use of the Project area by northern harriers, a general lack of the species' preferred open habitat, and low risk of collision, impacts to northern harriers resulting from Project development and operation are not anticipated.

American White Pelican and Sandhill Crane

American white pelican (two groups totaling 28 individuals) and sandhill crane (eight groups totaling 116 individuals), the only two waterbird species recorded during the Year 1 surveys, accounted for 4.4% of overall large bird observations at the Project. American white pelican is designated as a California SSC. Sandhill crane observations recorded during surveys were not identified to the subspecies level; however, each of the two subspecies potentially flying over

the Project are considered sensitive at the state level; *Antigone canadensis tabida* is a state-threatened species, and *A. c. canadensis* is a state SSC.

Waterbirds, including sandhill crane and American white pelican, do not appear to be particularly susceptible to collision with wind turbines. According to the NRC (2007) cumulative effects report, waterbirds composed about 1% of documented fatalities at 14 wind energy facilities. Waterbirds made up 0.2% of all bird fatalities (n = 4,975) in an analysis of 116 standardized monitoring studies conducted at over 70 wind energy facilities throughout the US and Canada (Erickson et al. 2014). Among publicly available reports reviewed by WEST, waterbirds accounted for just 0.3% of fatalities recorded during 239 studies at facilities across North America (27 of 10,681 total fatalities; see Appendix E for a list of facilities and references). The 27 waterbird fatalities documented at these facilities include two American white pelicans and one sandhill crane; however, the tally in WEST's database does not include three sandhill crane fatalities documented in non-standardized fatality surveys. These include one fatality at an older-generation facility at Altamont Pass in California (Smallwood and Karas 2009), and two fatalities from a facility in west Texas (Navarrete and Griffis-Kyle 2014 as cited in Gerber et al. 2014; Stehn 2011), documented as part of a wintering crane displacement study conducted by graduate student L. Navarrete of Texas Tech University. No American white pelican or sandhill crane fatalities were documented during the three-year fatality monitoring study at Hatchet Ridge, despite both species recorded flying over the site during pre-construction avian use surveys (Young et al. 2007a, Tetra Tech 2014).

Researchers at WEST monitored use by migrating sandhill cranes at five wind energy facilities in North and South Dakota from 2009 – 2013 for three years at each site. Concurrently, they searched underneath all turbines daily for fatalities of cranes. Cumulatively, observers spent about 13,182 hours recording crane use over 1,305 days, and even though 42,727 sandhill crane observations were recorded, no fatalities of cranes were found beneath turbines (Derby et al. 2012e) A crane monitoring study was conducted at the Forward Energy Center, a wind energy facility in southern Wisconsin located within 3.2 km (2.0 miles) of a large wetland used by sandhill cranes. No crane fatalities were found during the crane monitoring study in the fall of 2008, or during regular bird fatality monitoring studies conducted in the fall of 2008, spring and fall of 2009, and in the spring of 2010, even though sandhill cranes were observed in the study area (Grodsky et al. 2013).

The sandhill crane's range in the Pacific Flyway is from Siberia and Alaska to California's Central Valley. Sandhill cranes typically use large freshwater marshes, prairie ponds, and marshy tundra during summer and grain fields or prairies during migration and winter. Although suitable breeding and stopover habitat is absent from the Project area, sandhill cranes are known to breed in the Fall River Valley approximately 32 km (20 mi) east of the Project area, and there is potential for the species to migrate over the Project in spring and fall. Breeding and stopover habitat for American white pelican is also absent from the Project area. In California, the American white pelican's breeding range is restricted to the Klamath Basin to the north of the Project (Shuford and Gardali 2008); although there is potential for groups to migrate throughout the region, particularly in spring and fall. Given the absence of suitable breeding and

stopover habitat within the Project area and the available data regarding these species' interactions with wind turbines, impacts to sandhill crane and American white pelican from Project development and operation are anticipated to be low.

Olive-sided Flycatcher, Yellow Warbler, and Vaux's Swift

Sensitive small bird species recorded during Year 1 avian use surveys at the Project included three species designated as California SSC: olive-sided flycatcher (five observations), yellow warbler (35 observations), and Vaux's swift (35 observations within one group). All three species are likely summer residents, but may also occur as migrants within the Project area. Both olive-sided flycatcher and yellow warbler were observed only in summer (with the exception of a single yellow warbler observed in fall), and the single group of Vaux's swifts was observed in spring. Both olive-sided flycatcher and yellow warbler were also recorded during pre-construction avian use surveys at Hatchet Ridge, primarily in summer.

Based on publicly available data from post-construction fatality monitoring conducted at North American wind energy facilities, all three species have been documented as fatalities, including two olive-sided flycatchers, 36 yellow warblers, and 16 Vaux's swifts (see Appendix E for a list of facilities and references). At Hatchet Ridge, a single yellow warbler fatality and a single Vaux's swift fatality were documented during the three-year monitoring study (Tetra Tech 2014).

Given the presence of these three species within the Project area and known impacts observed at Hatchet Ridge and other wind energy facilities nationwide, risk of collision with Project turbines is anticipated to be low to moderate. The most likely direct impact to potentially suitable nesting habitat would be timber harvest and vegetation clearing in preparation of turbine pads or road construction. However, given the existing level of disturbance and habitat fragmentation within the Project area, it is unlikely that Project development will cause displacement of sensitive small bird species beyond what has occurred and will continue to occur from ongoing timber harvest operations.

CONCLUSIONS

To date, overall fatality rates for birds at wind energy facilities in California and the Pacific Northwest have ranged from 0.16 to 17.44 fatalities/MW/year, while diurnal raptor fatality rates at these same facilities have ranged from zero to 1.06 fatalities/MW/year (Appendix E). However, the forested habitats covering the majority of the Project area are unique to wind energy facilities in the western US, which are more typically composed of desert scrub, grassland, and shrub-steppe vegetation communities, potentially limiting the inference from studies conducted at these facilities. The one exception to this is the Hatchet Ridge facility, which has similar ecological characteristics to the Project, and is located immediately to the northeast, providing the most relevant source of information for assessing potential risk to avian species at the Project. The results of pre-construction avian use surveys conducted at Hatchet Ridge were largely consistent with those documented at the Project during this study. Furthermore, based on post-construction monitoring at Hatchet Ridge, all bird, small bird, and diurnal raptor fatality rates have all been low and within the range of other facilities in California

and the Pacific Northwest. Given the similarity in species composition and temporal use patterns reported at Hatchet Ridge and observed at the Project, it is reasonable to expect that fatality rates and the species composition of fatalities at the Project will be similar to that documented at Hatchet Ridge. Following recommendations presented in the ECPG, a second year of large bird/eagle use surveys is currently underway at the Project to collect data sufficient to support a future application for an incidental eagle take permit under the BGEPA, should unanticipated impacts to eagles suggest a need for such permit. Because field studies were being conducted to gather a second year of large bird/eagle use data, Pacific Wind opted to capitalize on the efficiency of being in the field and is also completing a second year of small bird use surveys. The additional avian use surveys are expected to conclude in May 2019 and. an updated risk assessment will be prepared following the completion of the two-year study. The updated risk assessment will focus on risk to bald and golden eagles, as well as any inter-annual variations in species composition or use documented during the Year 2 surveys that may influence perceived risk to avian species at the Project.

REFERENCES

AECOM. 2013. Annual Monitoring Report: July 2012 - June 2013. Solano Wind Project - Phase 3. Prepared for SMUD - Environmental Management, Sacramento, California. Prepared by AECOM, Sacramento, California. September 2013.

Arnett, E. B., M. R. Schirmacher, C. D. Hein, and M. M. P. Huso. 2011. Patterns of Bird and Bat Fatality at the Locust Ridge II Wind Project, Pennsylvania. 2009-2010 Final Report. Prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission (PGC). Prepared by Bat Conservation International (BCI), Austin, Texas. January 2011.

Arnett, E. B., M. R. Schirmacher, M. M. P. Huso, and J. P. Hayes. 2009. Patterns of Bat Fatality at the Casselman Wind Project in South-Central Pennsylvania: 2008 Annual Report. Annual report prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission. Bat Conservation International (BCI), Austin, Texas. June 2009. Available online: http://www.batsandwind.org/pdf/2008%20Casselman%20Fatality%20Report.pdf

Arnett, E. B., M. R. Schirmacher, M. M. P. Huso, and J. P. Hayes. 2010. Patterns of Bat Fatality at the Casselman Wind Project in South-Central Pennsylvania. 2009 Annual Report. Annual report prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission. Bat Conservation International (BCI), Austin, Texas. January 2010.

Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code (USC) Section (§) 668-668d. Bald Eagle Protection Act of 1940, June 8, 1940, Chapter 278, § 2, 54 Statute (Stat.) 251; Expanded to include the related species of the golden eagle October 24, 1962, Public Law (PL) 87-884, 76 Stat. 1246. [as amended: October 23, 1972, PL 92-535, § 2, 86 Stat. 1065; November 8, 1978, PL 95-616, § 9, 92 Stat. 3114.].

BHE Environmental, Inc. (BHE). 2010. Post-Construction Bird and Bat Mortality Study: Cedar Ridge Wind Farm, Fond Du Lac County, Wisconsin. Interim Report prepared for Wisconsin Power and Light, Madison, Wisconsin. Prepared by BHE Environmental, Inc. Cincinnati, Ohio. February 2010.

BHE Environmental, Inc. (BHE). 2011. Post-Construction Bird and Bat Mortality Study: Cedar Ridge Wind Farm, Fond Du Lac County, Wisconsin. Final Report. Prepared for Wisconsin Power and Light, Madison, Wisconsin. Prepared by BHE Environmental, Inc. Cincinnati, Ohio. February 2011.

BioResource Consultants, Inc. (BRC). 2012. Avian Mortality Monitoring Report, Pine Tree Wind Farm, Kern County, California. Prepared for the City of Los Angeles Department of Water and Power. Report prepared by BioResource Consultants, Inc., Ojai, California. March 26, 2012.

Brown, W. K. and B. L. Hamilton. 2006. Monitoring of Bird and Bat Collisions with Wind Turbines at the Summerview Wind Power Project, Alberta: 2005-2006. Prepared for Vision Quest Windelectric, Calgary, Alberta by TAEM Ltd., Calgary, Alberta, and BLH Environmental Services, Pincher Creek, Alberta. September 2006. Available online: http://www.batsandwind.org/pdf/Brown 2006.pdf

Bureau of Land Management (BLM). 2005. Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM Administered Land in the Western United States. US Department of the Interior (USDOI), BLM, Washington, D. C. Available online: http://windeis.anl.gov /documents/fpeis/index.cfm

California Department of Fish and Wildlife (CDFW). 2018. Special Animals List. California Natural Diversity Database. April 2018. Available online: https://nrm.dfg.ca.gov/FileHandler.ashx? DocumentID=109406&inline

California Energy Commission (CEC) and California Department of Fish and Game (CDFG). 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. CEC, Renewables Committee, and Energy Facilities Siting Division, and CDFG, Resources Management and Policy Division. CEC-700-2007-008-CMF.

Chatfield, A. and D. Russo. 2014. Post-Construction Avian and Bat Fatality Monitoring for the Pinyon Pines I & II Wind Energy Project, Kern County, California. Final Report for the First Year of Operation: March 2013 - March 2014. Prepared for MidAmerican Renewables, LLC, Des Moines, Iowa, and Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 28, 2014.

Chatfield, A. and K. Bay. 2014. Post-Construction Studies for the Mustang Hills and Alta VIII Wind Energy Facilities, Kern County, California. Final Report for the First Year of Operation: July 2012 - October 2013. Prepared for EverPower Wind Holdings, Inc. and Brookfield Renewable Energy Group. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 28, 2014.

Chatfield, A., D. Riser-Espinoza, and K. Bay. 2014. Bird and Bat Mortality Monitoring at the Alta Wind Energy Center, Phases I - V, Kern County, California. Final Report for the Second Year of Operation: March 4, 2013 - March 6, 2014. Prepared for Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 22, 2014.

Chatfield, A., K. Levenstein, and G. DiDonato. 2015. Post-Construction Avian and Bat Mortality Monitoring, Alta X, LLC, Kern County, California. Final Report for the First Year of Operation: March 2014 - March 2015. Prepared for Alta Wind X, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 10, 2015.

Chatfield, A., M. Sonnenberg, and K. Bay. 2012. Avian and Bat Mortality Monitoring at the Alta-Oak Creek Mojave Project, Kern County, California. Final Report for the First Year of Operation March 22, 2011 – June 15, 2012. Prepared for Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 12, 2012.

Chatfield, A., T. Rintz, and R. Clark. 2018. Post-Construction Avian and Bat Fatality Monitoring at the Rising Tree and Addison Wind Energy Projects, Kern County, California. Year 2 Final Report: June 2017 – June 2018. Prepared for EDP Renewables North America, LLC (EDPR), Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon. August 20, 2018. 35 pp. + appendices.

Chatfield, A., W. Erickson, and K. Bay. 2009. Avian and Bat Fatality Study, Dillon Wind-Energy Facility, Riverside County, California. Final Report: March 26, 2008 - March 26, 2009. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 3, 2009.

Chatfield, A., W. P. Erickson, and K. Bay. 2010. Final Report: Avian and Bat Fatality Study at the Alite Wind-Energy Facility, Kern County, California. Final Report: June 15, 2009 – June 15, 2010. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Chodachek, K., C. Derby, M. Sonnenberg, and T. Thorn. 2012. Post-Construction Fatality Surveys for the Pioneer Prairie Wind Farm I Llc Phase II, Mitchell County, Iowa: April 4, 2011 – March 31, 2012. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 27, 2012.

Chodachek, K., K. Adachi, and G. DiDonato. 2015. Post Construction Fatality Surveys for the Prairie Rose Wind Energy Facility, Rock County, Minnesota. Final Report: April 15 to June 13, 2014, and August 15 to October 29, 2014. Prepared for Enel Green Power, North America, San Diego, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. January 23, 2015. Available online: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7BF38C2FEC-ED84-4813-AF3E-5A397A954A34%7D&documentTitle=20152-107006-01

Denholm, P., M. Hand, M. Jackson, and S. Ong. 2009. Land-Use Requirements of Modern Wind Power Plants in the United States. NREL/TP-6A2-45834. National Renewable Energy Laboratory (NREL), Golden, Colorado. August 2009. Available online at: ftp://ftp.manomet.org/WildlifeandEnergy/Literature_8July10/NREL_Land_Use_2009.pdf

Derby, C., A. Dahl, A. Merrill, and K. Bay. 2010e. 2009 Post-Construction Monitoring Results for the Wessington Springs Wind-Energy Facility, South Dakota. Final Report. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 19, 2010.

Derby, C., A. Dahl, and A. Merrill. 2012c. Post-Construction Monitoring Results for the Prairiewinds Sd1 Wind Energy Facility, South Dakota. Final Report: March 2011 - February 2012. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. September 27, 2012.

Derby, C., A. Dahl, and D. Fox. 2013b. Post-Construction Fatality Monitoring Studies for the Prairiewinds Sd1 Wind Energy Facility, South Dakota. Final Report: March 2012 - February 2013. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 13, 2013.

Derby, C., A. Dahl, and G. DiDonato. 2014. Post-Construction Fatality Monitoring Studies for the Prairiewinds Sd1 Wind Energy Facility, South Dakota. Final Report: March 2013 - February 2014. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., A. Dahl, K. Bay, and L. McManus. 2011d. 2010 Post-Construction Monitoring Results for the Wessington Springs Wind Energy Facility, South Dakota. Final Report: March 9 – November 16, 2010. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 22, 2011.

Derby, C., A. Dahl, W. Erickson, K. Bay, and J. Hoban. 2007. Post-Construction Monitoring Report for Avian and Bat Mortality at the Nppd Ainsworth Wind Farm. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, for the Nebraska Public Power District.

Derby, C., G. Iskali, M. Kauffman, T. Thorn, T. Lyon, and A. Dahl. 2013c. Post-Construction Monitoring Results, Red Hills Wind Farm, Roger Mills and Custer Counties, Oklahoma. Final Report: March 2012 to March 2013. Prepared for Acciona Wind Energy, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. June 12, 2013.

Derby, C., G. Iskali, S. Howlin, T. Thorn, T. Lyon, and A. Dahl. 2013a. Post-Construction Monitoring Results for the Big Smile Wind Farm, Roger Mills County, Oklahoma. Final Report: March 2012 to February 2013. Prepared for Acciona Wind Energy, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. June 12, 2013.

Derby, C., J. Ritzert, and K. Bay. 2010d. Bird and Bat Fatality Study, Grand Ridge Wind Resource Area, Lasalle County, Illinois. January 2009 - January 2010. Prepared for Grand Ridge Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. July 13, 2010. Revised January 2011.

Derby, C., K. Chodachek, and M. Sonnenberg. 2012a. Post-Construction Casualty Surveys for the Buffalo Ridge II Wind Project. Iberdrola Renewables: March 2011- February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 31, 2012.

Derby, C., K. Chodachek, and M. Sonnenberg. 2012d. Post-Construction Fatality Surveys for the Elm Creek II Wind Project. Iberdrola Renewables: March 2011-February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. October 8, 2012.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010a. Post-Construction Fatality Surveys for the Moraine II Wind Project: March - December 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010b. Post-Construction Fatality Survey for the Buffalo Ridge I Wind Project. May 2009 - May 2010. Prepared for Iberdrola Renewables, Inc., Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010c. Post-Construction Fatality Surveys for the Elm Creek Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010f. Post-Construction Fatality Surveys for the Winnebago Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and S. Nomani. 2011a. Post-Construction Fatality Surveys for the Barton I and II Wind Project: Iri. March 2010 - February 2011. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Version: September 28, 2011.

Derby, C., K. Chodachek, K. Bay, and S. Nomani. 2011c. Post-Construction Fatality Surveys for the Rugby Wind Project: Iberdrola Renewables, Inc. March 2010 - March 2011. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Version: October 14, 2011.

Derby, C., K. Chodachek, T. Thorn, and A. Merrill. 2012b. Post-Construction Surveys for the Prairiewinds Nd1 (2011) Wind Facility Basin Electric Power Cooperative: March - October 2011. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western Ecosystems Technology, Inc. (WEST), Bismarck, North Dakota. August 31, 2012.

Derby, C., K. Chodachek, T. Thorn, K. Bay, and S. Nomani. 2011b. Post-Construction Fatality Surveys for the Prairiewinds Nd1 Wind Facility, Basin Electric Power Cooperative, March - November 2010. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 2, 2011.

Derby, C., T. Thorn, and M. Wolfe. 2012e. Whooping and Sandhill Crane Monitoring at Five Operating Wind Facilities in North and South Dakota. Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota, and Cheyenne, Wyoming. National Wind Coordinating Collaborative (NWCC) Wind Wildlife Research Meeting IX. November 27-30, 2012, Denver, Colorado.

Downes, S. and R. Gritski. 2012a. White Creek Wind I Wildlife Monitoring Report: November 2007 - November 2011. Prepared for White Creek Wind I, LLC, Roosevelt, Washington. Prepared by Northwest Wildlife Consultants, Inc., Pendleton, Oregon. May 1, 2012.

Downes, S. and R. Gritski. 2012b. Harvest Wind Project Wildlife Monitoring Report: January 2010 – January 2012. Prepared for Harvest Wind Project, Roosevelt, Washington. Prepared by Northwest Wildlife Consultants, Inc., Pendleton, Oregon. May 1, 2012.

Enk, T., C. Derby, K. Bay, and M. Sonnenberg. 2011a. 2010 Post-Construction Fatality Monitoring Report, Elkhorn Valley Wind Farm, Union County, Oregon. January – December 2010. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Walla Walla, Washington, and Cheyenne, Wyoming. December 8, 2011.

Enk, T., K. Bay, M. Sonnenberg, and J. R. Boehrs. 2012a. Year 2 Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase II, Sherman County, Oregon. September 13, 2010 - September 15, 2011. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. April 23, 2012.

Enk, T., K. Bay, M. Sonnenberg, and J. R. Boehrs. 2012b. Year 1 Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase III, Sherman County, Oregon. September 13, 2010 - September 9, 2011. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. April 24, 2012.

Enk, T., K. Bay, M. Sonnenberg, J. Baker, M. Kesterke, J. R. Boehrs, and A. Palochak. 2010. Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring Second Annual Report, Sherman County, Oregon. January 26, 2009 - December 11, 2009. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc.(WEST) Cheyenne, Wyoming, and Walla Walla, Washington. April 2010.

Enk, T., K. Bay, M. Sonnenberg, J. Flaig, J. R. Boehrs, and A. Palochak. 2011b. Year 1 Post-Construction Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase II, Sherman County, Oregon. September 10, 2009 - September 12, 2010. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. January 7, 2011.

Enz, T. and K. Bay. 2010. Post-Construction Avian and Bat Fatality Monitoring Study, Tuolumne Wind Project, Klickitat County, Washington. Final Report: April 20, 2009 - April 7, 2010. Prepared for Turlock Irrigation District, Turlock, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 6, 2010.

Enz, T. and K. Bay. 2011. Post-Construction Monitoring at the Linden Ranch Wind Farm, Klickitat County, Washington. Final Report: June 30, 2010 - July 17, 2011. Prepared for EnXco. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. November 10, 2011.

Enz, T., K. Bay, M. Sonnenberg, and A. Palochak. 2012. Post-Construction Monitoring Studies for the Combine Hills Turbine Ranch, Umatilla County, Oregon. Final Report: January 7 - December 2, 2011. Prepared for Eurus Energy America Corporation, San Diego, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Walla Walla, Washington.

Enz, T., K. Bay, S. Nomani, and M. Kesterke. 2011. Bird and Bat Fatality Monitoring Study, Windy Flats and Windy Point II Wind Energy Projects, Klickitat County, Washington. Final Report: February 1, 2010 - January 14, 2011. Prepared for Windy Flats Partners, LLC, Goldendale, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 19, 2011.

Erickson, W. P., G. D. Johnson, M. D. Strickland, and K. Kronner. 2000. Avian and Bat Mortality Associated with the Vansycle Wind Project, Umatilla County, Oregon: 1999 Study Year. Prepared for Umatilla County Department of Resource Services and Development, Pendleton, Oregon. Prepared by Western EcoSystems Technology, Inc., (WEST). February 7, 2000.

Erickson, W.P., G.D. Johnson, M.D. Strickland, D. P. Young, Jr., K.J. Sernka, and R.E. Good. 2001. Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Bird Collision Mortality in the United States. National Wind Coordinating Collaborative (NWCC) Publication and Resource Document. Prepared for the NWCC by WEST, Inc., Cheyenne, Wyoming. August 2001.

Erickson, W. P., J. D. Jeffrey, and V. K. Poulton. 2008. Puget Sound Energy Wild Horse Wind Facility Avian and Bat Monitoring: First Annual Report: January–December, 2007. Prepared for Puget Sound Energy, Ellensburg, Washington. Prepared by by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 2008.

Erickson, W. P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Annual Report. July 2001 - December 2003. Technical report peer-reviewed by and submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee. Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 2004. Available online: http://www.west-inc.com/reports/swp_final_dec04.pdf

Erickson, W. P., K. Kronner, and K. J. Bay. 2007. Stateline 2 Wind Project Wildlife Monitoring Report, January - December 2006. Technical report submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee.

Erickson, W. P., K. Kronner, and R. Gritski. 2003. Nine Canyon Wind Power Project Avian and Bat Monitoring Report. September 2002 – August 2003. Prepared for the Nine Canyon Technical Advisory Committee and Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants (NWC), Pendleton, Oregon. October 2003. Available online: http://www.west-inc.com/reports/nine_canyon_monitoring_final.pdf

Erickson, W. P., M. M. Wolfe, K. J. Bay, D. H. Johnson, and J. L. Gehring. 2014. A Comprehensive Analysis of Small Passerine Fatalities from Collisions with Turbines at Wind Energy Facilities. PLoS ONE 9(9): e107491. doi: 10.1371/journal.pone.0107491.

ESRI. 2013. World Topographic Map. ArcGIS Resource Center. ESRI, producers of ArcGIS software. ESRI, Redlands, California. Last modified June 6, 2018. Available online: http://www.arcgis.com/home/item.html?id=30e5fe3149c34df1ba922e6f5bbf808f

ESRI. 2018a. World Street Map. ArcGIS Resource Center. Environmental Systems Research Institute (ESRI), producers of ArcGIS software, Redlands, California. Data accessed January 2018. Information online: https://www.arcgis.com/home/item.html?id=3b93337983e9436f8db950e38a8629af

ESRI. 2018b. World Imagery and Aerial Photos. ArcGIS Resource Center. Environmental Systems Research Institute (ESRI), producers of ArcGIS software. Redlands, California. Information online: http://www.arcgis.com/home/webmap/viewer.html?useExisting=1

Fagen Engineering, LLC. 2014. 2013 Avian and Bat Monitoring Annual Report: Big Blue Wind Farm, Blue Earth, Minnesota. Prepared for Big Blue Wind Farm. Prepared by Fagen Engineering, LLC. May 2014.

Fagen Engineering, LLC. 2015. 2014 Avian and Bat Monitoring Annual Report: Big Blue Wind Farm, Blue Earth, Minnesota. Prepared for Big Blue Wind Farm. Prepared by Fagen Engineering, LLC.

Ferrer, M., M. de Lucas, G.F.E. Janss, E. Casado, A.R. Muñoz, M.J. Bechard, and C.P. Calabuig. 2012. Weak Relationship between Risk Assessment Studies and Recorded Mortality in Wind Farms. Journal of Applied Ecology 49(1): 38-46.

Fiedler, J. K., T. H. Henry, R. D. Tankersley, and C. P. Nicholson. 2007. Results of Bat and Bird Mortality Monitoring at the Expanded Buffalo Mountain Windfarm, 2005. Tennessee Valley Authority. June 28, 2007.

Gerber, B. D., J. F. Dwyer, S. A. Nesbitt, R. C. Drewien, C. D. Littlefield, T. C. Tacha, and P. A. Vohs. 2014. Sandhill Crane (*Antigone Canadensis*), Version 2.0. A. F. Poole, ed. *In:* The Birds of North America Online. Cornell Lab of Ornithology, Ithaca, New York. Retrieved from the Birds of North America Online: https://birdsna.org/Species-Account/bna/species/sancra

Good, R. E., J. P. Ritzert, and K. Adachi. 2013b. Post-Construction Monitoring at the Top Crop Wind Farm, Gundy and Lasalle Counties, Illinois. Final Report: May 2012 - May 2013. Prepared for EDP Renewables, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. December 13, 2013.

Good, R. E., M. L. Ritzert, and K. Adachi. 2013a. Post-Construction Monitoring at the Rail Splitter Wind Farm, Tazwell and Logan Counties, Illinois. Final Report: May 2012 - May 2013. Prepared for EDP Renewables, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. December 16, 2013.

Griffith, G. E., J. M. Omernik, D. W. Smith, T. D. Cook, E. Tallyn, K. Moseley, and C. B. Johnson. 2016. Ecoregions of California. Color poster with map, scale 1:1,100,000. US Geological Survey Open-File Report 2016–1021. Available online: ftp://newftp.epa.gov/EPADataCommons/ORD/Ecoregions/ca/CA_eco_front_ofr20161021_sheet1.pdf and ftp://newftp.epa.gov/EPADataCommons/ORD/Ecoregions/ca/CA_eco_back_ofr20161021_sheet2.pdf

Gritski, R. and K. Kronner. 2010a. Pebble Springs Wind Power Project Wildlife Monitoring Study: January 2009 - January 2010. Prepared for Iberdrola Renewables, Inc. (IRI), and the Pebble Springs Advisory Committee. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 20, 2010.

Gritski, R. and K. Kronner. 2010b. Hay Canyon Wind Power Project Wildlife Monitoring Study: May 2009 - May 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Hay Canyon Wind Power Project LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. September 20, 2010.

Gritski, R., K. Kronner, and S. Downes. 2008. Leaning Juniper Wind Power Project, 2006 − 2008. Wildlife Monitoring Final Report. Prepared for PacifiCorp Energy, Portland, Oregon. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 30, 2008.

Gritski, R., S. Downes, and K. Kronner. 2010. Klondike III (Phase 1) Wind Power Project Wildlife Monitoring: October 2007-October 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon, for Klondike Wind Power III LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 21, 2010 (Updated September 2010).

Gritski, R., S. Downes, and K. Kronner. 2011. Klondike IIIa (Phase 2) Wind Power Project Wildlife Monitoring: August 2008 - August 2010. Updated Final. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon, for Klondike Wind Power III LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. Updated April 2011.

Grodsky, S. M., C. S. Jennelle, and D. Drake. 2013. Bird Mortality at a Wind-Energy Facility near a Wetland of International Importance. Condor 115(4): 700-711. doi: 10.1525/cond.2013.120167.

Gruver, J., M. Sonnenberg, K. Bay, and W. Erickson. 2009. Post-Construction Bat and Bird Fatality Study at the Blue Sky Green Field Wind Energy Center, Fond Du Lac County, Wisconsin July 21 - October 31, 2008 and March 15 - June 4, 2009. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. December 17, 2009.

Hallingstad, E., M. Gerringer, and J. Lombardi. 2016. Post-Construction Fatality Monitoring for the Tucannon River Wind Facility, Columbia County, Washington. Final Report: January – December 2015. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc (WEST), Cheyenne, Wyoming. March 18, 2016.

Harvey & Associates. 2013. Montezuma II Wind Energy Center: Post Construction Monitoring Report, Year-1. Prepared by NextEra Montezuma II Wind, LLC, Juno Beach, Florida. Prepared by H.T. Harvey & Associates, Los Gatos, California. September 3, 2013.

Hein, C. D., A. Prichard, T. Mabee, and M. R. Schirmacher. 2013. Avian and Bat Post-Construction Monitoring at the Pinnacle Wind Farm, Mineral County, West Virginia, 2012. Final Report. Bat Conservation International, Austin, Texas, and ABR, Inc., Forest Grove, Oregon. April 2013.

Homer, C. G., J. A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N. D. Herold, J. D. Wickham, and K. Megown. 2015. Completion of the 2011 National Land Cover Database for the Conterminous United States-Representing a Decade of Land Cover Change Information. Photogrammetric Engineering and Remote Sensing 81(5): 345-354. Available online: http://www.mrlc.gov/nlcd2011.php

Howe, R. W., W. Evans, and A. T. Wolf. 2002. Effects of Wind Turbines on Birds and Bats in Northeastern Wisconsin. Prepared by University of Wisconsin-Green Bay, for Wisconsin Public Service Corporation and Madison Gas and Electric Company, Madison, Wisconsin. November 21, 2002. 104 pp.

ICF International. 2012. Montezuma Wind Llc (Montezuma I) 2011 Avian and Bat Fatality Monitoring Report. Prepared for NextEra Energy Resources. Prepared by ICF International, Sacramento, California. May 17, 2012.

ICF International. 2013. Montezuma Wind Llc (Montezuma I) 2012 Avian and Bat Fatality Monitoring Report. Prepared for NextEra Energy Resources. Prepared by ICF International, Sacramento, California. May 2013.

Jacques Whitford Stantec Limited (Jacques Whitford). 2009. Ripley Wind Power Project Postconstruction Monitoring Report. Project No. 1037529.01. Report to Suncor Energy Products Inc., Calgary, Alberta, and Acciona Energy Products Inc., Calgary, Alberta. Prepared for the Ripley Wind Power Project Post-Construction Monitoring Program. Prepared by Jacques Whitford, Markham, Ontario. April 30, 2009.

Jain, A. 2005. Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm. Thesis. Iowa State University, Ames, Iowa.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, A. Fuerst, and A. Harte. 2010a. Annual Report for the Noble Bliss Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. March 9, 2010.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and A. Harte. 2011c. Annual Report for the Noble Wethersfield Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. January 22, 2011.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2011a. Annual Report for the Noble Altona Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. January 22, 2011.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2011b. Annual Report for the Noble Chateaugay Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. January 22, 2011.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2010b. Annual Report for the Noble Clinton Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. March 9, 2010.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2010c. Annual Report for the Noble Ellenburg Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. March 14, 2010.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2009a. Annual Report for the Maple Ridge Wind Power Project: Post-Construction Bird and Bat Fatality Study - 2007. Final report prepared for PPM Energy and Horizon Energy and Technical Advisory Committee (TAC) for the Maple Ridge Project Study. May 6, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, A. Fuerst, and C. Hansen. 2009e. Annual Report for the Noble Ellenburg Windpark, Llc, Postconstruction Bird and Bat Fatality Study - 2008. Prepared for Noble Environmental Power, LLC by Curry and Kerlinger, LLC. April 13, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, and M. Lehman. 2009b. Maple Ridge Wind Power Avian and Bat Fatality Study Report - 2008. Annual Report for the Maple Ridge Wind Power Project, Post-construction Bird and Bat Fatality Study - 2008. Prepared for Iberdrola Renewables, Inc, Horizon Energy, and the Technical Advisory Committee (TAC) for the Maple Ridge Project Study. Prepared by Curry and Kerlinger, LLC. May 14, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Histed, and J. Meacham. 2009d. Annual Report for the Noble Clinton Windpark, Llc, Postconstruction Bird and Bat Fatality Study - 2008. Prepared for Noble Environmental Power, LLC by Curry and Kerlinger, LLC. April 13, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Quant, and D. Pursell. 2009c. Annual Report for the Noble Bliss Windpark, Llc, Postconstruction Bird and Bat Fatality Study - 2008. Prepared for Noble Environmental Power, LLC by Curry and Kerlinger, LLC. April 13, 2009.

Jeffrey, J. D., K. Bay, W. P. Erickson, M. Sonneberg, J. Baker, M. Kesterke, J. R. Boehrs, and A. Palochak. 2009a. Portland General Electric Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring First Annual Report, Sherman County, Oregon. January 2008 - December 2008. Technical report prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology (WEST) Inc., Cheyenne, Wyoming, and Walla Walla, Washington. April 29, 2009.

Jeffrey, J. D., W. P. Erickson, K. Bay, M. Sonneberg, J. Baker, J. R. Boehrs, and A. Palochak. 2009b. Horizon Wind Energy, Elkhorn Valley Wind Project, Post-Construction Avian and Bat Monitoring, First Annual Report, January-December 2008. Technical report prepared for Telocaset Wind Power Partners, a subsidiary of Horizon Wind Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming, and Walla Walla, Washington. May 4, 2009.

Johnson, G. D., M. Ritzert, S. Nomani, and K. Bay. 2010. Bird and Bat Fatality Studies, Fowler Ridge I Wind-Energy Facility Benton County, Indiana. Unpublished report prepared for British Petroleum Wind Energy North America Inc. (BPWENA) by Western EcoSystems Technology, Inc. (WEST).

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, and D. A. Shepherd. 2000. Final Report: Avian Monitoring Studies at the Buffalo Ridge Wind Resource Area, Minnesota: Results of a 4-Year Study. Final report prepared for Northern States Power Company, Minneapolis, Minnesota, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 22, 2000. 212 pp.

Johnson, G., W. Erickson, and J. White. 2003. Avian and Bat Mortality During the First Year of Operation at the Klondike Phase I Wind Project, Sherman County, Oregon. Technical report prepared for Northwestern Wind Power, Goldendale, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 2003.

Kerlinger, P., J. Guarnaccia, R. Curry, and C. J. Vogel. 2014. Bird and Bat Fatality Study, Heritage Garden I Wind Farm, Delta County, Michigan: 2012-2014. Prepared for Heritage Sustainable Energy, LLC. Prepared by Curry and Kerlinger, LLC, McLean, Virginia. November 2014.

Kerlinger, P., R. Curry, A. Hasch, J. Guarnaccia, and D. Riser-Espinoza. 2013a. Post-Construction Bird and Bat Studies at the Shiloh II Wind Project, LLC, Solano County, California. Final Report. Prepared for EDF Renewable Energy (formerly known as enXco). Prepared by Curry and Kerlinger, LLC, McLean, Virginia. December 2012 (Revised June 2013).

Kerlinger, P., R. Curry, A. Hasch, J. Guarnaccia, and D. Riser-Espinoza. 2013b. Post-Construction Bird and Bat Studies at the Shiloh III Wind Project, LLC, Solano County, California. Report on Year 1 Results. Prepared for EDF Renewable Energy (formerly known as enXco). Prepared by Curry and Kerlinger, LLC, McLean, Virginia. August 2013.

Kerlinger, P., R. Curry, L. Culp, A. Hasch, and A. Jain. 2009. Revised Post-Construction Avian Monitoring Study for the Shiloh I Wind Power Project, Solano County, California. Final Report: October 2009. Third Year Report (Revised 2010). Prepared for Iberdrola Renewables, Inc. (IRI). Prepared by Curry and Kerlinger, LLC., McLean, Virginia. Available online: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=8914

Kerlinger, P., R. Curry, L. Culp, A. Hasch, and A. Jain. 2010. Post-Construction Avian Monitoring Study for the Shiloh II Wind Power Project, Solano County, California. Year One Report. Prepared for enXco Development Inc. Prepared by Curry and Kerlinger, LLC, McLean, Virginia. September 2010. Available online: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=12118

Kerlinger, P., R. Curry, L. Culp, A. Jain, C. Wilkerson, B. Fischer, and A. Hasch. 2006. Post-Construction Avian and Bat Fatality Monitoring Study for the High Winds Wind Power Project, Solano County, California: Two Year Report. Prepared for High Winds LLC, FPL Energy. Prepared by Curry and Kerlinger, LLC, MacLean, Virginia. April 2006. Available online: http://www.co.solano.ca.us/civicax/filebank/blobdload.aspx?blobid=8915

Kerns, J. and P. Kerlinger. 2004. A Study of Bird and Bat Collision Fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: Annual Report for 2003. Prepared for FPL Energy and the Mountaineer Wind Energy Center Technical Review Committee. February 14, 2004. 39 pp.

Kritz, K., M. Rheude, B. Millsap, M. Sadlowski, J. Pagel, M. Stuber, C. Borgman, T. Wittig, U. Kirpatrick, J. Muir, and H. Beeler. 2018. Bald Eagle Mortalities and Injuries at Wind Energy Facilities in the United States. Poster presented at the 25th Annual Conference of The Wildlife Society (TWS), October 7-11, 2018, Cleveland, Ohio.

Kronner, K., B. Gritski, and S. Downes. 2008. Big Horn Wind Power Project Wildlife Fatality Monitoring Study: 2006−2007. Final report prepared for PPM Energy and the Big Horn Wind Project Technical Advisory Committee by Northwest Wildlife Consultants, Inc. (NWC), Mid-Columbia Field Office, Goldendale, Washington. June 1, 2008.

LeBeau, C.W., G.D. Johnson, M.J. Holloran, J.L. Beck, R.M. Nielson, M.E. Kauffman, E.J. Rodemaker, and T.L. McDonald. 2017. Greater Sage-Grouse Habitat Selection, Survival, and Wind Energy Infrastructure. Journal of Wildlife Management 81(4): 690-711.

Leddy, K.L., K.F. Higgins, and D.E. Naugle. 1999. Effects of Wind Turbines on Upland Nesting Birds in Conservation Reserve Program Grasslands. Wilson Bulletin 111(1): 100-104.

Levenstein, K. and G. DiDonato. 2015. Post-Construction Avian and Bat Mortality Study at the Lower West Wind Energy Project, Kern County, California. Final Report for the Third Year of Operation: July 2014 - July 2015. Prepared for Brookfield Renewable Energy Partners, LP. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. October 31, 2013.

Levenstein, K. and K. Bay. 2013a. Post-Construction Avian and Bat Mortality Study at the Lower West Wind Energy Project, Kern County, California. Final Report for the First Year of Operation: May 2012 - May 2013. Prepared for Brookfield Renewable Energy Partners, LP. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. October 31, 2013.

Levenstein, K. and K. Bay. 2013b. Post-Construction Avian and Bat Mortality Study at the Windstar Wind Energy Project, Kern County, California. Final Mortality Report: May 2012 - May 2013. Prepared for Brookfield Renewable Energy Partners, LP. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. October 29, 2013.

Levenstein, K., A. Chatfield, and D. Riser-Espinoza. 2015. Post-Construction Studies for the North Sky River Wind Energy Facility, Kern County, California. Draft Report for the Second Year of Operation: January 2014 - January 2015. Prepared for North Sky River Energy LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. April 10, 2015.

Levenstein, K., E. Baumgartner, and K. Bay. 2014. Post-Construction Studies for the North Sky River Wind Energy Facility, Kern County, California. Final Report for the First Year of Operation: January 2013 - January 2014. Prepared for North Sky River Energy LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 31, 2014.

Loesch, C., R. Reynolds, N. Niemuth, J. Walker, S. Stephens, J. Gleason, and M. Erickson. 2013. Effect of Wind Energy Development on Breeding Duck Densities in the Prairie Pothole Region. Presented at the National Wind Coordinating Collaborative (NWCC), Research Webinar. November 2013. Available online at: https://www.nationalwind.org/research/webinars/nwcc-webinar-4_loesch-11-20-13/

MacWhirter, R. B. and K. L. Bildstein. 1996. Northern Harrier (*Circus Cyaneus*). Pp. *In*: A. Poole and F. Gill, eds. The Birds of North America, No. 210. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C. 32 pp.

Marques, A.T., H. Batalha, S. Rodrigues, H. Costa, M. J. Ramos Pereira, C. Fonseca, M. Mascarenhas, and J. Bernardino. 2014. Understanding Bird Collisions at Wind Farms: An Updated Review on the Causes and Possible Mitigation Strategies. Biological Conservation 179: 40-52.

National Research Council (NRC). 2007. Environmental Impacts of Wind-Energy Projects. National Academies Press, Washington, D.C. www.nap.edu

NatureServe. 2018. Natureserve Explorer: An Online Encyclopedia of Life [Web Application]. Version 7.1. Natureserve, Arlington, Virginia. Accessed September 2018. Information online: http://explorer.natureserve.org

Navarrete, L. and K.L. Griffis-Kyle. 2014. Sandhill Crane Collisions with Wind Turbines in Texas. Proceedings of the North American Crane Workshop 12: 65-67.

Nicholson, C. P., R. D. Tankersley, Jr., J. K. Fiedler, and N. S. Nicholas. 2005. Assessment and Prediction of Bird and Bat Mortality at Wind Energy Facilities in the Southeastern United States. Final Report. Tennessee Valley Authority, Knoxville, Tennessee.

Normandeau Associates, Inc. 2010. Stetson Mountain II Wind Project Year 1 Post-Construction Avian and Bat Mortality Monitoring Study, T8 R4 Nbpp, Maine. Prepared for First Wind, LLC, Portland, Maine. Prepared by Normandeau Associates, Inc., Falmouth, Maine. December 2, 2010.

Normandeau Associates, Inc. 2011. Year 3 Post-Construction Avian and Bat Casualty Monitoring at the Stetson I Wind Farm, T8 R4 Nbpp, Maine. Prepared for First Wind Energy, LLC, Portland, Maine. Prepared by Normandeau Associates, Inc., Falmouth, Maine. December 2011.

North American Datum (NAD). 1983. Nad83 Geodetic Datum.

Northwest Wildlife Consultants, Inc. (NWC) and Western EcoSystems Technology, Inc. (WEST). 2007. Avian and Bat Monitoring Report for the Klondike II Wind Power Project. Sherman County, Oregon. Prepared for PPM Energy, Portland, Oregon. Managed and conducted by NWC, Pendleton, Oregon. Analysis conducted by WEST, Cheyenne, Wyoming. July 17, 2007.

Pagel, J. E., K. J. Kritz, B. A. Millsap, R. K. Murphy, E. L. Kershner, and S. Covington. 2013. Bald Eagle and Golden Eagle Mortalities at Wind Energy Facilities in the Contiguous United States. Journal of Raptor Research 47(3): 311-315.

Pearce-Higgins, J.W., L. Stephen, A. Douse, and R.H.W. Langston. 2012. Greater Impacts of Wind Farms on Bird Populations During Construction Than Subsequent Operation: Results of a Multi-Site and Multi-Species Analysis. Journal of Applied Ecology 49(2): 386-394.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. General Technical Report (GTR). PSW-GTR-144. US Department of Agriculture (USDA) Forest Service General Technical Report (GTR), Pacific Southwest (PSW) Research Station, Albany, California. Available online: http://www.fs.fed.us/psw/publications/documents/gtr-144/

Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. A Variable Circular-Plot Method for Estimating Bird Numbers. Condor 82(3): 309-313.

Rintz, T. and D. Pham. 2018. Post-Construction Avian and Bat Fatality Monitoring for the Pinyon Pines I & II Wind Energy Project, Kern County, California. Final Report for the Fifth Year of Operation: March 2017 - March 2018. Prepared for MidAmerican Energy Company, Des Moines, Iowa, and Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvalis, Oregon. June 19, 2018. 63 pp. + appendices.

Rintz, T. and J. Thompson. 2017. Post-Construction Avian and Bat Mortality Monitoring at the Cameron Ridge-Section 15 Wind Farm, Coram California Development, Lp, Kern County, California. Mortality Analysis, Fourth Year of Operation: August 2015 - August 2016. Prepared for Renewable Energy Trust, San Francisco, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon. January 12, 2017.

Rintz, T. and L. A. Starcevich. 2016. Post-Construction Avian and Bat Fatality Monitoring for the Pinyon Pines I & II Wind Energy Project, Kern County, California. Final Report for the Third Year of Operation: March 2015 - March 2016. Prepared for Berkshire Hathaway Energy Renewables, LLC, Des Moines, Iowa, and Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvalis, Oregon. October 17, 2016.

Rintz, T., J. Thompson, and S. Howlin. 2016. Post-Construction Avian and Bat Mortality Monitoring at the Rising Tree and Addison Wind Energy Projects, Kern County, California. Year 1 – Final Report: September 2015 – September 2016. Prepared for EDP Renewables North America, LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon. November 16, 2016.

Shaffer, J. A. and D. A. Buhl. 2016. Effects of Wind-Energy Facilities on Breeding Grassland Bird Distributions. Conservation Biology 30(1): 59-71. doi: 10.1111/cobi.12569.

Shuford, W. D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Smallwood, K. S. and B. Karas. 2009. Avian and Bat Fatality Rates at Old-Generation and Repowered Wind Turbines in California. Journal of Wildlife Management 73(7): 1062-1071.

Stantec Consulting Ltd. (Stantec Ltd.). 2015. Port Dover and Nanticoke Wind Project: Post-Construction Wildlife Monitoring Report 2014. Prepared for Capital Power LP, Edmonton, Alberta. Prepared by Stantec Ltd., Guelph Ontario. January 21, 2015.

Stantec Consulting Ltd. (Stantec Ltd.). 2017. Grand Valley Wind Farms Phase 3 Wind Project: Year 1 Post-Construction Wildlife Monitoring Report (2016). Prepared for Grand Valley 2 Limited Partnership, Calgary Alberta. Prepared by Stantec Ltd., Guelph Ontario. February 24, 2017. Available online: http://www.vereseninc.com/wp-content/uploads/2013/02/Bird-and-Bat-Mortality-Monitoring-2016.pdf

Stantec Consulting Services, Inc. (Stantec Consulting). 2012. Post-Construction Monitoring, Summer 2011 - Spring 2012. Year 1 Annual Report. Kittitas Valley Wind Power Project, Cle Elum, Washington. Prepared for Sagebrush Power Partners, LLC, Houston, Texas. Prepared by Stantec Consulting, Salt Lake City, Utah.

Stantec Consulting Services, Inc. (Stantec Consulting). 2018. 2017 Post-Construction Bat Mortality Monitoring Report. Wildcat Wind Farm, Madison and Tipton Counties, Indiana. Prepared for Wildcat Wind Farm, LLC, Chicago, Illinois. Prepared by Stantec Consulting, Independence, Iowa. January 26, 2018.

Stantec Consulting, Inc. (Stantec). 2008. 2007 Spring, Summer, and Fall Post-Construction Bird and Bat Mortality Study at the Mars Hill Wind Farm, Maine. Prepared for UPC Wind Management, LLC, Cumberland, Maine. Prepared by Stantec (formerly Woodlot Alternatives, Inc.), Topsham, Maine. January 2008.

Stantec Consulting, Inc. (Stantec). 2009a. Post-Construction Monitoring at the Mars Hill Wind Farm, Maine - Year 2, 2008. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec Consulting, Topsham, Maine. January 2009.

Stantec Consulting, Inc. (Stantec). 2009b. Post-Construction Monitoring at the Munnsville Wind Farm, New York: 2008. Prepared for E.ON Climate and Renewables, Austin, Texas. Prepared by Stantec Consulting, Topsham, Maine. January 2009.

Stantec Consulting, Inc. (Stantec). 2009c. Stetson I Mountain Wind Project: Year 1 Post-Construction Monitoring Report, 2009 for the Stetson Mountain Wind Project in Penobscot and Washington Counties, Maine. Prepared for First Wind Management, LLC. Portland, Maine. Prepared by Stantec, Topsham, Maine. December 2009.

Stantec Consulting, Inc. (Stantec). 2010. Cohocton and Dutch Hill Wind Farms Year 1 Post-Construction Monitoring Report, 2009, for the Cohocton and Dutch Hill Wind Farms in Cohocton, New York. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. January 2010.

Stantec Consulting, Inc. (Stantec). 2011a. Post-Construction Monitoring 2010 Final Annual Report – Year 1, Milford Wind Corridor Phase I, Milford, Utah. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. August 2011.

Stantec Consulting, Inc. (Stantec). 2011b. Cohocton and Dutch Hill Wind Farms Year 2 Post-Construction Monitoring Report, 2010, for the Cohocton and Dutch Hill Wind Farms in Cohocton, New York. Prepared for Canandaigua Power Partners, LLC, and Canandaigua Power Partners II, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. October 2011.

Stantec Consulting, Inc. (Stantec). 2012. Post-Construction Monitoring 2011 - 2012, Milford Wind Corridor Phase I and II, Milford, Utah. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. May 2012.

Stantec Consulting, Inc. (Stantec). 2013a. Palouse Wind Post-Construction Wildlife Monitoring Report, 2012-2013. Prepared for Palouse Wind, Whitman County, Washington. Prepared by Stantec, Topsham, Maine. December 2013.

Stantec Consulting, Inc. (Stantec). 2013b. Record Hill Wind Project Post-Construction Monitoring Report, 2012. Prepared for Record Hill Wind LLC, Lyme, New Hampshire. Prepared by Stantec, Topsham, Maine. March 2013.

Stantec Consulting, Inc. (Stantec). 2013c. Rollins Wind Project Post-Construction Monitoring Report, 2012. Prepared for First Wind, Portland, Maine. Prepared by Stantec, Topsham, Maine. March 2013.

Stantec Consulting, Inc. (Stantec). 2013d. Stetson II Wind Project Post-Construction Monitoring Report, 2012. Prepared for First Wind, Portland, Maine. Prepared by Stantec, Topsham, Maine. March 2013.

Stantec Consulting, Inc. (Stantec). 2014. Stetson I Wind Project 2013 Post-Construction Wildlife Monitoring Report, Year 5. Stetson I Wind Project, Washington County, Maine. Prepared for First Wind, Portland, Maine. Prepared by Stantec, Topsham, Maine. February 2014.

Stantec Consulting, Inc. (Stantec). 2015. Record Hill Wind Project Year 2 Post-Construction Wildlife Monitoring Report, 2014. Prepared for Record Hill Wind LLC and Wagner Forest Management, Ltd., Lyme, New Hampshire. Prepared by Stantec Consulting, Topsham, Maine. March 2015.

Stehn, T. 2011. Whooping Crane Recovery Activities: October, 2010 - August, 2011. Aransas National Wildlife Refuge, US Fish and Wildlife Service (USFWS). August 31, 2011.

Stevens, T. K., A. M. Hale, K. B. Karsten, and V. J. Bennett. 2013. An Analysis of Displacement from Wind Turbines in a Wintering Grassland Bird Community. Biodiversity and Conservation 22: 1755-1767. doi: 10.1007/s10531-013-0510-8.

Strickland, D. and G. D. Johnson. 2006. Overview of What We Know About Avian/Wind Interaction. Presented at the National Wind Coordinating Collaborative (NWCC) Wildlife Workgroup Research Meeting VI, November 14, San Antonio, Texas.

Strickland, M. D., E. B. Arnett, W. P. Erickson, D. H. Johnson, G. D. Johnson, M. L. Morrison, J. A. Shaffer, and W. Warren-Hicks. 2011. Comprehensive Guide to Studying Wind Energy/Wildlife Interactions. Prepared for the National Wind Coordinating Collaborative (NWCC), Washington, D.C., USA. June 2011. Available online at: http://www.batsandwind.org/pdf/Comprehensive_Guide_to_Studying_Wind_Energy_Wildlife_Interactions_2011.pdf

Tetra Tech. 2013. Hatchet Ridge Wind Farm Post-Construction Mortality Monitoring: Year Two Annual Report. Prepared for Hatchet Ridge Wind, LLC. Prepared by Tetra Tech, Portland, Oregon. March 2013. Available online: http://wintuaudubon.org/Documents/HatchetRidgeYear2FinalReport3-13.pdf

Tetra Tech. 2014. Hatchet Ridge Wind Farm Post-Construction Mortality Monitoring: Comprehensive Three Year Report. Prepared for Hatchet Ridge Wind, LLC. Prepared by Tetra Tech, Portland, Oregon. May 2014.

Tetra Tech. 2017a. 2016 - 2017 Post-Construction Mortality Monitoring Annual Report, Pleasant Valley Wind Farm, Mower and Dodge Counties, Minnesota. Prepared for Northern States Power Company-Minnesota, Xcel Energy. Prepared by Tetra Tech, Bloomington, Minnesota. June 2017. Available online: https://mn.gov/commerce/energyfacilities/Docket.html?Id=25724

Tetra Tech. 2017b. 2016-2017 Post-Construction Fatality Monitoring Annual Report: Waverly Wind Farm, Coffey County, Kansas. Prepared for Waverly Wind Farm, LLC. Prepared by Portland, Oregon. October 2017.

Thompson, J. 2018. 2017 Raptor Nest Survey Report for the Fountain Wind Project, California. Technical memorandum prepared for Pacific Wind Development LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon. September 19, 2018.

Thompson, J. and K. Bay. 2012. Post-Construction Fatality Surveys for the Dry Lake II Wind Project: February 2011 – February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 6, 2012.

Thompson, J., D. Solick, and K. Bay. 2011. Post-Construction Fatality Surveys for the Dry Lake Phase I Wind Project. Iberdrola Renewables: September 2009 - November 2010. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 10, 2011.

Thompson, J., J. Lombardi, and C. Boyd. 2016. Bird and Bat Mortality Monitoring at the Alta Wind Energy Center, Phases I - V, Kern County, California. Final Report for the Third Year of Monitoring: March 10, 2015 - March 4, 2016. Prepared for Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 9, 2016.

Tidhar, D., L. McManus, D. Solick, Z. Courage, and K. Bay. 2012b. 2011 Post-Construction Fatality Monitoring Study and Bat Acoustic Study for the High Sheldon Wind Farm, Wyoming County, New York. Final Report: April 15 - November 15, 2011. Prepared for High Sheldon Wind Farm, Sheldon Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Waterbury, Vermont. April 25, 2012.

Tidhar, D., L. McManus, Z. Courage, and W. L. Tidhar. 2012a. 2010 Post-Construction Fatality Monitoring Study and Bat Acoustic Study for the High Sheldon Wind Farm, Wyoming County, New York. Final Report: April 15 - November 15, 2010. Prepared for High Sheldon Wind Farm, Sheldon Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Waterbury, Vermont. April 15, 2012.

Tidhar, D., M. Sonnenberg, and D. P. Young, Jr. 2013. 2012 Post-Construction Carcass Monitoring Study for the Beech Ridge Wind Farm, Greenbrier County, West Virginia. Final Report: April 1 - October 28, 2012. Prepared for Beech Ridge Wind Farm, Beech Ridge Energy, LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), NE/Mid-Atlantic Branch, Waterbury, Vermont. January 18, 2013.

Tidhar, D., W. L. Tidhar, L. McManus, and Z. Courage. 2011. 2010 Post-Construction Fatality Surveys for the Lempster Wind Project, Lempster, New Hampshire. Prepared for Iberdrola Renewables, Inc. and the Lempster Wind Technical Committee. Prepared by Western EcoSystems Technology, Inc., Waterbury, Vermont. May 18, 2011.

Tidhar, D., W. Tidhar, and M. Sonnenberg. 2010. Post-Construction Fatality Surveys for Lempster Wind Project, Iberdrola Renewables. Prepared for Lempster Wind, Llc, Lempster Wind Technical Advisory Committee, and Iberdrola Renewables, Inc. Prepared by Western EcoSystems Technology Inc. (WEST), Waterbury, Vermont. September 30, 2010.

Tierney, R. 2007. Buffalo Gap I Wind Farm Avian Mortality Study: February 2006-January 2007. Final Survey Report. Prepared for AES SeaWest, Inc. TRC, Albuquerque, New Mexico. TRC Report No. 110766-C-01. May 2007.

Tierney, R. 2009. Buffalo Gap 2 Wind Farm Avian Mortality Study: July 2007 - December 2008. Final Survey Report. Submitted by TRC, Albuquerque, New Mexico. TRC Report No. 151143-B-01. June 2009.

URS Corporation. 2010a. Final Goodnoe Hills Wind Project Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 16, 2010.

URS Corporation. 2010b. Final Marengo II Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

URS Corporation. 2010c. Final Marengo I Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

US Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern 2008. December 2008. Division of Migratory Bird Management, Arlington, Virginia. Available online: https://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf

US Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf

US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Executive Summary and frontmatter + 103 pp. Available online: https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf

US Geological Survey (USGS) National Land Cover Database (NLCD). 2011. National Land Cover Database 2011 (NLCD 2011). Multi-Resolution Land Characteristics Consortium (MRLC), National Land Cover Database (NLCD). USGS Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota. Available online: http://www.mrlc.gov/nlcd2011.php; Legend: http://www.mrlc.gov/nlcd11_leg.php

US Geological Survey (USGS). 2018. USGS Topographic Maps. Accessed January 17, 2018. Information online: https://nationalmap.gov/ustopo/index.html

Ventus Environmental Solutions (Ventus). 2012. Vantage Wind Energy Center Avian and Bat Monitoring Study: March 2011- March 2012. Prepared for Vantage Wind Energy, LLC, Chicago, Illinois. Prepared by Ventus, Portland, Oregon. May 16, 2012.

Watson, R.T., P.S. Kolar, M. Ferrer, T. Nygård, N. Johnston, W.G. Hunt, H.A. Smit-Robinson, C.J. Farmer, M. Huso, and T.E. Katzner. 2018. Raptor Interactions with Wind Energy: Case Studies from around the World. Journal of Raptor Research 52(1): 1-18.

Welcker, J., M. Liesenjohann, J. Blew, G. Nehls, and T. Grünkorn. 2017. Nocturnal Migrants Do Not Incur Higher Collision Risk at Wind Turbines Than Diurnally Active Species. Ibis 159(2): 366-373.

Western EcoSystems Technology, Inc. (WEST). 2006. Diablo Winds Wildlife Monitoring Progress Report, March 2005 - February 2006. Technical report submitted to FPL Energy and Alameda County California. WEST, Cheyenne, Wyoming.

Western EcoSystems Technology, Inc. (WEST). 2008. Diablo Winds Wildlife Monitoring Progress Report: March 2005 – February 2007. Prepared by WEST, Cheyenne, Wyoming. August 2008.

Western EcoSystems Technology, Inc. (WEST). 2011. Post-Construction Fatality Surveys for the Barton Chapel Wind Project: Iberdrola Renewables. Version: July 2011. Iberdrola Renewables, Portland, Oregon.

Western EcoSystems Technology, Inc. (WEST). 2016a. Post-Construction Avian and Bat Fatality Monitoring at the Pacific Wind Energy Facility, Kern County, California. Final Report for the Third Year of Operation: October 2014 - October 2015. Prepared for Pacific Wind, LLC, San Diego, California. Prepared by WEST, Cheyenne, Wyoming. January 27, 2016.

Western EcoSystems Technology, Inc. (WEST). 2016b. Post-Construction Avian and Bat Mortality Monitoring at the Cameron Ridge-Section 15 Wind Farm, Coram California Development, Lp, Kern County, California. Mortality Analysis, Third Year of Operation: August 2014 - August 2015. Prepared for Renewable Energy Trust, San Francisco, California. Prepared by WEST, Corvallis, Oregon. January 2016.

Western EcoSystems Technology, Inc. (WEST). 2016c. Post-Construction Studies for the Mustang Hills and Alta VIII Wind Energy Facilities, Kern County, California. Draft Report for the Third Year of Operation: September 2014 - September 2015. Prepared for EverPower Wind Holdings, Inc. and Brookfield Renewable Energy Group. Prepared by WEST, Cheyenne, Wyoming. February 22, 2016.

Western EcoSystems Technology, Inc. (WEST). 2016d. Post-Construction Studies for the North Sky River Wind Energy Facility, Kern County, California. Prepared for North Sky River Energy LLC, Juno Beach, Florida. Prepared by WEST, Cheyenne, Wyoming.

Western EcoSystems Technology, Inc. (WEST). 2017a. Post-Construction Avian and Bat Fatality Monitoring at the Pacific Wind Energy Facility, Kern County, California. Final Report for the Fourth Year of Operation, October 2015 - October 2016. Prepared for Pacific Wind, LLC, San Diego, California. Prepared by WEST, Cheyenne, Wyoming. January 2017.

Western EcoSystems Technology, Inc. (WEST). 2017b. Post-Construction Avian and Bat Mortality Study at the Lower West Wind Energy Project, Kern County, California. Final Report for the Fifth Year of Operation: July 2016 – August 2017. Prepared for Brookfield Renewable Energy Partners, LP. Prepared by WEST, Corvallis, Oregon. December 15, 2017.

Western EcoSystems Technology, Inc. (WEST). 2017c. Post-Construction Studies for the North Sky River Wind Energy Facility, Kern County, California. Final Report for the Fourth Year of Operation: January 2016 – January 2017. Prepared for North Sky River Energy LLC, Juno Beach, Florida. Prepared by WEST, Corvallis, Oregon. May 16, 2017. 43 pp. + appendices.

Western EcoSystems Technology, Inc. (WEST). 2018. Post-Construction Avian and Bat Mortality Studies for the Mustang Hills and Alta VIII Wind Energy Facilities, Kern County, California. Final Report for the Fifth Year of Operation: September 2016 – September 2017. Prepared for EverPower Wind Holdings, Inc. and Brookfield Renewable Energy Partners, LP. Prepared by WEST, Corvallis, Oregon. January 12, 2018.

Whitfield, D. P. and M. Madders. 2005. Flight Height in the Hen Harrier *Circus Cyaneus* and Its Incorporation in Wind Turbine Collision Risk Modelling. October 2005. Natural Research Information Note 2, Natural Research Ltd., Banchory, United Kingdom.

Whitfield, D. P. and M. Madders. 2006. A Review of the Impacts of Wind Farms on Hen Harriers *Circus Cyaneus* and an Estimation of Collision Avoidance Rates. Natural Research Information Note 1 (revised), Natural Research Ltd., Banchory, United Kingdom.

Young, D. P., Jr., C. Nations, M. Lout, and K. Bay. 2013. 2012 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland. April - November 2012. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. January 15, 2013.

Young, D. P., Jr., G. D. Johnson, V. K. Poulton, and K. Bay. 2007a. Ecological Baseline Studies for the Hatchet Ridge Wind Energy Project, Shasta County, California. Prepared for Hatchet Ridge Wind, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 31, 2007. Available online: https://tethys.pnnl.gov/sites/default/files/publications/Young-et-al-2007.pdf

Young, D. P., Jr., J. D. Jeffrey, K. Bay, and W. P. Erickson. 2009a. Puget Sound Energy Hopkins Ridge Wind Project, Phase 1, Columbia County, Washington. Post-Construction Avian and Bat Monitoring, Second Annual Report: January - December, 2008. Prepared for Puget Sound Energy, Dayton, Washington, and the Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. May 20, 2009.

Young, D. P., Jr., J. Jeffrey, W. P. Erickson, K. Bay, V. K. Poulton, K. Kronner, R. Gritski, and J. Baker. 2006. Eurus Combine Hills Turbine Ranch. Phase 1 Post Construction Wildlife Monitoring First Annual Report: February 2004 - February 2005. Technical report prepared for Eurus Energy America Corporation, San Diego, California, and the Combine Hills Technical Advisory Committee, Umatilla County, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla Washington, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. February 21, 2006. Available online: http://wind.nrel.gov/public/library/young7.pdf

Young, D. P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2009b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: March - June 2009. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. August 17, 2009.

Young, D. P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2010a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2009. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 12, 2010.

Young, D. P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2010b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: April - July 2010. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 27, 2010.

Young, D. P., Jr., M. Kauffman, M. Lout, and K. Bay. 2014b. 2013 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland. April - November 2013. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. February 18, 2014.

Young, D. P., Jr., M. Lout, L. McManus, and K. Bay. 2014a. 2013 Post-Construction Monitoring Study, Beech Ridge Wind Energy Project, Greenbrier and Nicholas Counties, West Virginia. Final Report: April 1 - November 15, 2013. Prepared for Beech Ridge Energy, LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Burlington, Vermont. January 28, 2014.

Young, D. P., Jr., M. Lout, Z. Courage, S. Nomani, and K. Bay. 2012b. 2011 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland: April - November 2011. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. April 20, 2012. Revised November 25, 2013.

Young, D. P., Jr., S. Nomani, W. Tidhar, and K. Bay. 2011a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2010. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 10, 2011.

Young, D. P., Jr., S. Nomani, Z. Courage, and K. Bay. 2011b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: April - July 2011. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. August 29, 2011.

Young, D. P., Jr., S. Nomani, Z. Courage, and K. Bay. 2012a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2011. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 27, 2012.

Young, D. P., Jr., W. P. Erickson, J. Jeffrey, and V. K. Poulton. 2007b. Puget Sound Energy Hopkins Ridge Wind Project Phase 1 Post-Construction Avian and Bat Monitoring First Annual Report, January - December 2006. Technical report for Puget Sound Energy, Dayton, Washington and Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Western EcoSystems Technology, Inc. (WEST) Cheyenne, Wyoming, and Walla Walla, Washington. 25 pp.

Young, D. P., Jr., W. P. Erickson, R. E. Good, M. D. Strickland, and G. D. Johnson. 2003. Avian and Bat Mortality Associated with the Initial Phase of the Foote Creek Rim Windpower Project, Carbon County, Wyoming, Final Report, November 1998 - June 2002. Prepared for Pacificorp, Inc. Portland, Oregon, SeaWest Windpower Inc. San Diego, California, and Bureau of Land Management, Rawlins District Office, Rawlins, Wyoming. January 10, 2003. Available online: http://west-inc.com/reports/fcr_final_mortality.pdf

Appendix A. All Bird Types and Species Observed at the Fountain Wind Project during Fixed-Point Bird Use Surveys from 19 April 2017 – 22 May 2018

Appendix A1. Summary of number of groups (grps) and observations (obs) by bird type and species for 60-minute large bird surveys at the Fountain Wind Project[a] from 19 April 2017 – 22 May 2018.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Waterbirds		**1**	**20**	**0**	**0**	**2**	**33**	**7**	**91**	**10**	**144**
American white pelican	*Pelecanus erythrorhynchos*	1	20	0	0	0	0	1	8	2	28
sandhill crane	*Antigone canadensis*	0	0	0	0	2	33	6	83	8	116
Waterfowl		**4**	**161**	**1**	**200**	**7**	**764**	**13**	**938**	**25**	**2,063**
cackling goose	*Branta hutchinsii*	0	0	0	0	1	20	0	0	1	20
Canada goose	*Branta canadensis*	0	0	0	0	2	60	1	3	3	63
greater white-fronted goose	*Anser albifrons*	3	160	0	0	1	102	0	0	4	262
snow goose	*Chen caerulescens*	1	1	0	0	3	582	7	702	11	1,285
tundra swan	*Cygnus columbianus*	0	0	0	0	0	0	3	123	3	123
unidentified goose		0	0	1	200	0	0	2	110	3	310
Diurnal Raptors		**47**	**51**	**46**	**49**	**65**	**65**	**49**	**51**	**207**	**216**
Accipiters		*8*	*8*	*4*	*4*	*19*	*19*	*1*	*1*	*32*	*32*
Cooper's hawk	*Accipiter cooperii*	4	4	2	2	2	2	1	1	9	9
northern goshawk	*Accipiter gentilis*	3	3	0	0	0	0	0	0	3	3
sharp-shinned hawk	*Accipiter striatus*	1	1	2	2	15	15	0	0	18	18
unidentified accipiter	*Accipiter* spp.	0	0	0	0	2	2	0	0	2	2
Buteos		*30*	*34*	*37*	*40*	*38*	*38*	*37*	*39*	*142*	*151*
red-shouldered hawk	*Buteo lineatus*	0	0	1	1	2	2	0	0	3	3
red-tailed hawk	*Buteo jamaicensis*	30	34	36	39	36	36	37	39	139	148
Northern Harrier		*1*	*1*	*0*	*0*	*2*	*2*	*1*	*1*	*4*	*4*
northern harrier	*Circus cyaneus*	1	1	0	0	2	2	1	1	4	4
Eagles		*4*	*4*	*1*	*1*	*4*	*4*	*9*	*9*	*18*	*18*
bald eagle	*Haliaeetus leucocephalus*	2	2	1	1	4	4	9	9	16	16
golden eagle	*Aquila chrysaetos*	2	2	0	0	0	0	0	0	2	2
Falcons		*2*	*2*	*2*	*2*	*2*	*2*	*0*	*0*	*6*	*6*
American kestrel	*Falco sparverius*	0	0	0	0	1	1	0	0	1	1
merlin	*Falco columbarius*	1	1	0	0	1	1	0	0	2	2
prairie falcon	*Falco mexicanus*	1	1	1	1	0	0	0	0	2	2
unidentified falcon	*Falco* spp.	0	0	1	1	0	0	0	0	1	1
Other Raptors		*2*	*2*	*2*	*2*	*0*	*0*	*1*	*1*	*5*	*5*
unidentified raptor		2	2	2	2	0	0	1	1	5	5
Owls		**2**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**
great horned owl	*Bubo virginianus*	1	1	0	0	0	0	0	0	1	1
northern pygmy-owl	*Glaucidium gnoma*	1	1	0	0	0	0	0	0	1	1
Vultures		**121**	**151**	**275**	**364**	**45**	**48**	**12**	**15**	**453**	**578**
turkey vulture	*Cathartes aura*	121	151	275	364	45	48	12	15	453	578

Appendix A1. Summary of number of groups (grps) and observations (obs) by bird type and species for 60-minute large bird surveys at the Fountain Wind Project[a] from 19 April 2017 – 22 May 2018.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Upland Game Birds		**4**	**5**	**3**	**3**	**1**	**1**	**0**	**0**	**8**	**9**
mountain quail	*Oreortyx pictus*	4	5	3	3	1	1	0	0	8	9
Doves/Pigeons		**2**	**5**	**7**	**21**	**1**	**1**	**0**	**0**	**10**	**27**
band-tailed pigeon	*Patagioenas fasciata*	2	5	7	21	1	1	0	0	10	27
Large Corvids		**43**	**77**	**33**	**39**	**44**	**68**	**29**	**44**	**149**	**228**
American crow	*Corvus brachyrhynchos*	0	0	1	1	0	0	0	0	1	1
common raven	*Corvus corax*	43	77	32	38	44	68	29	44	148	227
Overall		**224**	**472**	**365**	**676**	**165**	**980**	**110**	**1,139**	**864**	**3,267**

[a] Regardless of distance from observer.

Appendix A2. Summary of number of groups (grps) and observations (obs) by bird type and species for 10-minute small bird surveys at the Fountain Wind Project[a] from 19 April 2017 – 22 May 2018.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Passerines		**243**	**377**	**600**	**780**	**310**	**696**	**136**	**324**	**1,289**	**2,177**
American robin	*Turdus migratorius*	5	5	9	12	11	25	3	3	28	45
ash-throated flycatcher	*Myiarchus cinerascens*	0	0	3	3	0	0	0	0	3	3
Bewick's wren	*Thryomanes bewickii*	1	1	3	3	1	3	1	1	6	8
black-capped chickadee	*Poecile atricapillus*	0	0	13	21	0	0	0	0	13	21
black-headed grosbeak	*Pheucticus melanocephalus*	1	2	6	6	0	0	0	0	7	8
black-throated gray warbler	*Setophaga nigrescens*	1	1	6	9	0	0	0	0	7	10
black phoebe	*Sayornis nigricans*	0	0	0	0	0	0	1	1	1	1
blue-gray gnatcatcher	*Polioptila caerulea*	3	5	2	2	0	0	0	0	5	7
Brewer's blackbird	*Euphagus cyanocephalus*	0	0	0	0	2	2	0	0	2	2
brown-headed cowbird	*Molothrus ater*	0	0	0	0	1	2	0	0	1	2
brown creeper	*Certhia americana*	0	0	0	0	1	2	0	0	1	2
bushtit	*Psaltriparus minimus*	3	3	4	23	1	9	3	55	11	90
California scrub-jay	*Aphelocoma californica*	7	63	5	5	2	2	2	2	16	72
Cassin's finch	*Haemorhous cassinii*	1	1	1	1	0	0	0	0	2	2
Cassin's vireo	*Vireo cassinii*	1	1	2	2	0	0	0	0	3	3
cliff swallow	*Petrochelidon pyrrhonota*	1	3	1	3	0	0	0	0	2	6
dark-eyed junco	*Junco hyemalis*	34	54	107	140	47	84	6	25	194	303
dusky flycatcher	*Empidonax oberholseri*	0	0	4	4	0	0	0	0	4	4
evening grosbeak	*Coccothraustes vespertinus*	0	0	2	4	2	11	0	0	4	15
fox sparrow	*Passerella iliaca*	8	9	27	27	5	6	1	1	41	43
golden-crowned kinglet	*Regulus satrapa*	2	3	1	1	20	43	19	20	42	67
golden-crowned sparrow	*Zonotrichia atricapilla*	0	0	0	0	3	4	0	0	3	4
gray jay	*Perisoreus canadensis*	0	0	0	0	2	2	0	0	2	2
green-tailed towhee	*Pipilo chlorurus*	0	0	1	1	0	0	0	0	1	1
hermit thrush	*Catharus guttatus*	0	0	2	2	2	2	0	0	4	4
hermit warbler	*Setophaga occidentalis*	0	0	2	2	0	0	0	0	2	2
house finch	*Haemorhous mexicanus*	0	0	3	3	1	1	0	0	4	4
house wren	*Troglodytes aedon*	0	0	2	2	0	0	0	0	2	2
Hutton's vireo	*Vireo huttoni*	0	0	6	6	1	2	2	2	9	10
lesser goldfinch	*Spinus psaltria*	0	0	6	12	9	12	0	0	15	24
Lincoln's sparrow	*Melospiza lincolnii*	0	0	0	0	1	1	0	0	1	1
MacGillivray's warbler	*Geothlypis tolmiei*	0	0	1	1	0	0	0	0	1	1
mountain bluebird	*Sialia currucoides*	1	1	3	3	3	14	0	0	7	18
mountain chickadee	*Poecile gambeli*	31	40	42	60	26	88	24	57	123	245
Nashville warbler	*Oreothlypis ruficapilla*	6	6	17	18	0	0	0	0	23	24

Appendix A2. Summary of number of groups (grps) and observations (obs) by bird type and species for 10-minute small bird surveys at the Fountain Wind Project[a] from 19 April 2017 – 22 May 2018.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
northern rough-winged swallow	*Stelgidopteryx serripennis*	0	0	8	45	0	0	0	0	8	45
oak titmouse	*Baeolophus inornatus*	0	0	0	0	0	0	1	1	1	1
olive-sided flycatcher	*Contopus cooperi*	0	0	5	5	0	0	0	0	5	5
Pacific-slope flycatcher	*Empidonax difficilis*	0	0	1	1	0	0	0	0	1	1
pine siskin	*Spinus pinus*	0	0	0	0	3	22	0	0	3	22
purple finch	*Haemorhous purpureus*	1	1	5	7	6	46	1	4	13	58
red-breasted nuthatch	*Sitta canadensis*	33	44	16	22	45	62	52	59	146	187
ruby-crowned kinglet	*Regulus calendula*	0	0	0	0	10	16	4	4	14	20
song sparrow	*Melospiza melodia*	0	0	4	4	0	0	2	2	6	6
spotted towhee	*Pipilo maculatus*	13	13	51	53	10	12	1	1	75	79
Steller's jay	*Cyanocitta stelleri*	23	29	44	53	45	49	1	1	113	132
Townsend's solitaire	*Myadestes townsendi*	4	4	3	3	0	0	0	0	7	7
Townsend's warbler	*Setophaga townsendi*	0	0	3	4	0	0	0	0	3	4
tree swallow	*Tachycineta bicolor*	0	0	2	7	0	0	0	0	2	7
unidentified empidonax	*Empidonax* spp.	0	0	2	2	0	0	0	0	2	2
unidentified flycatcher		0	0	4	5	0	0	0	0	4	5
unidentified passerine		4	5	34	37	18	32	0	0	56	74
unidentified sparrow		1	1	0	0	0	0	0	0	1	1
unidentified swallow		2	11	2	3	0	0	0	0	4	14
unidentified warbler		2	3	1	1	1	1	0	0	4	5
unidentified wren		0	0	1	2	0	0	0	0	1	2
varied thrush	*Ixoreus naevius*	1	2	0	0	1	1	0	0	2	3
violet-green swallow	*Tachycineta thalassina*	0	0	1	1	0	0	0	0	1	1
western bluebird	*Sialia mexicana*	13	19	5	6	12	106	6	78	36	209
western kingbird	*Tyrannus verticalis*	1	1	0	0	0	0	0	0	1	1
western tanager	*Piranga ludoviciana*	0	0	30	34	0	0	0	0	30	34
western wood-pewee	*Contopus sordidulus*	0	0	13	15	0	0	0	0	13	15
white-breasted nuthatch	*Sitta carolinensis*	0	0	4	4	0	0	0	0	4	4
white-crowned sparrow	*Zonotrichia leucophrys*	0	0	1	1	0	0	0	0	1	1
Wilson's warbler	*Cardellina pusilla*	0	0	1	1	0	0	0	0	1	1
wrentit	*Chamaea fasciata*	8	8	6	7	5	8	6	7	25	30
yellow-rumped warbler	*Setophaga coronata*	31	38	43	47	12	25	0	0	86	110
yellow warbler	*Setophaga petechia*	0	0	29	34	1	1	0	0	30	35
Swifts/Hummingbirds		**6**	**40**	**4**	**7**	**4**	**4**	**7**	**8**	**21**	**59**
Anna's hummingbird	*Calypte anna*	3	3	1	1	2	2	7	8	13	14
rufous hummingbird	*Selasphorus rufus*	2	2	0	0	0	0	0	0	2	2

Appendix A2. Summary of number of groups (grps) and observations (obs) by bird type and species for 10-minute small bird surveys at the Fountain Wind Project[a] from 19 April 2017 – 22 May 2018.

		Spring		Summer		Fall		Winter		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
unidentified hummingbird		0	0	2	2	2	2	0	0	4	4
Vaux's swift	*Chaetura vauxi*	1	35	0	0	0	0	0	0	1	35
white-throated swift	*Aeronautes saxatalis*	0	0	1	4	0	0	0	0	1	4
Woodpeckers		**37**	**38**	**53**	**54**	**56**	**57**	**17**	**21**	**163**	**170**
downy woodpecker	*Picoides pubescens*	0	0	3	3	3	3	3	3	9	9
hairy woodpecker	*Picoides villosus*	7	8	9	10	12	12	2	2	30	32
northern flicker	*Colaptes auratus*	20	20	32	32	30	31	5	8	87	91
pileated woodpecker	*Dryocopus pileatus*	1	1	0	0	3	3	1	1	5	5
red-breasted sapsucker	*Sphyrapicus ruber*	0	0	1	1	0	0	0	0	1	1
unidentified woodpecker		3	3	5	5	2	2	0	0	10	10
white-headed woodpecker	*Picoides albolarvatus*	6	6	3	3	6	6	6	7	21	22
Unidentified Birds		**2**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**
Unidentified small bird		2	2	0	0	0	0	0	0	2	2
Overall		**288**	**457**	**657**	**841**	**370**	**757**	**160**	**353**	**1,475**	**2,408**

[a] Regardless of distance from observer.

Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Large Birds and Small Birds Observed during Fixed-Point Bird Use Surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018

Appendix B1. Mean large bird use (number of large birds/800-meter plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season during large bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

	Mean Use				% of Use				% Frequency			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Waterbirds	**0.17**	**0**	**0.28**	**0.78**	**4.1**	**0**	**3.4**	**8**	**0.9**	**0**	**0.9**	**4.3**
American white pelican	0.17	0	0	0.07	4.1	0	0	0.7	0.9	0	0	0.9
sandhill crane	0	0	0.28	0.71	0	0	3.4	7.3	0	0	0.9	4.3
Waterfowl	**1.38**	**1.03**	**6.53**	**8.02**	**33.0**	**30.2**	**78.0**	**82.4**	**2.6**	**0.5**	**5.1**	**8.5**
cackling goose	0	0	0.17	0	0	0	2.0	0	0	0	0.9	0
Canada goose	0	0	0.51	0.03	0	0	6.1	0.3	0	0	1.7	0.9
greater white-fronted goose	1.37	0	0.87	0	32.8	0	10.4	0	1.7	0	0.9	0
snow goose	<0.01	0	4.97	6.00	0.2	0	59.4	61.6	0.9	0	1.7	5.1
tundra swan	0	0	0	1.05	0	0	0	10.8	0	0	0	1.7
unidentified goose	0	1.03	0	0.94	0	30.2	0	9.7	0	0.5	0	1.7
Diurnal Raptors	**0.46**	**0.23**	**0.56**	**0.44**	**11.0**	**6.8**	**6.6**	**4.5**	**31.2**	**17.4**	**32.5**	**17.9**
Accipiters	*0.07*	*0.02*	*0.16*	*<0.01*	*1.6*	*0.6*	*1.9*	*<0.1*	*6.0*	*2.1*	*12.0*	*0.9*
Cooper's hawk	0.03	0.01	0.02	<0.01	0.8	0.3	0.2	<0.1	3.4	1.0	0.9	0.9
northern goshawk	0.03	0	0	0	0.6	0	0	0	1.7	0	0	0
sharp-shinned hawk	<0.01	0.01	0.13	0	0.2	0.3	1.5	0	0.9	1.0	11.1	0
unidentified accipiter	0	0	0.02	0	0	0	0.2	0	0	0	1.7	0
Buteos	*0.31*	*0.18*	*0.32*	*0.33*	*7.4*	*5.4*	*3.9*	*3.4*	*22.1*	*15.4*	*20.5*	*12.0*
red-shouldered hawk	0	<0.01	0.02	0	0	0.2	0.2	0	0	0.5	1.7	0
red-tailed hawk	0.31	0.18	0.31	0.33	7.4	5.3	3.7	3.4	22.1	14.9	20.5	12.0
Northern Harrier	*<0.01*	*0*	*0.02*	*<0.01*	*0.2*	*0*	*0.2*	*<0.1*	*0.9*	*0*	*1.7*	*0.9*
northern harrier	<0.01	0	0.02	<0.01	0.2	0	0.2	<0.1	0.9	0	1.7	0.9
Eagles	*0.03*	*<0.01*	*0.03*	*0.08*	*0.8*	*0.2*	*0.4*	*0.8*	*2.6*	*0.5*	*3.4*	*6.8*
bald eagle	0.02	<0.01	0.03	0.08	0.4	0.2	0.4	0.8	1.7	0.5	3.4	6.8
golden eagle	0.02	0	0	0	0.4	0	0	0	0.9	0	0	0
Falcons	*0.02*	*0.01*	*0.02*	*0*	*0.5*	*0.3*	*0.2*	*0*	*2.2*	*1.0*	*1.7*	*0*
American kestrel	0	0	<0.01	0	0	0	0.1	0	0	0	0.9	0
merlin	<0.01	0	<0.01	0	0.2	0	0.1	0	0.9	0	0.9	0
prairie falcon	0.01	<0.01	0	0	0.3	0.2	0	0	1.4	0.5	0	0
unidentified falcon	0	<0.01	0	0	0	0.2	0	0	0	0.5	0	0
Other Raptors	*0.02*	*0.01*	*0*	*<0.01*	*0.4*	*0.3*	*0*	*<0.1*	*1.7*	*1*	*0*	*0.9*
unidentified raptor	0.02	0.01	0	<0.01	0.4	0.3	0	<0.1	1.7	1.0	0	0.9
Owls	**0.02**	**0**	**0**	**0**	**0.4**	**0**	**0**	**0**	**1.7**	**0**	**0**	**0**
great horned owl	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
northern pygmy-owl	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
Vultures	**1.39**	**1.82**	**0.41**	**0.13**	**33.4**	**53.5**	**4.9**	**1.3**	**45.6**	**54.4**	**22.2**	**6.8**

Appendix B1. Mean large bird use (number of large birds/800-meter plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season during large bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

	Mean Use				% of Use				% Frequency			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
turkey vulture	1.39	1.82	0.41	0.13	33.4	53.5	4.9	1.3	45.6	54.4	22.2	6.8
Upland Game Birds	**0.04**	**0.02**	**<0.01**	**0**	**1.0**	**0.5**	**0.1**	**0**	**3.4**	**1.5**	**0.9**	**0**
mountain quail	0.04	0.02	<0.01	0	1.0	0.5	0.1	0	3.4	1.5	0.9	0
Doves/Pigeons	**0.04**	**0.11**	**<0.01**	**0**	**1.0**	**3.2**	**0.1**	**0**	**1.7**	**2.1**	**0.9**	**0**
band-tailed pigeon	0.04	0.11	<0.01	0	1.0	3.2	0.1	0	1.7	2.1	0.9	0
Large Corvids	**0.67**	**0.20**	**0.58**	**0.38**	**16.0**	**5.9**	**6.9**	**3.9**	**27.6**	**12.8**	**23.1**	**16.2**
American crow	0	<0.01	0	0	0	0.2	0	0	0	0.5	0	0
common raven	0.67	0.19	0.58	0.38	16.0	5.7	6.9	3.9	27.6	12.3	23.1	16.2
Overall	**4.17**	**3.39**	**8.38**	**9.74**	**100**	**100**	**100**	**100**				

Appendix B2. Mean small bird use (number of small birds/100-meter plot/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season during small bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

	Mean Use				% of Use				% Frequency			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Passerines	**2.92**	**3.93**	**5.21**	**2.59**	**82.0**	**93.1**	**92.8**	**92.9**	**81.7**	**89.7**	**80.3**	**59.0**
American robin	0.03	0.06	0.09	0.02	0.7	1.5	1.7	0.6	2.6	4.1	4.3	1.7
ash-throated flycatcher	0	0.02	0	0	0	0.4	0	0	0	1.5	0	0
Bewick's wren	<0.01	0.02	0.03	<0.01	0.2	0.4	0.5	0.3	0.9	1.0	0.9	0.9
black-capped chickadee	0	0.11	0	0	0	2.5	0	0	0	6.2	0	0
black-headed grosbeak	0.03	0.03	0	0	0.8	0.7	0	0	1.4	2.6	0	0
black-throated gray warbler	<0.01	0.05	0	0	0.2	1.1	0	0	0.9	3.1	0	0
blue-gray gnatcatcher	0.07	0.01	0	0	1.9	0.2	0	0	2.8	1.0	0	0
Brewer's blackbird	0	0	0.02	0	0	0	0.3	0	0	0	0.9	0
brown-headed cowbird	0	0	0.02	0	0	0	0.3	0	0	0	0.9	0
brown creeper	0	0	0.02	0	0	0	0.3	0	0	0	0.9	0
bushtit	0.04	0.12	0.08	0.47	1.2	2.8	1.4	16.9	2.8	2.1	0.9	2.6
California scrub-jay	0.29	0.02	0.02	<0.01	8.2	0.5	0.3	0.3	3.4	2.1	1.7	0.9
Cassin's finch	<0.01	<0.01	0	0	0.2	0.1	0	0	0.9	0.5	0	0
Cassin's vireo	0	0.01	0	0	0	0.2	0	0	0	1.0	0	0
cliff swallow	0.03	0.02	0	0	0.7	0.4	0	0	0.9	0.5	0	0
dark-eyed junco	0.47	0.72	0.70	0.21	13.3	17.0	12.5	7.7	24.1	41.0	28.2	4.3
dusky flycatcher	0	0.02	0	0	0	0.5	0	0	0	2.1	0	0
evening grosbeak	0	0.02	0.09	0	0	0.5	1.7	0	0	0.5	1.7	0
fox sparrow	0.09	0.14	0.03	<0.01	2.6	3.3	0.6	0.3	7.1	10.3	3.4	0.9
golden-crowned kinglet	0.03	<0.01	0.37	0.17	0.7	0.1	6.6	6.1	1.7	0.5	17.1	16.2
golden-crowned sparrow	0	0	0.03	0	0	0	0.6	0	0	0	2.6	0
gray jay	0	0	0.02	0	0	0	0.3	0	0	0	1.7	0
green-tailed towhee	0	<0.01	0	0	0	0.1	0	0	0	0.5	0	0
hermit thrush	0	0.01	0.02	0	0	0.2	0.3	0	0	1.0	1.7	0
hermit warbler	0	0.01	0	0	0	0.2	0	0	0	1.0	0	0
house finch	0	0.02	<0.01	0	0	0.4	0.2	0	0	1.5	0.9	0
house wren	0	0.01	0	0	0	0.2	0	0	0	0.5	0	0
Hutton's vireo	0	0.03	0.02	0.02	0	0.7	0.3	0.6	0	2.6	0.9	1.7
lesser goldfinch	0	0.06	0.10	0	0	1.5	1.8	0	0	2.1	2.6	0
Lincoln's sparrow	0	0	<0.01	0	0	0	0.2	0	0	0	0.9	0
MacGillivray's warbler	0	<0.01	0	0	0	0.1	0	0	0	0.5	0	0
mountain bluebird	0	0.02	0.11	0	0	0.4	2.0	0	0	1.0	0.9	0
mountain chickadee	0.37	0.30	0.61	0.48	10.3	7.0	10.8	17.2	25.2	19.5	15.4	17.9

Appendix B2. Mean small bird use (number of small birds/100-meter plot/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season during small bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

	Mean Use				% of Use				% Frequency			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Nashville warbler	0.07	0.09	0	0	1.9	2.2	0	0	5.9	7.2	0	0
northern rough-winged swallow	0	0.23	0	0	0	5.5	0	0	0	3.1	0	0
oak titmouse	0	0	0	<0.01	0	0	0	0.3	0	0	0	0.9
olive-sided flycatcher	0	0.03	0	0	0	0.6	0	0	0	2.6	0	0
Pacific-slope flycatcher	0	<0.01	0	0	0	0.1	0	0	0	0.5	0	0
pine siskin	0	0	0.19	0	0	0	3.4	0	0	0	2.6	0
purple finch	<0.01	0.04	0.37	0.03	0.2	0.8	6.6	1.2	0.9	2.1	4.3	0.9
red-breasted nuthatch	0.33	0.10	0.42	0.36	9.4	2.3	7.5	12.9	22.2	7.7	23.1	26.5
ruby-crowned kinglet	0	0	0.14	0.03	0	0	2.4	1.2	0	0	8.5	3.4
song sparrow	0	0.02	0	0.02	0	0.5	0	0.6	0	2.1	0	0.9
spotted towhee	0.11	0.27	0.10	<0.01	3.1	6.4	1.8	0.3	11.1	21.5	8.5	0.9
Steller's jay	0.23	0.26	0.25	<0.01	6.4	6.2	4.4	0.3	16.8	19.5	20.5	0.9
Townsend's solitaire	<0.01	0.01	0	0	0.2	0.2	0	0	0.9	1.0	0	0
Townsend's warbler	0	0.02	0	0	0	0.5	0	0	0	1.5	0	0
tree swallow	0	0.04	0	0	0	0.8	0	0	0	1.0	0	0
unidentified empidonax	0	0.01	0	0	0	0.2	0	0	0	1.0	0	0
unidentified flycatcher	0	0.03	0	0	0	0.6	0	0	0	2.1	0	0
unidentified passerine	0.06	0.19	0.27	0	1.6	4.5	4.9	0	5	15.4	12.8	0
unidentified sparrow	0.01	0	0	0	0.4	0	0	0	1.4	0	0	0
unidentified swallow	0.01	<0.01	0	0	0.4	0.1	0	0	1.4	0.5	0	0
unidentified warbler	0.04	<0.01	<0.01	0	1.2	0.1	0.2	0	2.8	0.5	0.9	0
unidentified wren	0	0.01	0	0	0	0.2	0	0	0	0.5	0	0
varied thrush	0.02	0	<0.01	0	0.5	0	0.2	0	0.9	0	0.9	0
violet-green swallow	0	<0.01	0	0	0	0.1	0	0	0	0.5	0	0
western bluebird	0.17	0.03	0.78	0.67	4.7	0.6	13.9	23.9	11.6	2.1	6.8	5.1
western kingbird	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
western tanager	0	0.17	0	0	0	4.1	0	0	0	14.4	0	0
western wood-pewee	0	0.08	0	0	0	1.8	0	0	0	5.6	0	0
white-breasted nuthatch	0	0.02	0	0	0	0.5	0	0	0	2.1	0	0
white-crowned sparrow	0	<0.01	0	0	0	0.1	0	0	0	0.5	0	0
Wilson's warbler	0	<0.01	0	0	0	0.1	0	0	0	0.5	0	0
wrentit	0.06	0.04	0.07	0.06	1.7	0.8	1.2	2.1	5.1	2.6	4.3	5.1
yellow-rumped warbler	0.32	0.24	0.21	0	8.9	5.6	3.8	0	24.1	19.5	7.7	0
yellow warbler	0	0.17	<0.01	0	0	4.1	0.2	0	0	9.2	0.9	0

Appendix B2. Mean small bird use (number of small birds/100-meter plot/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season during small bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

	Mean Use				% of Use				% Frequency			
Type/Species	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**
Swifts/Hummingbirds	**0.34**	**0.02**	**0.03**	**0.07**	**9.6**	**0.4**	**0.6**	**2.5**	**4.3**	**1.5**	**2.6**	**5.1**
Anna's hummingbird	0.03	<0.01	0.02	0.07	0.7	0.1	0.3	2.5	2.6	0.5	1.7	5.1
rufous hummingbird	0.02	0	0	0	0.5	0	0	0	1.7	0	0	0
unidentified hummingbird	0	0.01	0.02	0	0	0.2	0.3	0	0	1.0	0.9	0
Vaux's swift	0.30	0	0	0	8.4	0	0	0	0.9	0	0	0
Woodpeckers	**0.27**	**0.28**	**0.37**	**0.13**	**7.6**	**6.6**	**6.6**	**4.6**	**20.6**	**22.1**	**26.5**	**9.4**
downy woodpecker	0	0.02	0.03	0.03	0	0.4	0.5	0.9	0	1.5	2.6	2.6
hairy woodpecker	0.07	0.05	0.08	0.02	1.9	1.2	1.4	0.6	6.0	4.6	6.0	1.7
northern flicker	0.13	0.16	0.19	0.03	3.7	3.9	3.4	1.2	13.2	15.4	16.2	2.6
pileated woodpecker	0	0	<0.01	0	0	0	0.2	0	0	0	0.9	0
red-breasted sapsucker	0	<0.01	0	0	0	0.1	0	0	0	0.5	0	0
unidentified woodpecker	0.02	0.03	0.02	0	0.6	0.6	0.3	0	2.2	2.6	1.7	0
white-headed woodpecker	0.05	0.02	0.05	0.05	1.3	0.4	0.9	1.8	4.0	1.5	4.3	3.4
Unidentified Birds	**0.03**	**0**	**0**	**0**	**0.8**	**0**	**0**	**0**	**2.8**	**0**	**0**	**0**
Unidentified small bird	0.03	0	0	0	0.8	0	0	0	2.8	0	0	0
Overall	**3.56**	**4.23**	**5.61**	**2.79**	**100**	**100**	**100**	**100**				

Appendix C. Mean Use by Point for All Birds, Major Bird Types, and Diurnal Raptor Subtypes during Fixed-Point Surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018

Appendix C1. Mean use (number of birds/800-meter plot/60-minute survey) by point for all large birds, major bird types, and diurnal raptor subtypes observed at the Fountain Wind Project during large bird surveys from 19 April 2017 – 22 May 2018.

Obs. Pt.	Waterbirds	Waterfowl	Diurnal Raptors	Accipiters	Buteos	Northern Harrier	Eagles	Falcons	Other Raptors	Owls	Vultures	Upland Game Birds	Doves/ Pigeons	Large Corvids	All Large Birds
1	0	0	0.36	0.14	0.14	0	0.07	0	0	0.07	0.36	0	0	0.29	**1.07**
2	0	2.14	0.36	0.14	0.21	0	0	0	0	0	0.79	0	0	0.93	**4.21**
3	0.14	42.64	0.14	0	0.07	0.07	0	0	0	0	0.43	0	0	0.79	**44.14**
4	0	0	0.43	0.07	0.29	0	0.07	0	0	0	0.57	0	0	0.64	**1.64**
5	0	0.21	1	0.21	0.64	0.07	0	0.07	0	0	2.29	0	0	0.07	**3.57**
6	0	0	0.43	0.21	0.21	0	0	0	0	0	0.71	0	0	0.29	**1.43**
7	0	0	0.93	0	0.79	0	0.14	0	0	0	0.36	0	0	0.57	**1.86**
8	0	1.43	0.07	0	0	0	0.07	0	0	0	0.21	0.07	0	0.07	**1.86**
9	0	0	0.29	0.07	0.21	0	0	0	0	0	0.5	0.07	0.14	0.57	**1.57**
10	0	0	0.07	0	0	0	0	0	0.07	0	0.36	0	0	0	**0.43**
11	0	7.21	0.14	0	0	0	0	0.07	0.07	0	0.64	0	0.93	0.14	**9.07**
12	0	0	0.14	0	0.07	0	0.07	0	0	0	0.93	0	0	0.29	**1.36**
13	0	0	0.07	0	0.07	0	0	0	0	0	0.86	0.07	0	0	**1**
14	0	0	0.64	0.14	0.5	0	0	0	0	0.07	1.07	0	0.07	0.07	**1.93**
15	0	0	0.43	0	0.36	0	0	0.07	0	0	1.64	0	0	0.36	**2.43**
16	0	13.57	0.29	0	0.29	0	0	0	0	0	0.64	0.07	0	0	**14.57**
17	0	13.85	0.77	0.15	0.54	0	0	0	0.08	0	2.85	0	0.23	0	**17.69**
18	0	35.31	0.46	0	0.23	0	0.23	0	0	0	1.77	0	0	0.08	**37.62**
19	0	0	0.31	0.08	0.15	0	0.08	0	0	0	0.85	0	0	0.15	**1.31**
20	0	0.08	0.08	0	0	0	0.08	0	0	0	0.62	0	0	0.08	**0.85**
21	0	2	0.14	0	0.14	0	0	0	0	0	1.07	0.07	0.43	0.43	**4.14**
22	0	0	0.21	0.07	0.14	0	0	0	0	0	0.64	0	0	0.21	**1.07**
23	0	0.71	0.07	0	0.07	0	0	0	0	0	0.21	0	0	0	**1**
24	0	0	0.36	0.14	0.14	0	0.07	0	0	0	1.5	0	0	1.86	**3.71**
25	1.14	7.29	0.21	0	0.21	0	0	0	0	0	0.93	0	0	0.64	**10.21**
26	2.36	0	0.86	0.07	0.71	0	0.07	0	0	0	1.93	0	0	0.86	**6**
27	0	8.36	0.36	0.07	0.14	0	0.07	0.07	0	0	0.5	0	0	0.14	**9.36**
28	0	0	0.46	0.15	0.31	0	0	0	0	0	0.85	0.15	0	0.62	**2.08**
29	4.21	0	0.71	0	0.57	0.07	0	0	0.07	0	2.07	0	0.14	0.64	**7.79**
30	0	3.08	1.92	0.15	1.62	0	0	0.15	0	0	3.77	0.08	0	1.31	**10.15**
31	0.38	0	0.31	0	0.31	0	0	0	0	0	1	0	0	0	**1.69**
32	0	0	0.31	0	0.23	0	0	0	0.08	0	1.08	0	0	0.69	**2.08**
33	0	8.85	0.23	0.08	0.15	0	0	0	0	0	1.38	0	0	0.46	**10.92**
34	0	0	0.46	0.15	0.31	0	0	0	0	0	0.85	0	0	0.23	**1.54**
35	0	5.38	0.62	0.08	0.31	0	0.23	0	0	0	1.31	0.08	0	0.15	**7.54**
36	0	0	0.23	0	0.15	0.08	0	0	0	0	1.46	0	0	1	**2.69**

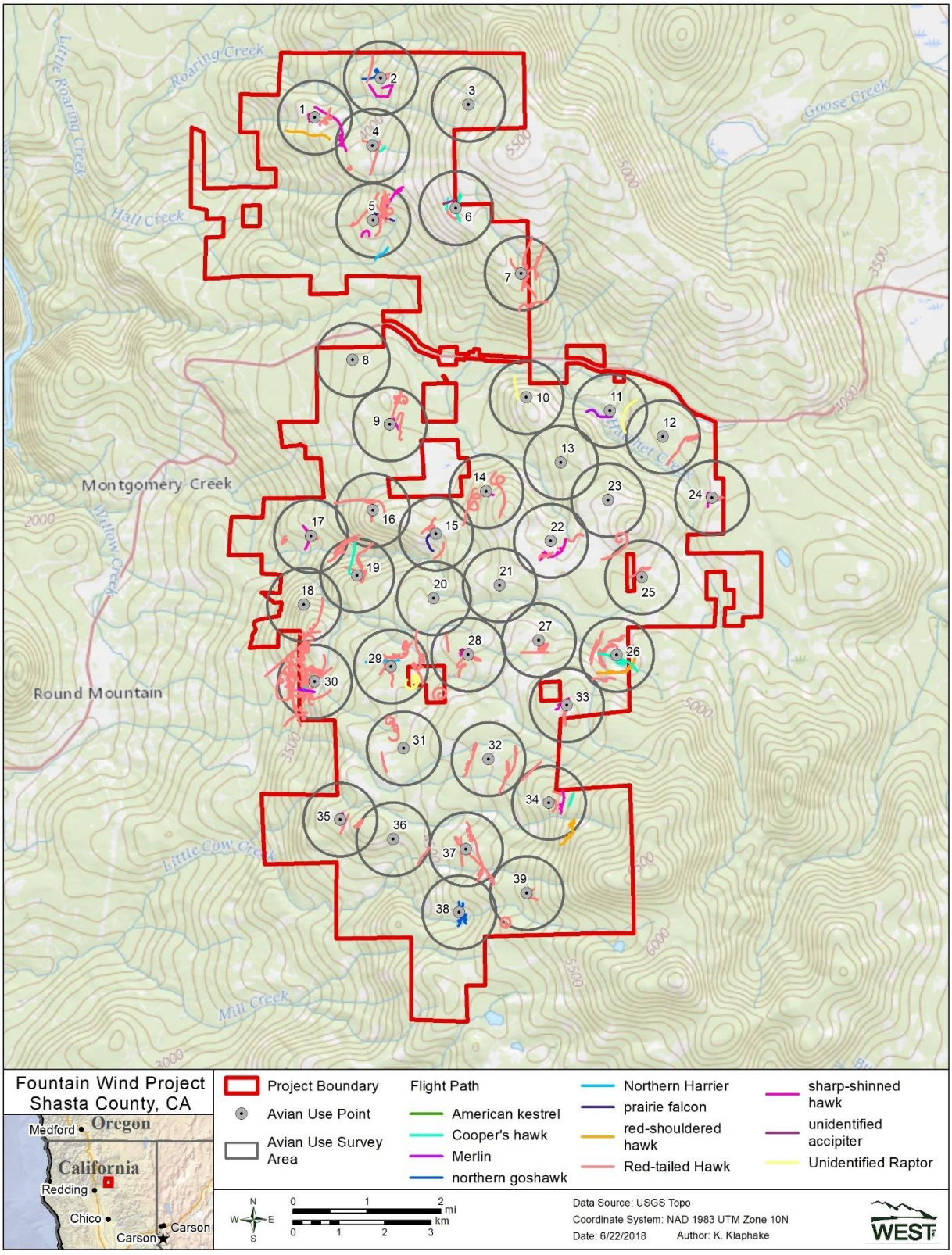
Appendix C1. Mean use (number of birds/800-meter plot/60-minute survey) by point for all large birds, major bird types, and diurnal raptor subtypes observed at the Fountain Wind Project during large bird surveys from 19 April 2017 – 22 May 2018.

Obs. Pt.	Waterbirds	Waterfowl	Diurnal Raptors	Accipiters	Buteos	Northern Harrier	Eagles	Falcons	Other Raptors	Owls	Vultures	Upland Game Birds	Doves/ Pigeons	Large Corvids	All Large Birds
37	0	0	0.31	0	0.31	0	0	0	0	0	1.92	0	0	0.62	**2.85**
38	0	0	0.23	0.15	0.08	0	0	0	0	0	0.69	0	0	0.85	**1.77**
39	2.23	0	0.23	0	0.15	0	0.08	0	0	0	0.46	0	0	0.69	**3.62**

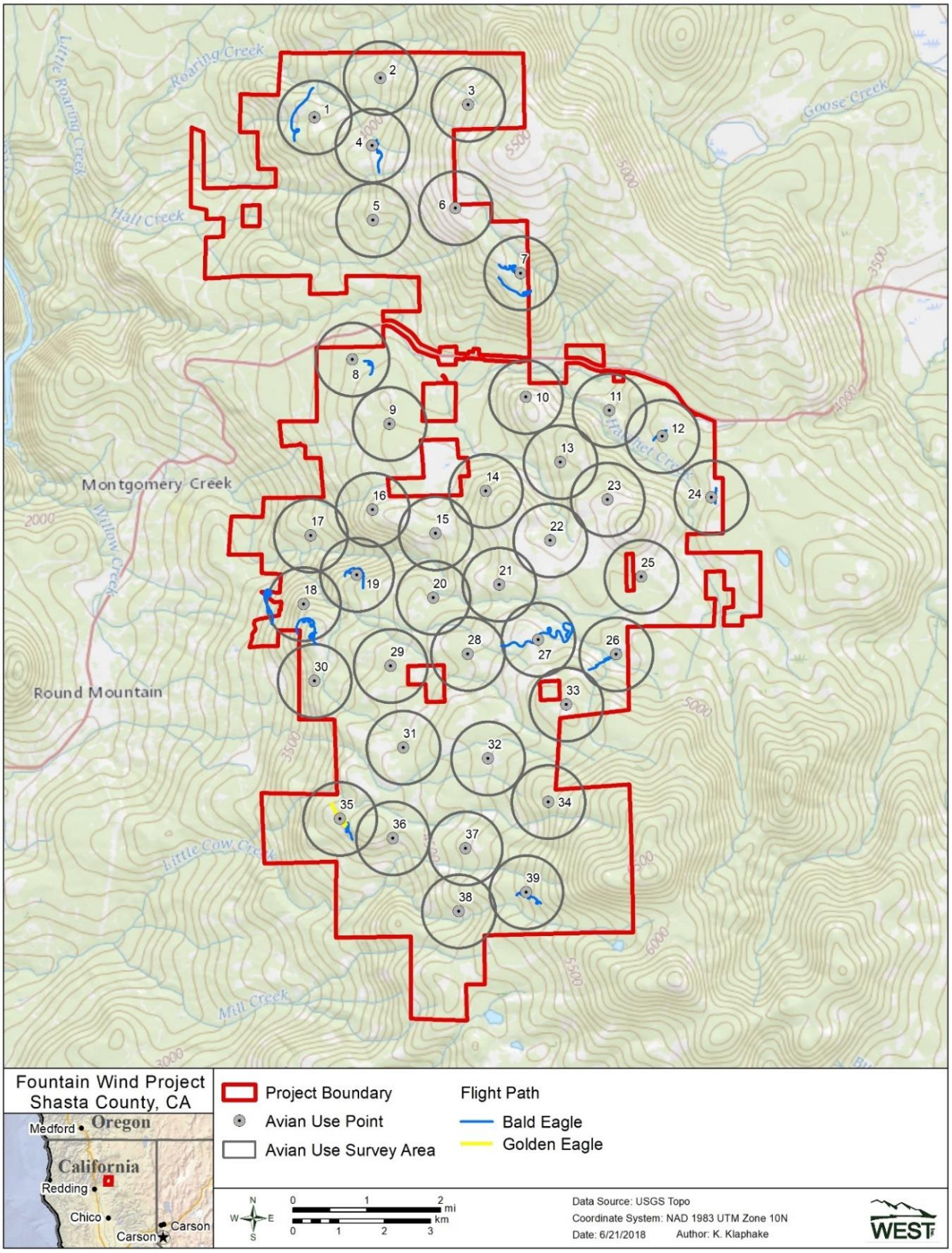
Appendix C2. Mean use (number of birds/100-meter plot/10-minute survey) by point for all small birds and major small bird types observed at the Fountain Wind Project during small bird surveys from 19 April 2017 – 22 May 2018.

Observation Point	Passerines	Swifts/ Hummingbirds	Woodpeckers	Unidentified Birds	All Small Birds
1	5.36	0	0.29	0	5.64
2	2.79	0	0.50	0	3.29
3	3.79	0	0.29	0	4.07
4	3.57	0.07	0.57	0	4.21
5	2.86	0.07	0	0	2.93
6	2.50	2.57	0.36	0	5.43
7	6.93	0	0.21	0	7.14
8	3.64	0	0.14	0	3.79
9	3.14	0	0.07	0	3.21
10	2.86	0	0	0	2.86
11	5.50	0.07	0.14	0.07	5.79
12	3.29	0	0.50	0.07	3.86
13	3.36	0	0.07	0	3.43
14	4.43	0	0.07	0	4.50
15	2.00	0	0.29	0	2.29
16	4.29	0	0.14	0	4.43
17	8.15	0.31	0.31	0	8.77
18	2.85	0.15	0	0	3.00
19	4.38	0.08	0.31	0	4.77
20	2.23	0	0.46	0	2.69
21	3.50	0	0.29	0	3.79
22	2.71	0	0.14	0	2.86
23	4.00	0	0.07	0	4.07
24	4.79	0	0.21	0	5.00
25	3.64	0	0.21	0	3.86
26	1.64	0.07	0.43	0	2.14
27	2.36	0.07	0.36	0	2.79
28	2.23	0	0.54	0	2.77
29	3.57	0.21	0.29	0	4.07
30	4.85	0.23	0.31	0	5.38
31	5.85	0	0.23	0	6.08
32	3.15	0	0.15	0	3.31
33	4.69	0	0.46	0	5.15
34	5.31	0	0.38	0	5.69
35	5.54	0	0.23	0	5.77
36	2.92	0	0.31	0	3.23
37	3.00	0	0.54	0	3.54
38	3.62	0	0.08	0	3.69
39	1.69	0.08	0.38	0	2.15

Appendix D. Diurnal Raptor and Eagle Flight Paths Recorded during Fixed-Point Avian Use Surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018



Appendix D1. Diurnal raptor (non-eagle) flight paths recorded during large bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.



Appendix D2. Eagle flight paths recorded during large bird surveys at the Fountain Wind Project from 19 April 2017 – 22 May 2018.

Appendix E. All Bird and Diurnal Raptor Fatality Rates at Wind Energy Facilities in North America

Appendix E. Wind energy facilities in North America, by region, with publicly available and comparable fatality data for all bird species and diurnal raptor species.

Wind Energy Facility	All Bird Fatality Estimate[A]	Diurnal Raptor Fatality Estimate	No. of Turbines	Total MW
	California			
Pine Tree, CA (2009-2010, 2011)	17.44	-	90	135
Alta I, CA (2013-2014)	12.05	0.15	290	720
Montezuma I, CA (2012)	8.91	0.79	16	36.8
Alta I, CA (2011-2012)	7.07	0.27	100	150
Shiloh I, CA (2006-2009)	6.96	0.42	100	150
Windstar, CA (2012-2013)	6.65	0.18	53	106
Montezuma I, CA (2011)	5.19	1.06	16	36.8
Alta X, CA (2014-2015)	4.88	0.04	48	137
Dillon, CA (2008-2009)	4.71	0	45	45
Diablo Winds, CA (2005-2007)	4.29	0.4	31	20.46
Lower West, CA (2012-2013)	3.25	0	7	14
Shiloh III, CA (2012-2013)	3.3	-	50	102.5
Rising Tree, CA (2015-2016)	3.1	0.06	60	198
Shiloh II, CA (2010-2011)	2.8	0.44	75	150
Shiloh II, CA (2011-2012)	2.8	0.97	75	150
Alta II-V, CA (2013-2014)	2.79	0	290	720
Alta I, CA (2015-2016)	2.57	0.15	290	720
Hatchet Ridge, CA (2011)	2.5	0.03	44	101
Alta X, CA (2015-2016)	2.17	0	48	137
North Sky River, CA (2013-2014)	2.05	0.05	100	160
Shiloh II, CA (2009-2010)	1.9	0.11	75	150
Alta II-V, CA (2011-2012)	1.66	0.05	190	570
Mustang Hills, CA (2012-2013)	1.66	0.08	50	150
Rising Tree, CA (2017-2018)	1.63	0.14	60	198
High Winds, CA (2003-2004)	1.62	0.5	90	162
Solano III, CA (2012-2013)	1.6	0.95	55	128
North Sky River, CA (2014-2015)	1.23	0.07	100	160
Hatchet Ridge, CA (2013)	1.22	-	44	101
Pinyon Pines I & II, CA (2013-2014)	1.18	0	100	300
High Winds, CA (2004-2005)	1.1	0.28	90	162
Montezuma II, CA (2012-2013)	1.08	0.46	34	78.2
Mustang Hills, CA (2014-2015)	0.97	0.03	100	300
Lower West, CA (2014-2015)	0.9	0	7	14
Hatchet Ridge, CA (2012)	0.83	0	44	101
Pacific Wind, CA (2015-2016)	0.77	0.07	70	144
Lower West, CA (2016-2017)	0.73	0	7	14
North Sky River, CA (2015-2016)	0.72	0.17	100	160
Alta VIII, CA (2012-2013)	0.66	0.02	50	150
Cameron Ridge/Section 15, CA (2015-2016)	0.57	0	34	102
Pinyon Pines I & II, CA (2017-2018)	0.56	0.01	100	300
Alite, CA (2009-2010)	0.55	0.12	8	24
Mustang Hills, CA (2016-2017)	0.54	0.15	50	150
Alta II-V, CA (2015-2016)	0.51	0	290	720
Pinyon Pines I&II, CA (2015-2016)	0.5	0.02	100	300
Cameron Ridge/Section 15, CA (2014-2015)	0.45	0.04	34	102
Alta VIII, CA (2014-2015)	0.38	0.04	50	150
Alta VIII, CA (2016-2017)	0.25	0	50	150
Pacific Wind, CA (2014-2015)	0.17	0	70	144
	Pacific Northwest			

Appendix E. Wind energy facilities in North America, by region, with publicly available and comparable fatality data for all bird species and diurnal raptor species.

Wind Energy Facility	All Bird Fatality Estimate[A]	Diurnal Raptor Fatality Estimate	No. of Turbines	Total MW
Windy Flats, WA (2010-2011)	8.45	0.04	114	262.2
Leaning Juniper, OR (2006-2008)	6.66	0.16	67	100.5
Linden Ranch, WA (2010-2011)	6.65	0.27	25	50
Biglow Canyon, OR (Phase II; 2009-2010)	5.53	0.14	65	150
White Creek, WA (2007-2011)	4.05	0.47	89	204.7
Tuolumne (Windy Point I), WA (2009-2010)	3.2	0.29	62	136.6
Stateline, OR/WA (2001-2002)	3.17	0.09	454	299
Klondike II, OR (2005-2006)	3.14	0.06	50	75
Klondike III (Phase I), OR (2007-2009)	3.02	0.15	125	223.6
Hopkins Ridge, WA (2008)	2.99	0.07	87	156.6
Harvest Wind, WA (2010-2012)	2.94	0.23	43	98.9
Nine Canyon, WA (2002-2003)	2.76	0.03	37	48.1
Biglow Canyon, OR (Phase II; 2010-2011)	2.68	0.03	65	150
Stateline, OR/WA (2003)	2.68	0.09	454	299
Klondike IIIa (Phase II), OR (2008-2010)	2.61	0.06	51	76.5
Combine Hills, OR (Phase I; 2004-2005)	2.56	0	41	41
Big Horn, WA (2006-2007)	2.54	0.11	133	199.5
Biglow Canyon, OR (Phase I; 2009)	2.47	0	76	125.4
Combine Hills, OR (2011)	2.33	0.05	104	104
Biglow Canyon, OR (Phase III; 2010-2011)	2.28	0.05	76	174.8
Hay Canyon, OR (2009-2010)	2.21	0	48	100.8
Elkhorn, OR (2010)	1.95	0.08	61	101
Pebble Springs, OR (2009-2010)	1.93	0.04	47	98.7
Biglow Canyon, OR (Phase I; 2008)	1.76	0.03	76	125.4
Wild Horse, WA (2007)	1.55	0.09	127	229
Goodnoe, WA (2009-2010)	1.4	0.17	47	94
Vantage, WA (2010-2011)	1.27	0.29	60	90
Hopkins Ridge, WA (2006)	1.23	0.14	83	150
Stateline, OR/WA (2006)	1.23	0.11	454	299
Kittitas Valley, WA (2011-2012)	1.06	0.09	48	100.8
Klondike, OR (2002-2003)	0.95	0	16	24
Vansycle, OR (1999)	0.95	0	38	24.9
Palouse Wind, WA (2012-2013)	0.72	-	58	104.4
Elkhorn, OR (2008)	0.64	0.06	61	101
Marengo I, WA (2009-2010)	0.27	0	78	140.4
Marengo II, WA (2009-2010)	0.16	0.05	39	70.2
Southwestern				
Dry Lake I, AZ (2009-2010)	2.02	0	30	63
Dry Lake II, AZ (2011-2012)	1.57	0	31	65
Southern Plains				
Buffalo Gap I, TX (2006)	1.32	0.1	67	134
Barton Chapel, TX (2009-2010)	1.15	0.25	60	120
Buffalo Gap II, TX (2007-2008)	0.15	0	155	233
Big Smile, OK (2012-2013)	0.09	0	66	132
Red Hills, OK (2012-2013)	0.08	0.04	82	123
Rocky Mountains				
Foote Creek Rim, WY (Phase I; 1999)	3.4	0.08	69	41.4
Foote Creek Rim, WY (Phase I; 2000)	2.42	0.05	69	41.4
Foote Creek Rim, WY (Phase I; 2001-2002)	1.93	0	69	41.4

Appendix E. Wind energy facilities in North America, by region, with publicly available and comparable fatality data for all bird species and diurnal raptor species.

Wind Energy Facility	All Bird Fatality Estimate[A]	Diurnal Raptor Fatality Estimate	No. of Turbines	Total MW
Summerview, Alb (2005-2006)	1.06	0.11	39	70.2
Milford I & II, UT (2011-2012)	0.73	0.04	107	160.5
Milford I, UT (2010-2011)	0.56	-	58	145
Midwest				
Wessington Springs, SD (2009)	8.25	0.06	34	51
Blue Sky Green Field, WI (2008; 2009)	7.17	0	88	145
Cedar Ridge, WI (2009)	6.55	0.18	41	67.6
Buffalo Ridge, MN (Phase III; 1999)	5.93	0	138	103.5
Moraine II, MN (2009)	5.59	0.37	33	49.5
Barton I & II, IA (2010-2011)	5.5	0	80	160
Buffalo Ridge I, SD (2009-2010)	5.06	0.2	24	50.4
Buffalo Ridge, MN (Phase I; 1996)	4.14	0	73	25
Winnebago, IA (2009-2010)	3.88	0.27	10	20
Rugby, ND (2010-2011)	3.82	0.06	71	149
Cedar Ridge, WI (2010)	3.72	0.13	41	68
Elm Creek II, MN (2011-2012)	3.64	0	62	148.8
Buffalo Ridge, MN (Phase II; 1999)	3.57	0	143	107.25
Buffalo Ridge, MN (Phase I; 1998)	3.14	0	73	25
Ripley, Ont (2008)	3.09	0.1	38	76
Fowler I, IN (2009)	2.83	0	162	301
Buffalo Ridge, MN (Phase I; 1997)	2.51	0	73	25
Buffalo Ridge, MN (Phase II; 1998)	2.47	0	143	107.25
PrairieWinds SD1, SD (2012-2013)	2.01	0.03	108	162
Buffalo Ridge II, SD (2011-2012)	1.99	0	105	210
Kewaunee County, WI (1999-2001)	1.95	0	31	20.46
Port Dover and Nanticoke, ON (2014)	1.66	0.07	58	104
PrairieWinds SD1, SD (2013-2014)	1.66	0.17	108	162
NPPD Ainsworth, NE (2006)	1.63	0.06	36	20.5
PrairieWinds ND1 (Minot), ND (2011)	1.56	0.05	80	115.5
Elm Creek, MN (2009-2010)	1.55	0	67	100
PrairieWinds ND1 (Minot), ND (2010)	1.48	0.05	80	115.5
Buffalo Ridge, MN (Phase I; 1999)	1.43	0.47	73	25
PrairieWinds SD1, SD (2011-2012)	1.41	0	108	162
Top Crop I & II (2012-2013)	1.35	-	68	300
Heritage Garden I, MI (2012-2014)	1.3	-	14	28
Wessington Springs, SD (2010)	0.89	0.07	34	51
Rail Splitter, IL (2012-2013)	0.84	0	67	100.5
Top of Iowa, IA (2004)	0.81	0.17	89	80
Grand Valley, ON (2016)	0.68	0.04	16	40
Big Blue, MN (2013)	0.6	0	18	36
Grand Ridge I, IL (2009-2010)	0.48	0	66	99
Top of Iowa, IA (2003)	0.42	0	89	80
Big Blue, MN (2014)	0.37	0	18	36
Pioneer Prairie II, IA (2011-2012)	0.27	0	62	102.3
Northeast				
Stetson Mountain I, ME (2013)	6.95	0	38	57
Criterion, MD (2011)	6.4	0.02	28	70
Mount Storm, WV (2011)	4.24	0.03	132	264
Pinnacle, WV (2012)	3.99	0	23	55.2
Mount Storm, WV (2009)	3.85	0	132	264

Appendix E. Wind energy facilities in North America, by region, with publicly available and comparable fatality data for all bird species and diurnal raptor species.

Wind Energy Facility	All Bird Fatality Estimate[A]	Diurnal Raptor Fatality Estimate	No. of Turbines	Total MW
Record Hill, ME (2012)	3.7	-	22	50.6
Criterion, MD (2013)	3.49	-	28	70
Lempster, NH (2009)	3.38	0	12	24
Stetson Mountain II, ME (2012)	3.37	0	17	25.5
Rollins, ME (2012)	2.9	-	40	60
Casselman, PA (2009)	2.88	0	23	34.5
Mountaineer, WV (2003)	2.69	0.07	44	66
Stetson Mountain I, ME (2009)	2.68	0	38	57
Noble Ellenburg, NY (2009)	2.66	0.25	54	80
Lempster, NH (2010)	2.64	0	12	24
Mount Storm, WV (2010)	2.6	0.1	132	264
Maple Ridge, NY (2007)	2.34	0.03	195	321.75
Noble Bliss, NY (2009)	2.28	0.12	67	100
Criterion, MD (2012)	2.14	0.02	28	70
Maple Ridge, NY (2007-2008)	2.07	0.03	195	321.75
Record Hill, ME (2014)	1.84	-	22	50.6
Noble Altona, NY (2010)	1.84	0	65	97.5
High Sheldon, NY (2010)	1.76	0.06	75	112.5
Mars Hill, ME (2008)	1.76	0	28	42
Noble Wethersfield, NY (2010)	1.7	0.13	84	126
Mars Hill, ME (2007)	1.67	0	28	42
Noble Chateaugay, NY (2010)	1.66	0.08	71	106.5
Noble Clinton, NY (2008)	1.59	0.1	67	100
High Sheldon, NY (2011)	1.57	0	75	112.5
Casselman, PA (2008)	1.51	0	23	34.5
Beech Ridge, WV (2013)	1.48	0.01	67	100.5
Munnsville, NY (2008)	1.48	0.59	23	34.5
Stetson Mountain II, ME (2010)	1.42	0	17	25.5
Cohocton/Dutch Hill, NY (2009)	1.39	0	50	125
Cohocton/Dutch Hills, NY (2010)	1.32	0.08	50	125
Noble Bliss, NY (2008)	1.3	0.1	67	100
Beech Ridge, WV (2012)	1.19	0.01	67	100.5
Stetson Mountain I, ME (2011)	1.18	0	38	57
Noble Clinton, NY (2009)	1.11	0.16	67	100
Locust Ridge, PA (Phase II; 2009)	0.84	0	51	102
Noble Ellenburg, NY (2008)	0.83	0.11	54	80
Locust Ridge, PA (Phase II; 2010)	0.76	0	51	102
	Southeastern			
Buffalo Mountain, TN (2000-2003)	11.02	0	3	1.98
Buffalo Mountain, TN (2005)	1.1	0	18	28.98

A=number of bird fatalities/MW/year

Appendix E (*continued*). Wind energy facilities in North America, by region, with publicly available and comparable fatality data for all bird species and diurnal raptor species.

Data from the following sources:

Wind Energy Facility	Fatality Estimate	Wind Energy Facility	Fatality Estimate
Alite, CA (2009-2010)	Chatfield et al. 2010	Lower West, CA (2016-2017)	WEST 2017b
Alta I, CA (2011-2012)	Chatfield et al. 2012	Maple Ridge, NY (2007)	Jain et al. 2009a
Alta I, CA (2013-2014)	Chatfield et al. 2014	Maple Ridge, NY (2007-2008)	Jain et al. 2009b
Alta I, CA (2015-2016)	Thompson et al. 2016	Marengo I, WA (2009-2010)	URS Corporation 2010c
Alta II-V, CA (2011-2012)	Chatfield et al. 2012	Marengo II, WA (2009-2010)	URS Corporation 2010b
Alta II-V, CA (2013-2014)	Chatfield et al. 2014	Mars Hill, ME (2007)	Stantec 2008
Alta II-V, CA (2015-2016)	Thompson et al. 2016	Mars Hill, ME (2008)	Stantec 2009a
Alta VIII, CA (2012-2013)	Chatfield and Bay 2014	Milford I & II, UT (2011-2012)	Stantec 2012
Alta VIII, CA (2014-2015)	WEST 2016c	Milford I, UT (2010-2011)	Stantec 2011a
Alta VIII, CA (2016-2017)	WEST 2018	Montezuma I, CA (2011)	ICF International 2012
Alta X, CA (2014-2015)	Chatfield et al. 2015	Montezuma I, CA (2012)	ICF International 2013
Alta X, CA (2015-2016)	Thompson et al. 2016	Montezuma II, CA (2012-2013)	Harvey & Associates 2013
Barton Chapel, TX (2009-2010)	WEST 2011	Moraine II, MN (2009)	Derby et al. 2010a
Barton I & II, IA (2010-2011)	Derby et al. 2011a	Mount Storm, WV (2009)	Young et al. 2009b, 2010a
Beech Ridge, WV (2012)	Tidhar et al. 2013	Mount Storm, WV (2010)	Young et al. 2010b, 2011a
Beech Ridge, WV (2013)	Young et al. 2014a	Mount Storm, WV (2011)	Young et al. 2011b, 2012a
Big Blue, MN (2013)	Fagen Engineering 2014	Mountaineer, WV (2003)	Kerns and Kerlinger 2004
Big Blue, MN (2014)	Fagen Engineering 2015	Munnsville, NY (2008)	Stantec 2009b
Big Horn, WA (2006-2007)	Kronner et al. 2008	Mustang Hills, CA (2012-2013)	Chatfield and Bay 2014
Big Smile, OK (2012-2013)	Derby et al. 2013a	Mustang Hills, CA (2014-2015)	WEST 2016c
Biglow Canyon, OR (Phase I; 2008)	Jeffrey et al. 2009a	Mustang Hills, CA (2016-2017)	WEST 2018
Biglow Canyon, OR (Phase I; 2009)	Enk et al. 2010	Nine Canyon, WA (2002-2003)	Erickson et al. 2003
Biglow Canyon, OR (Phase II; 2009-2010)	Enk et al. 2011b	Noble Altona, NY (2010)	Jain et al. 2011a
Biglow Canyon, OR (Phase II; 2010-2011)	Enk et al. 2012a	Noble Bliss, NY (2008)	Jain et al. 2009c
Biglow Canyon, OR (Phase III; 2010-2011)	Enk et al. 2012b	Noble Bliss, NY (2009)	Jain et al. 2010a
Blue Sky Green Field, WI (2008; 2009)	Gruver et al. 2009	Noble Chateaugay, NY (2010)	Jain et al. 2011b
Buffalo Gap I, TX (2006)	Tierney 2007	Noble Clinton, NY (2008)	Jain et al. 2009d
Buffalo Gap II, TX (2007-2008)	Tierney 2009	Noble Clinton, NY (2009)	Jain et al. 2010b
Buffalo Mountain, TN (2000-2003)	Nicholson et al. 2005	Noble Ellenburg, NY (2008)	Jain et al. 2009e
Buffalo Mountain, TN (2005)	Fiedler et al. 2007	Noble Ellenburg, NY (2009)	Jain et al. 2010c
Buffalo Ridge I, SD (2009-2010)	Derby et al. 2010b	Noble Wethersfield, NY (2010)	Jain et al. 2011c
Buffalo Ridge II, SD (2011-2012)	Derby et al. 2012a	North Sky River, CA (2013-2014)	Levenstein et al. 2014
Buffalo Ridge, MN (Phase I; 1996)	Johnson et al. 2000	North Sky River, CA (2014-2015)	Levenstein et al. 2015
Buffalo Ridge, MN (Phase I; 1997)	Johnson et al. 2000	North Sky River, CA (2015-2016)	WEST 2016d
Buffalo Ridge, MN (Phase I; 1998)	Johnson et al. 2000	NPPD Ainsworth, NE (2006)	Derby et al. 2007
Buffalo Ridge, MN (Phase I; 1999)	Johnson et al. 2000	Pacific Wind, CA (2014-2015)	WEST 2016a
Buffalo Ridge, MN (Phase II; 1998)	Johnson et al. 2000	Pacific Wind, CA (2015-2016)	WEST 2017a
Buffalo Ridge, MN (Phase II; 1999)	Johnson et al. 2000	Palouse Wind, WA (2012-2013)	Stantec 2013a
Buffalo Ridge, MN (Phase III; 1999)	Johnson et al. 2000	Pebble Springs, OR (2009-2010)	Gritski and Kronner 2010a

Appendix E (*continued*). Wind energy facilities in North America, by region, with publicly available and comparable fatality data for all bird species and diurnal raptor species.

Data from the following sources:

Wind Energy Facility	Fatality Estimate	Wind Energy Facility	Fatality Estimate
Cameron Ridge/Section 15, CA (2014-2015)	WEST 2016b	Pine Tree, CA (2009-2010, 2011)	BioResource Consultants 2012
Cameron Ridge/Section 15, CA (2015-2016)	Rintz and Thompson 2017	Pinnacle, WV (2012)	Hein et al. 2013
Casselman, PA (2008)	Arnett et al. 2009	Pinyon Pines I & II, CA (2013-2014)	Chatfield and Russo 2014
Casselman, PA (2009)	Arnett et al. 2010	Pinyon Pines I & II, CA (2017-2018)	Rintz and Pham 2018
Cedar Ridge, WI (2009)	BHE Environmental 2010	Pinyon Pines, CA (2015-2016)	Rintz and Starcevich 2016
Cedar Ridge, WI (2010)	BHE Environmental 2011	Pioneer Prairie II, IA (2011-2012)	Chodachek et al. 2012
Cohocton/Dutch Hill, NY (2009)	Stantec 2010	Pleasant Valley, MN (2016-2017)	Tetra Tech 2017a
Cohocton/Dutch Hills, NY (2010)	Stantec 2011b	Port Dover and Nanticoke Wind Project, ON (2014)	Stantec Consulting Ltd. 2015
Combine Hills, OR (2011)	Enz et al. 2012	Prairie Rose, MN (2014)	Chodachek et al. 2015
Combine Hills, OR (Phase I; 2004-2005)	Young et al. 2006	PrairieWinds ND1 (Minot), ND (2010)	Derby et al. 2011b
Criterion, MD (2011)	Young et al. 2012b	PrairieWinds ND1 (Minot), ND (2011)	Derby et al. 2012b
Criterion, MD (2012)	Young et al. 2013	PrairieWinds SD1, SD (2011-2012)	Derby et al. 2012c
Criterion, MD (2013)	Young et al. 2014b	PrairieWinds SD1, SD (2012-2013)	Derby et al. 2013b
Diablo Winds, CA (2005-2007)	WEST 2006, 2008	PrairieWinds SD1, SD (2013-2014)	Derby et al. 2014
Dillon, CA (2008-2009)	Chatfield et al. 2009	Rail Splitter, IL (2012-2013)	Good et al. 2013a
Dry Lake I, AZ (2009-2010)	Thompson et al. 2011	Record Hill, ME (2012)	Stantec 2013b
Dry Lake II, AZ (2011-2012)	Thompson and Bay 2012	Record Hill, ME (2014)	Stantec 2015
Elkhorn, OR (2008)	Jeffrey et al. 2009b	Red Hills, OK (2012-2013)	Derby et al. 2013c
Elkhorn, OR (2010)	Enk et al. 2011a	Ripley, Ont (2008)	Jacques Whitford 2009
Elm Creek II, MN (2011-2012)	Derby et al. 2012d	Rising Tree, CA (2015-2016)	Rintz et al. 2016
Elm Creek, MN (2009-2010)	Derby et al. 2010c	Rising Tree, CA (2017-2018)	Chatfield et al. 2018
Foote Creek Rim, WY (Phase I; 1999)	Young et al. 2003	Rollins, ME (2012)	Stantec 2013c
Foote Creek Rim, WY (Phase I; 2000)	Young et al. 2003	Rugby, ND (2010-2011)	Derby et al. 2011c
Foote Creek Rim, WY (Phase I; 2001-2002)	Young et al. 2003	Shiloh I, CA (2006-2009)	Kerlinger et al. 2009
Fowler I, IN (2009)	Johnson et al. 2010	Shiloh II, CA (2009-2010)	Kerlinger et al. 2010, 2013a
Goodnoe, WA (2009-2010)	URS Corporation 2010a	Shiloh II, CA (2010-2011)	Kerlinger et al. 2013a
Grand Ridge I, IL (2009-2010)	Derby et al. 2010d	Shiloh II, CA (2011-2012)	Kerlinger et al. 2013a
Grand Valley, (2016)	Stantec Consulting Ltd. 2017	Shiloh III, CA (2012-2013)	Kerlinger et al. 2013b
Harvest Wind, WA (2010-2012)	Downes and Gritski 2012b	Solano III, CA (2012-2013)	AECOM 2013
Hatchet Ridge, CA (2011)	Tetra Tech 2013	Stateline, OR/WA (2001-2002)	Erickson et al. 2004
Hatchet Ridge, CA (2012)	Tetra Tech 2013	Stateline, OR/WA (2003)	Erickson et al. 2004
Hatchet Ridge, CA (2013)	Tetra Tech 2014	Stateline, OR/WA (2006)	Erickson et al. 2007
Hay Canyon, OR (2009-2010)	Gritski and Kronner 2010b	Stetson Mountain I, ME (2009)	Stantec 2009c
Heritage Garden I, MI (2012-2013)	Kerlinger et al. 2014	Stetson Mountain I, ME (2011)	Normandeau Associates 2011

Appendix E (*continued*). Wind energy facilities in North America, by region, with publicly available and comparable fatality data for all bird species and diurnal raptor species.

Data from the following sources:

Wind Energy Facility	Fatality Estimate	Wind Energy Facility	Fatality Estimate
Heritage Garden I, MI (2013-2014)	Kerlinger et al. 2014	Stetson Mountain I, ME (2013)	Stantec 2014
High Sheldon, NY (2010)	Tidhar et al. 2012a	Stetson Mountain II, ME (2010)	Normandeau Associates 2010
High Sheldon, NY (2011)	Tidhar et al. 2012b	Stetson Mountain II, ME (2012)	Stantec 2013d
High Winds, CA (2003-2004)	Kerlinger et al. 2006	Summerview, Alb (2005-2006)	Brown and Hamilton 2006
High Winds, CA (2004-2005)	Kerlinger et al. 2006	Top Crop I & II (2012-2013)	Good et al. 2013b
Hopkins Ridge, WA (2006)	Young et al. 2007b	Top of Iowa, IA (2003)	Jain 2005
Hopkins Ridge, WA (2008)	Young et al. 2009a	Top of Iowa, IA (2004)	Jain 2005
Kewaunee County, WI (1999-2001)	Howe et al. 2002	Tucannon River, WA (2015)	Hallingstad et al. 2016
Kittitas Valley, WA (2011-2012)	Stantec 2012	Tuolumne (Windy Point I), WA (2009-2010)	Enz and Bay 2010
Klondike II, OR (2005-2006)	NWC and WEST 2007	Vansycle, OR (1999)	Erickson et al. 2000
Klondike III (Phase I), OR (2007-2009)	Gritski et al. 2010	Vantage, WA (2010-2011)	Ventus 2012
Klondike IIIa (Phase II), OR (2008-2010)	Gritski et al. 2011	Waverly Wind, KS (2016-2017)	Tetra Tech 2017b
Klondike, OR (2002-2003)	Johnson et al. 2003	Wessington Springs, SD (2009)	Derby et al. 2010e
Leaning Juniper, OR (2006-2008)	Gritski et al. 2008	Wessington Springs, SD (2010)	Derby et al. 2011d
Lempster, NH (2009)	Tidhar et al. 2010	White Creek, WA (2007-2011)	Downes and Gritski 2012a
Lempster, NH (2010)	Tidhar et al. 2011	Wild Horse, WA (2007)	Erickson et al. 2008
Linden Ranch, WA (2010-2011)	Enz and Bay 2011	Wildcat, IN (2017)	Stantec 2018
Locust Ridge, PA (Phase II; 2009)	Arnett et al. 2011	Windstar, CA (2012-2013)	Levenstein and Bay 2013b
Locust Ridge, PA (Phase II; 2010)	Arnett et al. 2011	Windy Flats, WA (2010-2011)	Enz et al. 2011
Lower West, CA (2012-2013)	Levenstein and Bay 2013a	Winnebago, IA (2009-2010)	Derby et al. 2010f
Lower West, CA (2014-2015)	Levenstein and DiDonato 2015		

C8. Great Gray Owl Habitat Assessment

ENVIRONMENTAL & STATISTICAL CONSULTANTS

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TECHNICAL MEMORANDUM

DATE: October 24, 2018

TO: Kristen Goland, Pacific Wind Development LLC

FROM: Joel Thompson and Kori Hutchison, WEST, Inc.

RE: Great Gray Owl Habitat Assessment, Fountain Wind Project, CA

INTRODUCTION

Pacific Wind Development LLC contracted Western EcoSystems Technology, Inc. (WEST) to provide biological survey support for the development of the proposed Fountain Wind Project (Project; Figure 1). Great gray owl (*Strix nebulosa*) is currently designated as endangered by the state of California (CDFW 2018), with an estimated population size of only 100-200 pairs in the state (IBP 2015). According to the California Natural Diversity Database (CNDDB), there are no known occurrences of great gray owl within or immediately adjacent to the Project area; the nearest known occupied territories are located approximately 85 miles (mi; 136.7 kilometers [km]) to the northeast of the Project in Modoc County (CDFW 2018). While the Project is within the historical range of this species, based on CNDDB data (CDFW 2018) no confirmed detections of great gray owl have been recorded within Shasta County, and no indications of species presence have been observed during surveys conducted by WEST for various other species/species groups (e.g., northern goshawk, willow flycatcher, fixed point avian use surveys). Great gray owl nesting habitat in California is most commonly associated with dense forest stands adjacent to montane meadow foraging habitat (Huff and Godwin 2016; IBP 2015). Although this species has not been documented within the Project area, CDFW's Great Gray Owl Habitat Model (CDFW Model) indicated that potentially suitable foraging and nesting habitat may occur within the Project area (CDFW 2011), with all of the modeled potential habitat occurring on a private inholding within the larger Project area boundary (Figure 1). To determine the need for field surveys specific for great gray owl, WEST conducted desktop and field assessments of potential great gray owl habitats within the Project area in 2018, the methods and results of which are described in this memo.

SURVEY AREA

The Project is located on privately owned commercial timberlands in central Shasta County, California. The dominant vegetation type in and around the Project area is mixed coniferous forest (post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use in this area is commercial timber production, which has resulted in a highly fragmented landscape across much of the area. Dominant overstory species include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*).

METHODS

Geographic Information System (GIS) data from the CNDDB and examination of aerial imagery were used to conduct a desktop review of potential great gray owl nesting and foraging habitat within the Project area using the CDFW Model (CNDDB 2011; Figure 1). This GIS-based model estimates where potential great grey owl nest sites may occur by extracting potential nesting areas along with their associated foraging areas from CALVEG land cover data (CALVEG 2004; CDFW 2011).

Once identified during the desktop assessment, a WEST biologist visited the Project to evaluate areas of modelled great gray owl habitat and to identify areas of potential habitat not predicted by the model. Consistent with the CDFW Model, criteria for inclusion as potential foraging habitat included the following Wildlife Habitat Relationship (WHR) types: wet meadows, annual grasslands and perennial grasslands; criteria for inclusion as potential nesting habitat included WHR size 4M (11-24 inches diameter at breast height, 12-24 foot (ft) crowns, and 40-59% canopy cover) and larger/denser (CDFW 2011, CDFW 2014). The CDFW Model nesting habitat criteria are generally consistent with criteria identified in the survey protocol for great gray owl within the Northwest Forest Plan (NWFP) Area (Huff and Godwin 2016), which indicates that suitable nesting habitat must include mature or old-growth conifer stands with greater than 50% canopy cover containing potential nest trees (broken-top snags greater than 16-in diameter at breast height, trees containing pre-existing stick nests from hawks, ravens, or squirrels; or mistletoe brooms). The NWFP protocol also states that although the minimum patch size of nesting habitat needed to support this species is unknown, all nests encountered in southwest Oregon were within patches exceeding 40 acres (Huff and Godwin 2016).

Because the only modeled nesting habitat was located in and adjacent the large meadow (Figure 1) on a private inholding, no specific measurements of tree size or canopy closure were taken within the area of modeled habitat. The field assessment was limited to a view of the modeled nesting habitat from the fence located on the west side of the meadow and an assessment of tree sizes in close proximity (i.e., visible from the edge of the meadow and immediately west of the meadow). Information from the field assessment was used for additional evaluations of aerial imagery comparing the modeled nesting habitat to nearby areas visited during the field assessment.

RESULTS AND DISCUSSION

Based on the CDFW Model and NWFP survey protocol, suitable nesting habitat requires 10 or more acres of foraging habitat within 660 feet of a potential nest site (CDFW 2011; Huff and Godwin 2016). One area of potential great gray owl nesting and associated foraging habitat was predicted to occur within the Project area by the CDFW Model (Figure 1). However, the desktop review of aerial imagery and habitat classifications determined that the area of modeled nesting habitat within the Project area does not meet the minimum criteria for suitability, which was confirmed during the field assessment. The modeled habitat within the Project area includes one very small area (0.9 acre) of nesting habitat consisting of a few scattered residual trees intermixed within early-seral conifers and open meadow. Based on a review of aerial imagery and visual inspection of the modeled nesting habitat from the edge of the meadow, relative to surrounding forest age classes, the nesting habitat did not appear to meet the CDFW (CDFW 2011) or NWFP (Huff and Godwin 2016) criteria for consideration as great gray owl nesting habitat. The associated foraging habitat consists of 15 acres of modeled habitat within a larger approximately 82-acre meadow/pasture that appears to be used for cattle grazing and some hay production. No other areas of potentially suitable nesting or foraging habitat were identified in the Project area during the desktop review.

Based on the desktop review and field assessment, the CDFW modeled habitat does not meet the criteria of suitable great gray owl nesting habitat and no other areas of potentially suitable habitat were identified in the Project area. Additionally, even though the modeled nesting habitat does not meet the criteria of suitable great gray owl nesting habitat, because it is located on an inholding within the larger Project area Project construction and operations will have no impacts on the modeled habitat. Given the lack of suitable great gray owl habitat within the Project area, species-specific field surveys for great gray owl are not warranted in support of the Project.

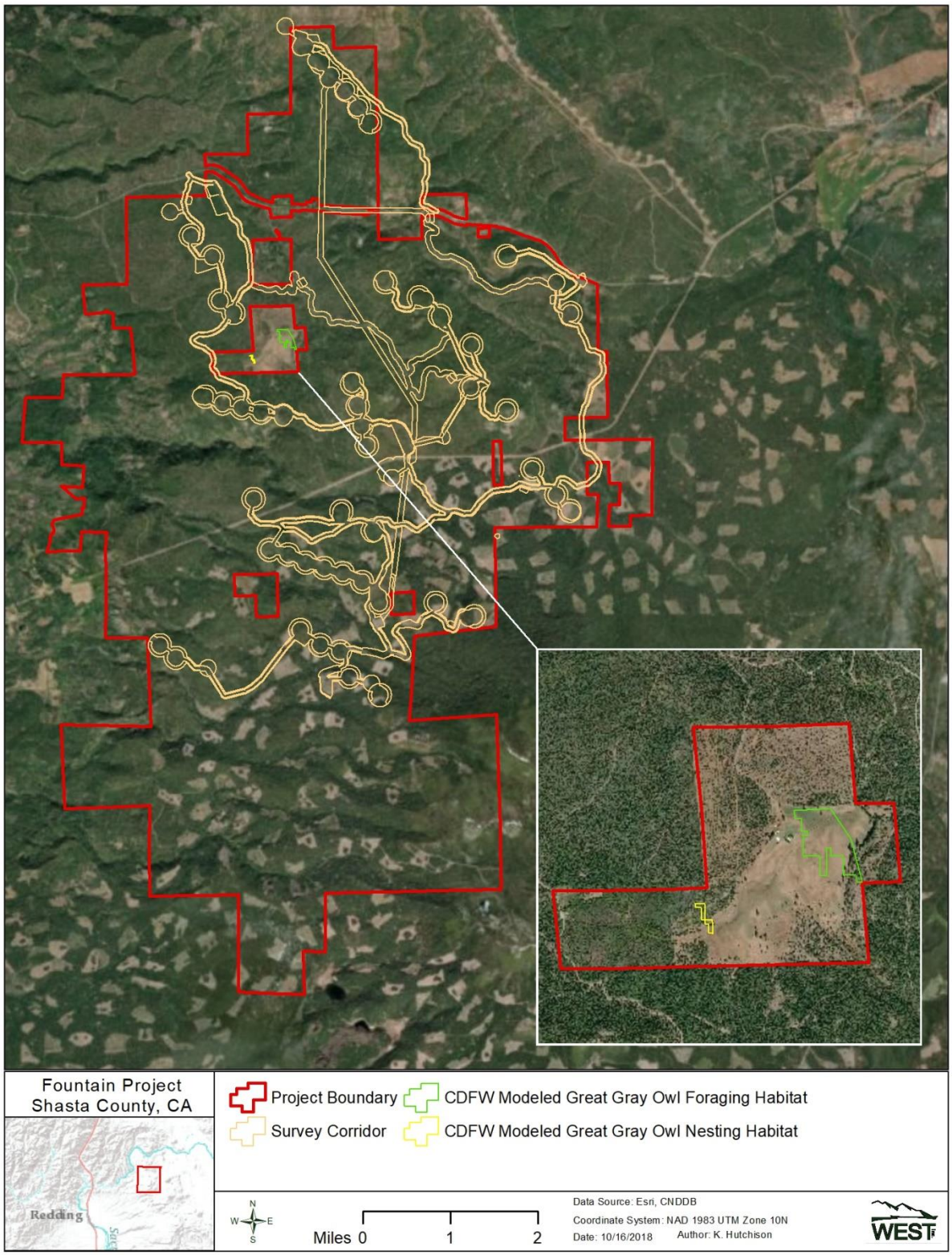

Figure 1. Areas of modeled nesting and foraging habitat identified by the CDFW Great Gray Habitat Model within the Fountain Wind Project, Shasta County, California.

LITERATURE CITED

CALVEG. 2004. ESRI personal geodatabase. McClellan, CA: USDA-Forest Service, Pacific Southwest Region. EvegTile03B_99_04_v2.

California Department of Fish and Wildlife (CDFW). 2014. California Interagency Wildlife Task Group. CWHR version 9.0 personal computer program. Sacramento, CA. Available at: https://www.wildlife.ca.gov/Data/CWHR/Wildlife-Habitats. Accessed 15 April, 2018.

California Department of Fish and Wildlife (CDFW). 2011. Great Gray Owl Habitat Model – Northern California CWHR version 9.0 (DS0280_20110128) personal computer program. Sacramento, CA. Available at: https://map.dfg.ca.gov/metadata/sec/ds0280.html?5.66.18

California Department of Fish and Wildlife (CDFW). 2018. Special Animals List. Natural Diversity Database. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline. Periodic Publication. Accessed April 15, 2018.

Huff, R.; Godwin, S. 2016. Survey protocol for great gray owl (Strix nebulosi) within the range of the Northwest Forest Plan, Version 4.0. Portland, OR. U.S. Department of the Interior, Bureau of Land Management, Oregon, and U.S. Department of Agriculture, Forest Service Regions 5 and 6. 42p.

Institute for Bird Populations (IBP). October 2015. Great gray owl research and conservation in California. Available at: https://www.birdpop.org/pages/greatGrayOwlResearch.php. Accessed October 15, 2018.

C9. Bat Acoustic Survey Report

BAT ACOUSTIC SURVEY REPORT

Fountain Wind Project
Shasta County, CA

Prepared for:

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October 22, 2018

Pre-Decisional Document - Privileged and Confidential - Not for Distribution

EXECUTIVE SUMMARY

In April 2017, Western Ecosystems Technology, Inc. (WEST) initiated bat acoustic surveys at the proposed Fountain Wind Project (Project) in Shasta County, California. WEST designed bat acoustic surveys to evaluate levels of bat activity and species' use of the Project during periods of expected peak activity (i.e., spring through fall). To address the two key study questions posed in the California Wind Energy Guidelines and assess the potential risk the Project may pose to bats, WEST conducted bat acoustic surveys to: 1) determine the bat species present at the Project during the peak bat activity period of spring through fall, and 2) assess the spatial and temporal patterns of bat activity which may influence the risk of collision for bats at the Project.

Bat acoustic surveys were conducted between 30 April and 13 November 2017 at seven stations representative of potential turbine locations ('representative' sampling stations) and at one station with feature(s) thought to be attractive to bats ('feature' sampling station) to assess risk to bats from Project development. Wildlife Acoustics Song Meter (SM3) full-spectrum bat detectors were placed at each of two meteorological (met) towers located in cleared montane coniferous forest. At each met tower, one microphone was placed near the ground ('ground' sampling station) at approximately 5.0 feet (ft; 1.5 meters [m]) above ground level (AGL) and a second microphone was elevated ('raised' sampling station) to approximately 148 ft (45 m) AGL. Raised sampling stations were placed to sample bat activity within the potential rotor-swept zone of commercial wind turbines. In total, there were four representative stations located at the two met towers; two raised stations and two ground stations. Three additional representative ground stations were added to increase spatial coverage at the Project. The one feature station was placed near ground level in a riparian meadow considered attractive to bats to provide an upper reference of bat activity at the Project.

Bat activity was monitored at eight sampling stations for a total of 1,301 detector-nights between 30 April and 13 November 2017. Overall, sampling stations recorded 96,107 bat passes for a mean of 68.18 bat passes per detector-night. Overall mean bat activity levels varied among representative sampling stations, ranging from 25.60 - 87.94 bat passes per detector-night. Ground representative sampling stations averaged 50.25 bat passes per detector-night, whereas raised representative sampling stations, which collected data on bat activity in the rotor-swept zone, averaged 26.07 bat passes per detector-night; roughly half the level of activity recorded at ground stations. The single feature station recorded 49,541 bat passes on 190 detector-nights for a mean of 260.74 bat passes per detector-night; however, the mean activity rate at the single feature station is not representative of activity levels at future turbine locations and should be considered an upper reference for activity in the Project area.

Overall bat activity at all representative sampling stations was greater in summer (45.73 bat passes per detector-night) than in spring (26.98) and fall (41.88), which was consistent with the pattern observed for the high-frequency species group, consisting of mostly smaller species (e.g., Myotis). In contrast, the activity rate of the larger low-frequency (LF) species (e.g., hoary

bat, silver-haired bat, Mexican free-tailed bat) was greater in fall (28.70 bat passes per detector-night) than in spring (20.52) and summer (25.01), with the late summer and early fall (i.e., the fall migration period) having the highest level of LF bat activity (35.83). Bat activity at ground representative sampling stations was higher than at raised representative sampling stations throughout the study period, except in late August to early September and mid to late October, when activity at raised representative sampling stations exceeded activity rates at ground stations.

Fourteen bat species, none of which were unexpected, were documented from acoustic survey data collected within the Project area, including two California species of special concern (SSC): spotted bat, and western mastiff bat. Three species (Townsend's big-eared bat, pallid bat, and western red bat) were identified prior to field studies as having potential to occur, but were not documented from the acoustic survey data. Silver-haired bat and hoary bat were the most commonly recorded species, present on 76% and 75% of operational detector-nights, respectively. Mexican free-tailed bat was the third most frequently identified species, present on 70% of detector-nights. Other commonly detected species included big brown bat (64% of detector nights), and California bat (54%).

Consistent with the California Wind Energy Guidelines' two key study questions: 1) "*which species of bats use the project area and how do their numbers vary throughout the year?"* and 2) "*how much time do these species spend in the risk zone (i.e., rotor-swept area) and does this vary by season*?" WEST conducted bat acoustic surveys to determine the bat species present at the Project and assess the spatial and temporal patterns of bat activity which may influence the risk of collision for bats at the Project. Silver-haired bat, hoary bat, Mexican free-tailed bat, big brown bat, and California bat were the most commonly detected species (documented on more than 50% of operational detector nights), while the two California SSC (spotted bat and western mastiff bat) were documented rarely (seven passes total on three separate nights) during the study period. Hoary bats, silver-haired bats, and Mexican free tailed bats all belong to the LF species group and are among the most commonly documented bat fatalities at wind energy facilities where these species occur.

While activity rates of LF species at paired sample sites (i.e., having both ground and raised stations) were 10-53% greater at ground stations in the spring and summer, activity rates of LF species in the fall were more mixed, with 7% greater activity at the ground station at one paired site and 20% lower activity at the ground station at the other paired site. While the data are not definitive, the temporal pattern of use at raised versus ground stations suggests that LF bats may spend more time at greater heights (and potentially within the rotor-swept zone) during the fall than during spring and summer. Furthermore, while data indicate that LF bats are active at all sampled heights, they clearly represent the majority of bat activity recorded within the rotor-swept zone, accounting for 96% of bat passes recorded at raised sampling stations.

It has been generally presumed that pre-construction bat activity rates are positively related to post-construction bat fatalities; however, to date, the relationship between pre-construction activity rates and post-construction fatality rates has not been established. At European wind

energy facilities, risk of collision was higher for bat species that fly at greater heights, and in Canada, a significant positive association was found between pass rates measured at 98 ft (30 m) AGL and fatality rates for hoary and silver-haired bats across five sites in southern Alberta; however, on a continental scale, a similar relationship has not been established. A recent meta-analysis of commercial wind projects in Maine showed no relationship between pre-construction bat activity and post-construction bat fatality rates. Other studies that have estimated both pre-construction activity and post-construction fatalities show results that trend toward a positive association between activity and fatality rates, but lack statistically significant correlations, resulting in the inability to use pre-construction acoustic data to predict post-construction bat fatalities. While researchers continue to investigate the potential utility of pre-construction acoustics in predicting post-construction fatalities, the current science remains consistent with that depicted in the California Wind Energy Guidelines, which state that passive acoustic surveys can provide pre-permitting information useful in establishing baseline patterns of seasonal bat activity, but that a fundamental gap exists regarding links between pre-permitting assessments and operations fatalities.

In other parts of the western US where wind energy facilities are clustered, bat fatality rates have generally been consistent among neighboring facilities; therefore, to evaluate the potential for bat fatalities at the Project, fatality rates documented at nearby facilities were examined to determine if patterns were evident. The only wind energy facility in the western US with publicly available post-construction fatality data and habitat similar to the Project is the Hatchet Ridge facility, located less than two mi (3.2 km) northeast of the Project. The Hatchet Ridge facility is very similar to the Project in terms of geography, topography and habitat, and is in close proximity; therefore, it is likely that bat fatality rates documented at the Hatchet Ridge facility are among the best indicators of potential risk at the Project. Bat fatality rates at the Hatchet Ridge facility were estimated to be 2.23, 5.22, and 4.20 bats/MW/year in the first, second, and third years of operation, respectively. Documented fatalities at the Hatchet Ridge facility were highest from July – September and primarily comprised hoary bats, silver-haired bats, and Mexican free-tailed bats, similar to patterns of bat fatalities throughout the US. The species found as fatalities at the Hatchet Ridge facility are consistent with the species most commonly detected in bat acoustic surveys conducted for the Project, and the timing of the peak fatality rate at the Hatchet Ridge facility aligns with peak bat activity rates documented at the Project.

Given that the species composition and temporal patterns of bat activity documented at the Project align with the results of fatality studies conducted at the nearby Hatchet Ridge facility; pre-construction bat acoustic data suggest that bat fatality patterns at the Project would likely be similar to those documented at the Hatchet Ridge facility. Based on the available data, fatality rates are anticipated to be similar to those documented at the Hatchet Ridge facility (2.23 – 5.22 bats/MW/year) and primarily consist of fatalities of hoary bats, silver-haired bats, and Mexican free-tailed bats during the late summer and fall migration period.

STUDY PARTICIPANTS

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REPORT REFERENCE

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INTRODUCTION

Pacific Wind Development LLC (Pacific Wind) is considering development of a wind energy facility in Shasta County, California, referred to as the Fountain Wind Project (Project). Pacific Wind contracted Western EcoSystems Technology, Inc. (WEST) to complete a study of bat activity based on recommendations in the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines* (USFWS 2012a), the *California Guidelines for Reducing Impacts to Birds and Bats from Wind Development* (California Energy Commission [CEC] and California Department of Fish and Game [CDFG] 2007), and Kunz et al. (2007a). The initial study plan was modified based on consultation with the USFWS and the California Department of Fish and Wildlife (CDFW), which occurred 15 June 2017. The CEC Guidelines (CEC and CDFG 2007) identify two key study questions that need to be addressed in order to assess risk to bats: 1) "*which species of bats use the project area and how do their numbers vary throughout the yea?"* and 2) *how much time do these species spend in the risk zone (i.e., rotor-swept area) and does this vary by season?".* To address these two key study questions and assess the potential risk the Project may pose to bats, WEST conducted bat acoustic surveys to: 1) determine the bat species present at the Project during the peak bat activity period of spring through fall, and 2) assess the spatial and temporal patterns of bat activity which may influence the risk of collision for bats at the Project. This report describes the bat acoustic surveys conducted at the Project in 2017, summarizes the results, and provides a qualitative risk assessment for the Project based on regional patterns in bat activity and fatalities.

STUDY AREA

The Project area currently encompasses approximately 32,000 acres (ac; 12,950 hectares [ha]) within Shasta County in northern California west of the community of Burney and northeast of the larger community of Redding (Figure 1). The east-west running California State Route 299 bisects the northern portion of the Project area, and the Hatchet Ridge Wind Energy Facility (Hatchet Ridge), in operation since 2010, is located approximately 1.48 miles (mi; 2.38 kilometers [km]) northeast of the Project. The Lassen National Forest is located to the southeast of the Project and the Shasta-Trinity National Forest is located to the north and east.

The Project area is entirely privately owned and actively managed for timber production, with recent and ongoing timber harvest operations occurring primarily within the southern half of the Project area. A large portion of the Project is early seral forest resulting from the Fountain Fire, which burned approximately 64,000 ac (24,900 ha) in 1992, including the north-central half of the Project area. Post-fire management included salvage logging, site preparation, and planting of conifer seedlings in the year following the fire to enhance forest regeneration for future timber harvesting.

The vegetation communities within the Project area are predominantly coniferous forest (54.7%) and harvested areas classified as shrub/scrub (38.3%; Figure 2, Table 1). The shrub/scrub classification is primarily the result of a temporary change in vegetation in recently harvested

coniferous forests that persists until the replanted conifer trees become established and reclaim dominance in the site. These shrub/scrub areas may also be actively treated with herbicides to enhance conifer seedling establishment. Small areas of mixed montane chaparral and herbaceous vegetation (i.e., grassland) are scattered throughout the Project area (Figure 2, Table 1). Wetlands are present within the Project area, occurring primarily as riverine habitats, with much smaller areas of wet montane meadow and open water (Figure 2, Table 1). Cliffs and rocky outcrops are present in addition to several bridges, culverts, and other manufactured structures that offer habitat for bats. While some of the cover types should remain relatively consistent over time, the spatial distribution and amount of coniferous forest and shrub/scrub cover types within the Project area are likely to change substantially over time due to ongoing timber management activities.

Table 1. Land cover types within the Fountain Wind Project area according to National Land Cover Data (US Geological Survey [USGS] National Land Cover Database [NLCD] 2011, Homer et al. 2015).

Land Cover	Acres	% Composition
Coniferous Forest	17,786.16	54.7
Shrub/Scrub	12,430.51	38.3
Herbaceous	1,516.25	4.7
Deciduous Forest	344.15	1.1
Barren Land	205.18	0.6
Mixed Forest	95.09	0.3
Developed, Open Space	74.90	0.2
Emergent Herbaceous Wetlands	21.26	0.1
Developed, Low Intensity	8.13	<0.01
Cultivated Crops	5.71	<0.01
Total	**32,487.34**	**100**

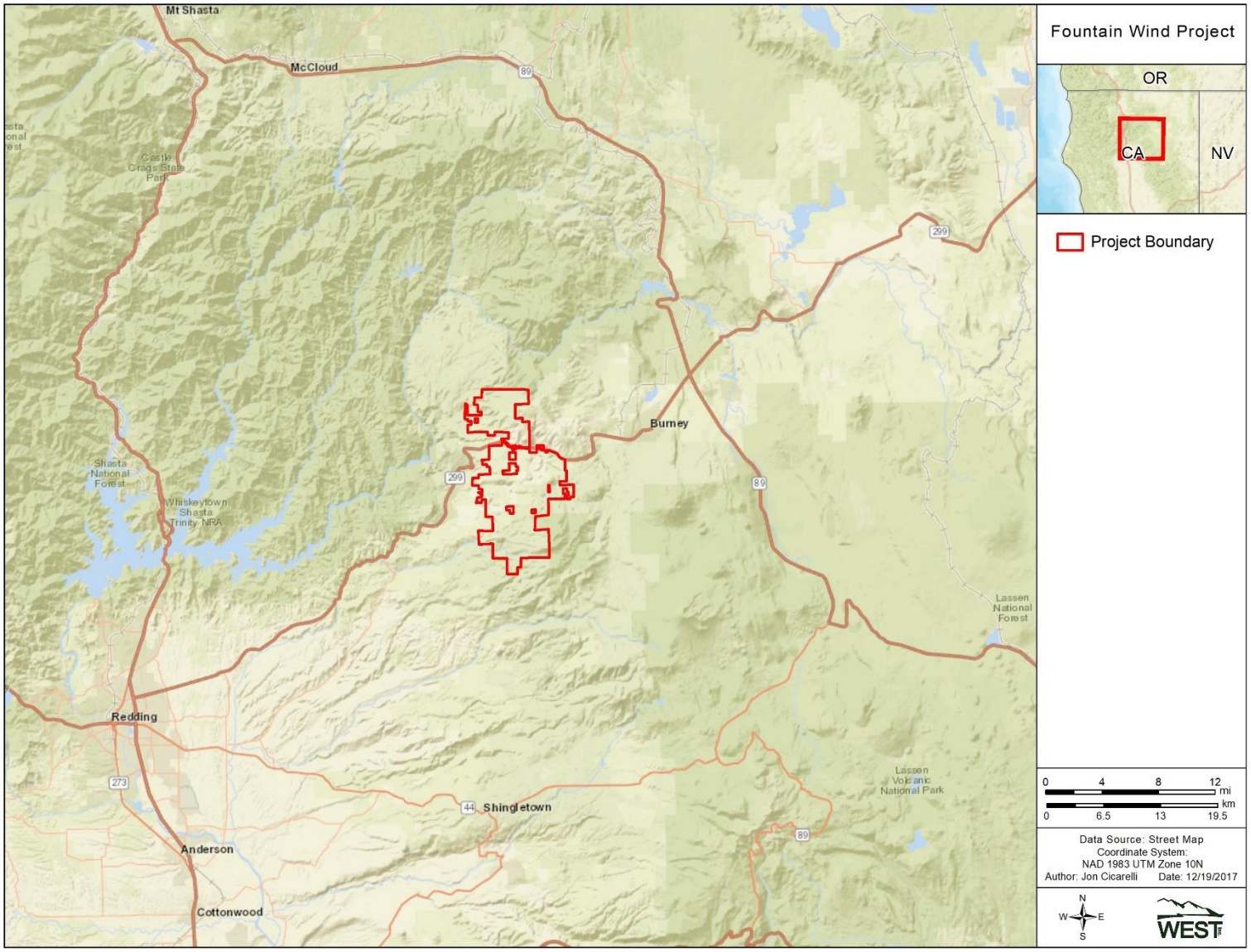

Figure 1. Location of the proposed Fountain Wind Project, Shasta County, California.

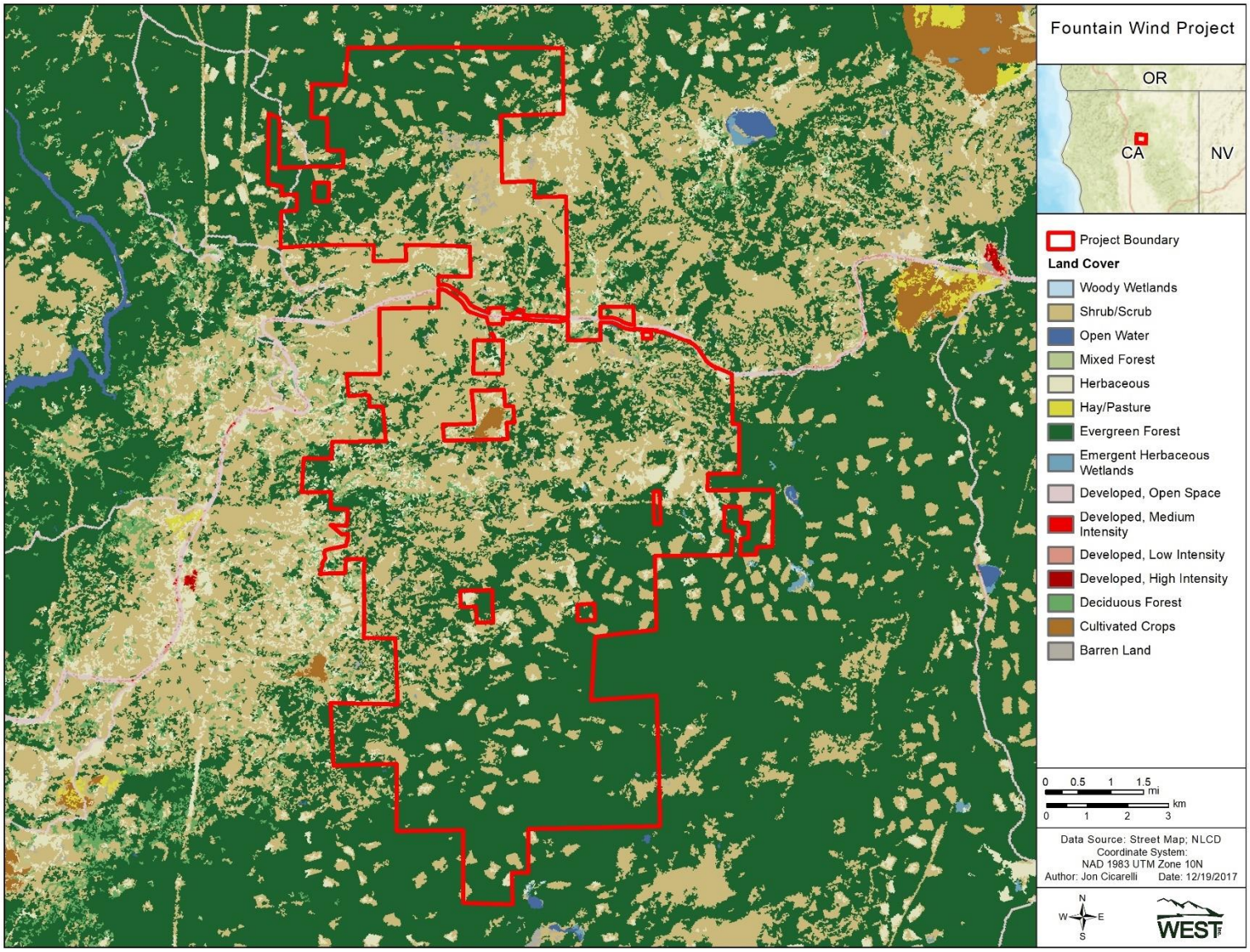

Figure 2. Land cover types within the proposed Fountain Wind Project (US Geological Survey [USGS] National Land Cover Database [NLCD] 2011, Homer et al. 2015).

Overview of Bat Diversity

Seventeen species of bats potentially occur at the Project (Table 2, International Union for Conservation of Nature [IUCN] 2016), none of which are federally protected. Eleven of the potentially occurring bat species have been documented as fatalities at wind energy facilities and five are considered Species of Special Concern (SSC) by the CDFW (Table 2).

Table 2. Bat species with the potential to occur within the Fountain Wind Project area categorized by echolocation call frequency.

Common Name	Scientific Name
High-Frequency (> 30 kilohertz [kHz])	
California bat	*Myotis californicus*
canyon bat[1, 4]	*Parastrellus hesperus*
little brown bat[1]	*Myotis lucifugus*
long-legged bat[1]	*Myotis volans*
western long-eared bat[1]	*Myotis evotis*
western red bat[1,2]	*Lasiurus blossevillii*
western small-footed bat [3]	*Myotis ciliolabrum*
Yuma bat	*Myotis yumanensis*
Low-Frequency (15 – 30 kHz)	
big brown bat[1]	*Eptesicus fuscus*
fringed bat	*Myotis thysanodes*
hoary bat[1]	*Lasiurus cinereus*
Mexican free-tailed bat[1]	*Tadarida brasiliensis*
pallid bat[3]	*Antrozous pallidus*
silver-haired bat[1]	*Lasionycteris noctivagans*
Townsend's big-eared bat[2]	*Corynorhinus townsendii*
Very Low-Frequency (< 15 kHz)	
spotted bat[2]	*Euderma maculatum*
western mastiff bat[2]	*Eumops perotis*

[1] Species known to have been killed at wind energy facilities (species reported by: Anderson et al. 2004, Kunz et al. 2007b, Baerwald 2008, Miller 2008, Arnett and Baerwald 2013, Barclay et al. 2017, AWWI 2018);
[2] California Species of Special Concern (CDFW 2018);
[3] Species not known to occur within the Project based on IUCN 2016 or BCI 2018 range maps but included in review due to proximity to known range and habitat suitability within the Project.

METHODS

Bat Acoustic Surveys

Sampling Stations

Bat activity levels and composition can vary with height above ground level (AGL; Baerwald and Barclay 2009, Collins and Jones 2009, Müeller et al. 2013), and high-flying bat species are at greater risk of collision with turbines (Roemer et al. 2017). Therefore, it is useful to monitor activity at different heights (Kunz et al. 2007b). Because most bat species spend at least some time flying at low flight heights, microphones near the ground may detect a more complete sample of the bat species present within a given area; however, elevated microphones may provide a more accurate assessment of bat species flying at rotor-swept heights (Kunz et al. 2007b, Müeller et al. 2013; but see Amorim et al. 2012).

Six Song Meter (SM3) full-spectrum ultrasonic bat detectors (Wildlife Acoustics, Inc., Concord, Massachusetts) were used to record bat echolocation and social calls during the study. Each SM3 detector is equipped with two microphone ports; each operational microphone was considered a sampling station. Biologists placed a single SM3 detector at each of two meteorological (met) towers, with one sampling station placed near the ground (g), and a second sampling station raised (r) to approximately 148 ft (45 m) AGL. Sampling stations are named by project, order of deployment, and type (e.g., MF1g = McCloud-Fountain, first-deployed, ground sampling station). Met towers are considered representative of future turbine locations; detectors at met towers comprise 'representative sampling stations'. Raised representative sampling stations monitored bat activity near the proposed rotor-swept zone.

During initiation of the bat acoustic surveys, WEST placed two additional detectors at other locations within the Project area. One detector was deployed in an area representative of future turbine locations (i.e., a forest opening); another detector was deployed in an area with features possibly attractive to bats (i.e., a riparian meadow), but not representative of future turbine locations. Data collected by the bat detector deployed near a habitat feature possibly attractive to bats served to provide an upper reference for bat activity at the Project and to increase the likelihood of detecting all species that may be present within the Project area. The detector at the bat habitat feature is considered a 'feature sampling station' while the detector placed in the forest opening is a representative sampling station; both additional detectors comprised ground sampling stations only. Finally, following the 15 June meeting with CDFW and USFWS, two additional ground sampling stations were added in areas representative of future turbine locations to increase the spatial coverage of the Project area.

Microphones at all ground sampling stations were elevated slightly on 5-ft (1.5-m) masts to enhance the quality of sound recordings (e.g., to reduce recordings of insect calls) for improved species identification. Microphones at raised sampling stations were positioned on met towers using pulley systems and oriented at 75 degrees relative to the ground to maximize the amount of air space sampled. Large weatherproof boxes housed the SM3 units and external deep-cycle batteries for protection from weather and wildlife.

Survey Schedule

Acoustic monitoring surveys were conducted at the Project from 30 April to 13 November 2017. Detectors were programmed to turn on approximately 30 minutes (min) before sunset and turn off approximately 30 min after sunrise each day. To highlight seasonal activity patterns, the study was divided into three survey periods: spring (30 April – 31 May), summer (1 June – 14 August), and fall (15 August – 13 November).

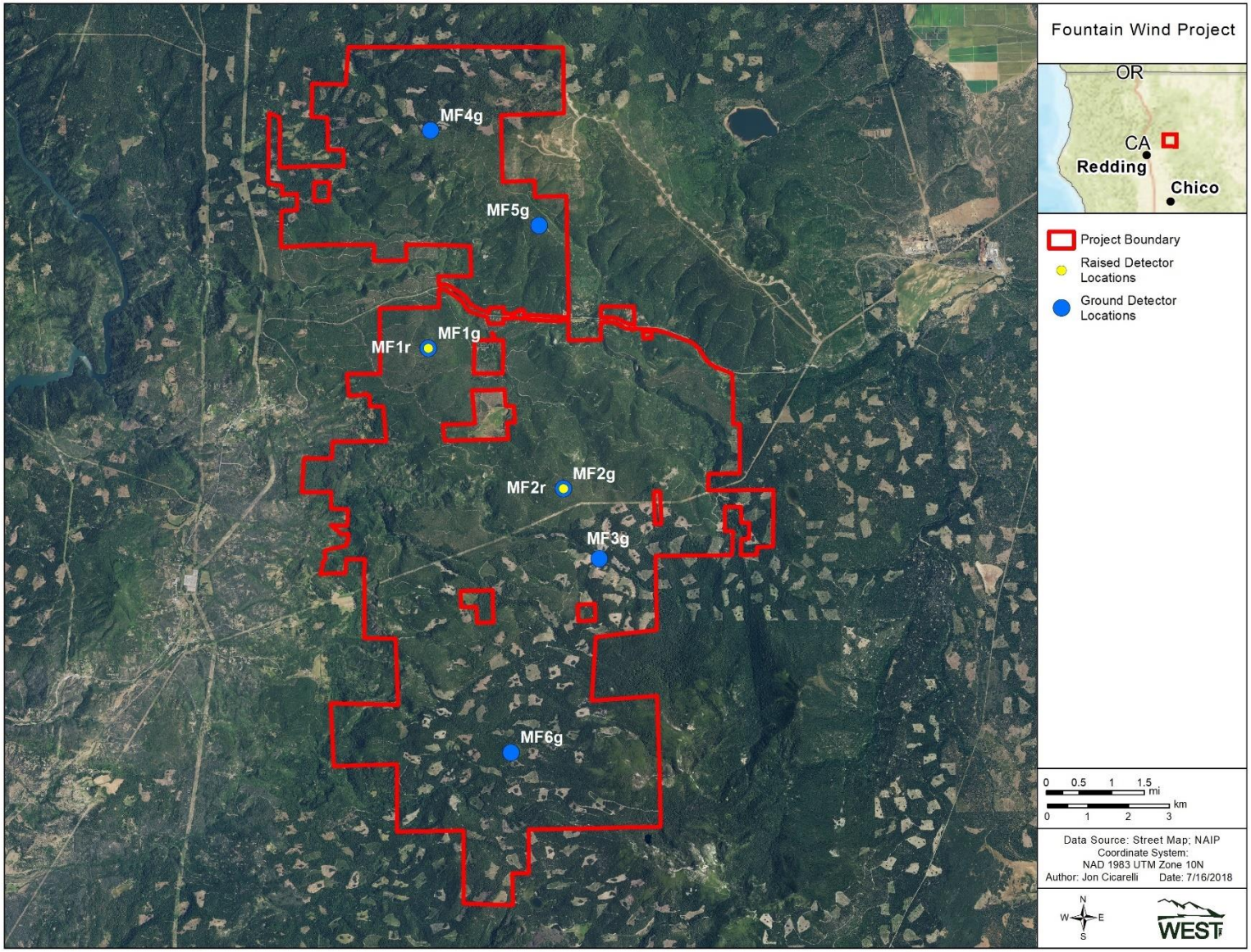

Figure 3. Location of sampling stations used during the bat acoustic surveys at the proposed Fountain Wind Project.

Data Collection and Call Analysis

The Song Meter SM3 is a highly reliable full-spectrum bat detector that records complete acoustic waveforms by sampling sound waves at 192 kilohertz (kHz). The high sampling rate enables the detector to record sound amplitude data at all frequencies up to 96 kHz and to make high resolution recordings. The high-quality recordings produced by the SM3 detector provide more information for making accurate species identifications at the cost of higher data storage requirements. SM3 detectors use an omnidirectional microphone to detect and record bat echolocation calls that are stored as files on Secure Digital (SD) cards.

All recorded files were converted from full-spectrum to zero-cross (division ratio 8) using the software program Kaleidoscope Pro (version 4.2.0; Wildlife Acoustics, Concord, Massachusetts). Noise files (i.e., files typically produced by wind or insects) were automatically filtered by Kaleidoscope into a Noise subfolder and not reviewed or included in results. All remaining ultrasonic files were viewed by a biologist as digital sonograms that show changes in echolocation call frequency over time in the bat call analysis software Analook©. Frequency versus time displays were used to separate bat calls from other types of ultrasonic noise (e.g., wind, insects) to determine the call frequency category, and when possible, identify the species of bat that generated the call.

For each sampling station, bat passes were grouped into three categories based on minimum frequency to aid in data sorting and because some species cannot be individually discerned through acoustic analysis. High-frequency (HF) bats such as *Myotis* species have minimum frequencies greater than 30 kHz. Low-frequency (LF) bats, such as big brown bat (*Eptesicus fuscus*), Mexican free-tailed bat (*Tadarida brasiliensis*), silver-haired bat (*Lasionycteris noctivagans*) and hoary bat (*Lasiurus cinereus*) typically emit echolocation calls with minimum frequencies between 15 and 30 kHz. Very low-frequency (VLF) bats, such as the western mastiff bat (*Eumops perotis*) and spotted bat (*Euderma maculatum*), have minimum echolocation frequencies below 15 kHz. Table 2 lists HF, LF, and VLF species that may occur in the Project area.

Files labeled as HF, LF, or VLF were then run through Kaleidoscope Pro again using the Bats of North America classifier (version 4.2.0) on the neutral (zero) setting to further define calls with sufficient call data (e.g., multiple pulses) to the species level, selecting for the 17 bat species that potentially occur in the Project area (Table 2). A qualified bat biologist reviewed all calls identified by Kaleidoscope Pro as spotted bat, western mastiff bat, pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii)*, and western red bat (*Lasiurus blossevillii*) to verify species-level identification because these five species are all listed as SSC. A qualified bat biologist also reviewed passes identified by Kaleidoscope Pro as western small-footed bat (*Myotis ciliolabrum*) or canyon bat (*Parastrellus hesperus*) until species presence was confirmed or all calls were reviewed, as the Project area includes potentially suitable habitat but is just outside the known range for these species. Calls of the remaining species, which have ranges that overlap with the Project area and are not considered SSC, were not reviewed by a bat biologist but assumed present based on the classification by Kaleidoscope Pro.

Statistical Analysis

The standard metric used for measuring bat activity, the number of bat passes per detector-night, was used as an index of bat activity at the Project. A bat pass was defined as a sequence of at least two echolocation calls (pulses) produced by an individual bat with no pause between calls of more than one second (Fenton 1980, White and Gehrt 2001, Gannon et al. 2003). A detector-night was defined as one sampling station (i.e., detector) operating for one entire night. The terms bat pass and bat call are used interchangeably in this report. Bat passes per detector-night were calculated for all bats, and for HF, LF, and VLF bats. Bat pass rates represent indices of bat activity and do not represent numbers of individuals.

Mean bat activity was calculated by sampling station, season, fall migration period (FMP), and overall (overall averages were calculated as unweighted averages of total activity at each individual detector station). The FMP, defined here as 30 July – 14 October 2017 is a known period of increased landscape-scale movement and reproductive behavior that occurs in late summer and early fall (Cryan 2008), and is often associated with increased levels of bat fatalities at operational wind energy facilities (Arnett et al. 2008, Arnett and Baerwald 2013). The defined FMP may vary among projects across the county, as the FMP may differ depending on latitude or regional climate patterns.

Using detector-nights as a metric for calculating bat activity controls for differences in sampling effort among individual sampling stations and provides unbiased estimates for the nights that were surveyed. The period of peak sustained bat activity was defined as the 7-day period with the highest average bat activity. If multiple 7-day periods equaled the peak sustained bat activity rate, all dates in these 7-day periods were reported. This and all multi-station averages reported here were calculated as unweighted averages of total activity at each sampling station.

Risk Assessment

Collision with wind turbine blades is the primary risk to bats at operating wind energy facilities (Arnett et al. 2008). The intent of the risk assessment is to use pre-construction bat activity data and other relevant information to describe the potential for bat fatalities at the Project. The intent of the risk assessment is not to predict the number of fatalities, but rather provide context for data collected at the Project. To assess the potential risk to bats, bat activity in the Project area was compared to existing publicly available pre- and post-construction data from other wind energy facilities in the California, Southwestern, and Pacific Northwest regions.

Forecasting collision risk for bats at the Project is challenging for several reasons. First, there are relatively few publicly available studies presenting both pre-construction bat activity and post-construction fatality data, and the ecological differences among geographically dispersed facilities could limit the strength of inference. Further, as explained in detail below, there is no clear correlation between pre-construction bat activity and post-construction fatality data. Second, among studies with both pre-construction bat activity and post-construction fatality data, most pre-construction data were collected during the fall (i.e., the period of greatest risk) using Anabat™ zero-cross detectors (Titley Scientific™, Columbia, Missouri) placed near the

ground. In contrast, this study used SM3 full-spectrum detectors near the ground and elevated near the rotor-swept area. Finally, the primary limitation of conducting a qualitative risk assessment for the Project is the difference in data collected by Anabat (used at most other projects) and SM3 detectors (used at the Project). Full-spectrum detectors, such as the SM3 units used at the Project, may record more bat passes per detector-night on average than the Anabat (zero-cross) units used for data collection at the majority of wind farms. Full-spectrum detectors have more sensitive microphones that sample more airspace, as well as different data processing algorithms (Solick et al. 2011, Adams et al. 2012), which may combine to result in higher activity rates than those measured by Anabat detectors. For this reason, activity levels recorded by SM3 detectors are not directly comparable to activity levels recorded by Anabat detectors, though trends in spatial and temporal activity rates collected by Anabat detectors can serve to contextualize trends in data collected using SM3 detectors. Differences in data collection technology (i.e., full-spectrum versus zero-cross detectors), and the resultant possibility that use of SM3 detectors rather than Anabat units at the Project led to increased collection of bat acoustic data should be considered. Inclusion of Anabat data in this report is for general discussion purposes only.

It has been generally presumed that pre-construction bat activity rates are positively related to post-construction bat fatalities (Kunz et al. 2007b). However, to date, the relationship between pre-construction activity rates and post-construction fatality rates has not been definitively established. At European wind energy facilities, Roemer et al. (2017) determined risk of collision was higher for bat species that fly at greater heights. In Canada, Baerwald and Barclay (2009) found a significant positive association between pass rates measured at 98 ft (30 m) AGL and fatality rates for hoary and silver-haired bats across five sites in southern Alberta; however, on a continental scale, a similar relationship has not been established. A recent meta-analysis of commercial wind projects in Maine showed no relationship between pre-construction bat activity and post-construction bat fatality rates (Peterson 2017). Hein et al. (2013) analyzed studies at 12 wind projects that included both pre- and post-construction data to assess if pre-construction acoustic activity predicted post-construction fatality rates. Based on data from the 12 projects, the authors did not find a statistically significant relationship ($p=0.07$) between pre-construction activity and post-construction mortality; and although the results suggested a positive relationship only a small portion of the variation in fatalities was explained by the pre-construction activity (adj. $R^2= 21.8\%$; Hein et al. 2013). Hein et al. (2013) went on to conclude that the analysis results indicated the inability to use pre-construction acoustic data to predict post-construction bat fatalities. While researchers continue to investigate the potential utility of pre-construction acoustics in predicting post-construction fatalities, the current science remains consistent with that depicted in the CEC Guidelines, which state that passive acoustic surveys can provide pre-permitting information useful in establishing baseline patterns of seasonal bat activity, but that a fundamental gap exists regarding links between pre-permitting assessments and operations fatalities (CEC and CDFW 2007).

RESULTS

Bat Acoustic Surveys

Bat activity was monitored at eight sampling stations for a total of 1,301 detector-nights between 30 April and 13 November 2017; sampling stations were operational 95.4% of the study period. All sampling stations, with the exception of MF4g, occasionally failed to collect data due to wildlife interference with equipment (e.g., small mammals chewing cables, bears disturbing detectors). Overall, sampling stations recorded 96,107 bat passes for a mean (± standard error) of 68.18 ± 4.08 bat passes per detector-night (Table 3).

Spatial Variation

Overall bat activity varied among representative sampling stations (Table 3), ranging from a mean of (± standard error) 25.60 ± 2.64 bat passes per detector-night at sampling station MF2r, to 87.94 ± 5.32 bat passes per detector-night at sampling station MF4g (Table 3, Figure 4). Ground representative sampling stations recorded 36,582 bat passes on 728 detector-nights for a mean of 50.25 ± 4.33 bat passes per detector-night (Table 3; Figure 4a). In contrast, raised representative sampling stations, which collected data on bat activity in the rotor-swept zone, recorded 9,984 bat passes on 383 detector-nights for a mean of 26.07 ± 2.76 bat passes per detector-night; roughly half the level of activity recorded at ground stations (Table 3).

The single feature sampling station recorded 49,541 bat passes on 190 detector-nights for a mean of 260.74 ± 18.75 bat passes per detector-night (Table 3). The mean activity rate at the single feature station is not representative of activity levels at future turbine locations and should be considered an upper reference for bat activity in the Project area.

Table 3. Results of bat acoustic surveys by sampling station in the Fountain Wind Project area from 30 April – 13 November 2017. Passes are separated by call frequency: high frequency (HF), low frequency (LF), and very low frequency (VLF).

Sampling Station	Type	Habitat	# of HF Bat Passes	# of LF Bat Passes	# of VLF Bat Passes	Total Bat Passes	Detector-Nights	Mean Bat Passes/Night (± Standard Error)*†
MF1g	Ground representative	Representative of future turbine locations	1,114	5,756	1	6,871	189	36.35 ± 3.32
MF1r	Raised representative		132	4,885	1	5,018	189	26.55 ± 3.18
MF2g	Ground representative	Representative of future turbine locations	2,151	4,324	1	6,476	194	33.38 ± 3.31
MF2r	Raised representative		284	4,681	1	4,966	194	25.60 ± 2.64
MF3g	Ground feature	Includes features possibly attractive to bats	23,031	26,508	2**	49,541	190	260.74 ±18.75
MF4g	Ground representative	Representative of future turbine locations	9,913	7,498	1	17,412	198	87.94 ± 5.32
MF5g**	Ground representative	Representative of future turbine locations	2,539	1,719	0	4,258	88	48.39 ± 5.72
MF6g**	Ground representative	Representative of future turbine locations	566	999	0	1,565	59	26.53 ± 3.99
Total: Ground Representative Sampling Stations			16,283	12,798	3	36,582	728	50.25 ± 4.33
Total: Raised Representative Sampling Stations			416	9,566	2	9,984	383	26.07 ± 2.76
Total: Feature Sampling Stations			23,031	26,508	2	49,541	190	260.74 ±18.75
Total			**39,730**	**56,370**	**7**	**96,107**	**1,301**	**68.18 ± 4.08**

*± bootstrapped standard error.
†Sums may not total the values shows due to rounding.
**Sampling stations added 17 August

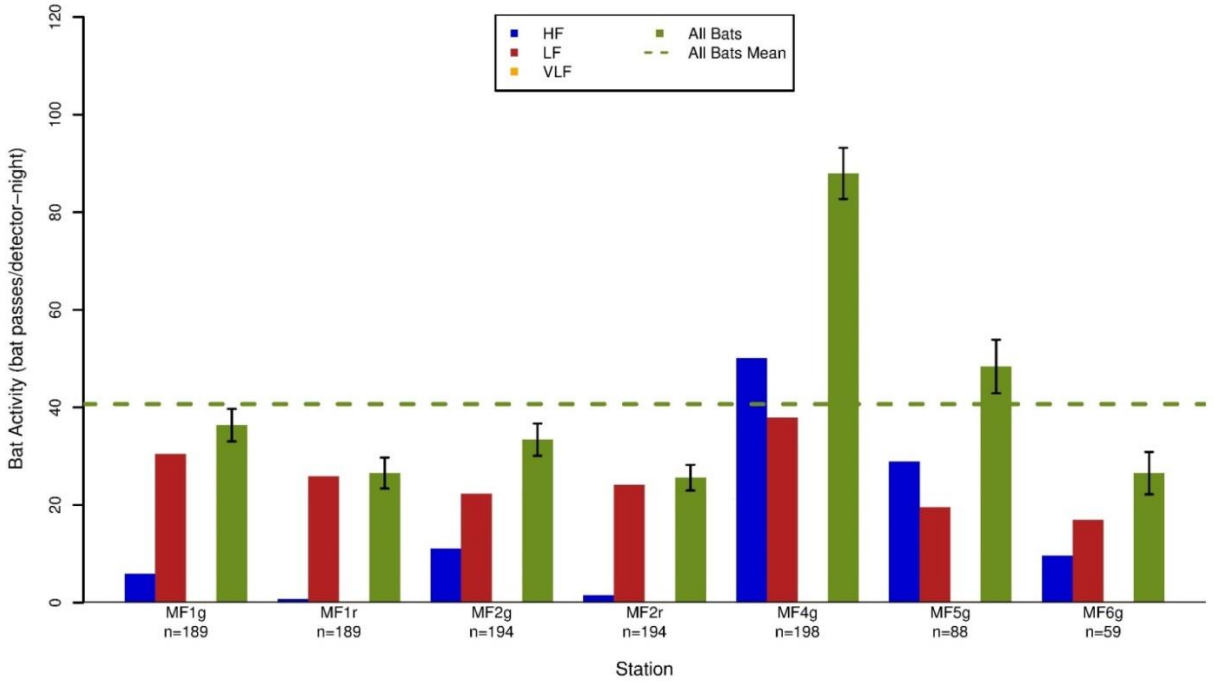

Figure 4. Number of high-frequency (HF), low-frequency (LF), and very low-frequency (VLF) bat passes per detector-night recorded at SM3 representative stations in the Fountain Wind Project area from 30 April – 13 November 2017. The bootstrapped standard errors are represented by the black error bars on the "All Bats" columns. VLF bat passes per detector night were very low at all stations and are thus not discernable here.

Temporal Variation

Overall bat activity at all representative sampling stations was lowest in spring (26.98 ± 3.38 bat passes per detector-night), highest in summer (45.73 ± 2.73), and slightly decreased numerically during fall (41.88 ± 5.37), which was consistent with the pattern observed for the HF species group (Table 4; Figure 5). In contrast, activity rates of LF species were greater in fall (28.70 ± 3.59 bat passes per detector-night) than in spring (20.52 ± 2.66) and summer (25.01 ± 1.52), with activity during the FMP (35.83 ± 2.74), which overlaps late summer and early fall, having the highest levels of LF bat activity (Table 4). The week of peak activity for all bats and HF bats at representative sampling stations was 29 July to 4 August (90.57 and 46.71 bat passes per detector night, respectively), while LF bat activity peaked the week of 3-9 October.

Bat activity at ground representative sampling stations was higher than at raised representative sampling stations throughout the study period, except in late August/early September and mid to late October, when activity at raised representative sampling stations exceeded activity rates at ground stations (Figure 5). Activity by VLF species was documented only in the spring and fall, consisting of a spotted bat pass recorded simultaneously at stations MF1g and MF1r in the spring and western mastiff bat calls detected in mid-October at multiple representative sampling stations (Table 3).

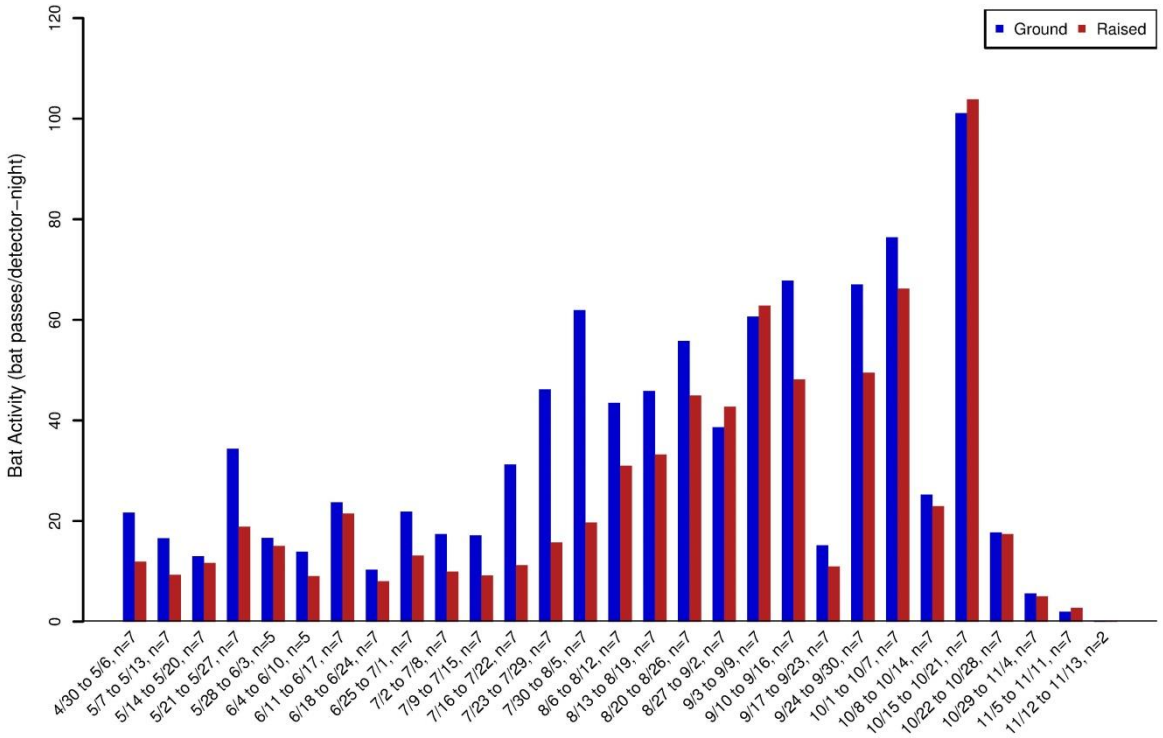

Figure 5. Number of bat passes per detector-night recorded at raised and ground level stations considered representative of future turbine locations in the Fountain Wind Project area from 30 April – 13 November 2017.

Species Composition

Calls of 17 bat species were identified by Kaleidoscope Pro from bat acoustic survey data collected in the Project area, including five California SSC: western red bat, pallid bat, Townsend's big-eared bat, spotted bat, and western mastiff bat (Table 5). However, calls for three (western red bat, Townsend's big-eared bat, and pallid bat) of the five SSC could not be verified upon review by an experienced bat biologist. A bat biologist also reviewed and verified the calls of western small-footed bat and canyon bat during review because the Project is located at the edge of the range of these species. The remaining 10 species were assumed present based on the Kaleidoscope Pro classifications because the calls were numerous and all 10 species were expected based on species ranges and habitats; thus 14 species were documented from acoustic survey data collected within the Project area. Silver-haired bat and hoary bat were the most commonly recorded species, present on 76% and 75% of operational detector-nights, respectively. Mexican free-tailed bat was the third most frequently recorded species, present on 70% of detector-nights. Other commonly detected species included big brown bat (64%), California bat (*Myotis californicus*; 54%), and Yuma bat (*Myotis yumanensis;* 41%). All other species were detected on less than 30% of operational detector-nights (Table 5).

Table 4. Number of bat passes per detector-night recorded at representative sampling stations in the Fountain Wind Project area during each season and during the standardized Fall Migration Period, separated by call frequency: high-frequency (HF), low-frequency (LF), very low-frequency (VLF), and all bats (AB).

Station	Call Frequency	Spring 30 April – 31 May	Summer 1 June – 14 August	Fall 15 August – 13 November	Fall Migration Period 30 July – 14 October
MF1g	VLF	0.04	0	0	0
	LF	22.11	22.23	39.35	44.75
	HF	2.75	6.96	6.04	8.86
	AB	24.89	29.19	45.4	53.61
MF1r	VLF	0.04	0	0	0
	LF	16.39	15.73	36.54	37.51
	LF	0.14	0.09	1.34	0.35
	AB	16.57	15.81	37.88	37.86
MF2g	VLF	0	0	0.01	0
	LF	14.59	18.23	28.16	34.36
	HF	3.22	12.70	12.59	13.47
	AB	17.81	30.93	40.77	47.83
MF2r	VLF	0	0	0.01	0
	LF	9.53	16.58	35.15	40.13
	HF	0.16	0.04	3.03	0.57
	AB	9.69	16.62	38.20	40.70
MF4g	VLF	0.03	0	0	0
	LF	40	52.29	25.23	43.53
	HF	25.91	83.8	30.76	55.88
	AB	65.94	136.09	55.99	99.42
MF5g*	VLF	-	-	0	0
	LF	-	-	19.53	25.59
	HF	-	-	28.85	38.37
	AB	-	-	48.39	63.97
MF6g*	VLF	-	-	0	0
	LF	-	-	16.93	24.97
	HF	-	-	9.59	12.55
	AB	-	-	26.53	37.52
Ground Station Totals	**VLF**	**0.02±0.02**	**0.00±0.00**	**0.00±0.00**	**0.00±0.00**
	LF	**25.57±3.57**	**30.92±1.88**	**25.84±2.89**	**34.64±2.62**
	HF	**10.62±2.06**	**34.49±2.63**	**17.57±2.26**	**25.83±2.44**
	AB	**36.21±4.71**	**65.40±4.06**	**43.41±4.76**	**60.47±4.18**
Raised Station Totals	**VLF**	**0.02±0.02**	**0.00±0.00**	**0.01±0.01**	**0.00±0.00**
	LF	**12.96±2.19**	**16.15±1.37**	**35.85±5.08**	**38.82±3.95**
	HF	**0.15±0.07**	**0.06±0.03**	**2.19±1.39**	**0.46±0.14**
	AB	**13.13±2.21**	**16.22±1.37**	**38.04±6.10**	**39.28±4.00**
Representative Sampling Station Overall	**VLF**	**0.02±0.02**	**0.00±0.00**	**0.00±0.00**	**0.00±0.00**
	LF	**20.52±2.66**	**25.01±1.52**	**28.70±3.59**	**35.83±2.74**
	HF	**6.43±1.42**	**20.72±1.53**	**13.17±2.11**	**18.58±1.97**
	AB	**26.98±3.38**	**45.73±2.73**	**41.88±5.37**	**54.41±3.89**

*Sampling stations added on 17 August

Table 5. The number and percent (in parentheses) of detector-nights that bat species were detected using Kaleidoscope Pro 4.2.0 and verified by a bat biologist at the proposed Fountain Wind Project from 30 April – 13 November 2017.

Common Name	MF1g	MF1r	MF2g	MF2r	MF3g	MF4g	MF5g	MF6g	Total
High-Frequency (> 30 kHz)									
California bat	122 (65)	10 (5)	134 (69)	9 (5)	163 (86)	171 (86)	60 (68)	35 (59)	704 (54)
canyon bat*	22 (12)	5 (3)	27 (14)	0 (0)	54 (28)	104 (53)	12 (14)	3 (5)	227 (17)
little brown bat	20 (11)	3 (2)	44 (23)	2 (1)	134 (71)	107 (54)	7 (8)	9 (15)	326 (25)
long-legged bat	11 (6)	0 (0)	14 (7)	0 (0)	112 (59)	85 (43)	8 (9)	12 (20)	242 (19)
western long-eared bat	16 (8)	0 (0)	76 (39)	0 (0)	118 (62)	114 (58)	31 (35)	19 (32)	374 (29)
western small-footed bat	13 (7)	0 (0)	15 (8)	0 (0)	66 (35)	85 (43)	21 (24)	4 (7)	204 (16)
Yuma bat	78 (41)	6 (3)	82 (42)	9 (5)	140 (74)	141 (71)	48 (55)	30 (51)	534 (41)
Low-Frequency (15 – 30 kHz)									
big brown bat	135 (71)	97 (51)	145 (75)	89 (46)	145 (76)	149 (75)	51 (58)	27 (46)	838 (64)
fringed bat	22 (12)	3 (2)	24 (12)	2 (1)	50 (26)	85 (43)	32 (36)	9 (15)	227 (17)
hoary bat	137 (72)	144 (76)	135 (70)	158 (81)	163 (86)	148 (75)	51 (58)	42 (71)	978 (75)
Mexican free-tailed bat	124 (66)	139 (74)	138 (71)	141 (73)	164 (86)	114 (58)	54 (61)	39 (66)	913 (70)
silver-haired bat	147 (78)	142 (75)	150 (77)	140 (72)	169 (89)	159 (80)	51 (58)	37 (63)	995 (76)

*Species presence verified by a bat biologist

**Very low-frequency bats (i.e., spotted bat and western mastiff bat) are not included in this table

***Kaleidoscope also identified calls by pallid bat, Townsend's big-eared bat, and western red bat; these calls were reviewed by a bat biologist and could not be confirmed

DISCUSSION AND RISK ASSESSMENT

Consistent with the California Wind Energy Guidelines' two key study questions: 1) *which species of bats use the project area and how do their numbers vary throughout the year?*, and 2) *how much time do these species spend in the risk zone (i.e., rotor-swept area) and does this vary by season?*, WEST conducted bat acoustic surveys to: 1) determine the bat species present at the Project during the peak bat activity period of spring – fall and 2) assess the spatial and temporal patterns of bat activity which may influence the risk of collision for bats at the Project.

Fourteen species of bat were confirmed as occurring at the Project during the bat activity study, none of which were unexpected. Three species (Townsend's big-eared bat, pallid bat, and western red bat) identified prior to field studies as having potential to occur were not documented from the acoustic survey data. Silver-haired bat, hoary bat, Mexican free-tailed bat, big brown bat, and California bat were the most commonly detected species, with calls of all five species documented on more than 50% of operational detector nights (see Table 5). Among the 14 identified species, two (spotted bat and western mastiff bat) are designated as California SSC. Calls of both SSC were documented in low numbers (seven passes total) on three separate nights during the study period. Hoary bats, silver-haired bats, and Mexican free-tailed bats all belong to the LF species group and were the three most commonly detected of the five LF bats identified, therefore, it is presumed in this discussion that the LF bat data is highly indicative of the amount of use and spatial and temporal patterns of use exhibited by these three species, while recognizing that there may be some variability among the three species. These three species are also among the most commonly documented bat fatalities at wind energy facilities where these species occur (Cryan and Barclay 2009, Arnett and Baerwald 2013, Tetra Tech 2013, Thompson et al. 2017, AWWI 2018).

Overall bat activity measured at representative stations was greater in the summer and fall, compared to spring; however the variability in temporal patterns was largely due to patterns within the HF species group, which varied up to about 70% across seasons and peaked in the summer. In contrast, LF bat activity was more consistent, varying only about 30% across seasons and peaking in the fall. LF species accounted for a larger proportion of overall bat activity in the spring and fall (76 and 66%, respectively) compared to the summer (55%), when HF bat activity was at its peak.

Based on the 2017 bat acoustic surveys at the Project, activity rates of LF species (inclusive of the three migratory species) were 10-53% greater at ground stations compared to raised stations at paired sample sites in the spring and summer. However, activity rates of LF species in the fall were more mixed, with 7% greater activity at the ground station at one paired site (MF1) and 20% lower activity at the ground station at the other paired site (MF2; see Table 4). While the data are not definitive, the temporal pattern of use at raised versus ground stations suggests that LF bats may spend more time at greater heights (and potentially within the rotor-swept zone) during the fall than during spring and summer. Furthermore, while data indicate that LF bats are active at all sampled heights, LF bats accounted for 96% of bat passes

recorded at raised sampling stations within the rotor-swept zone compared to only 35% of bat passes at representative ground stations.

As the relationship between pre-construction activity rates and post-construction fatality rates has not been definitively established (Hein et al. 2013; see Risk Assessment in Methods section p. 9-10), fatality rates documented at nearby facilities were used to evaluate the potential for bat fatalities at the Project. In other parts of the western US where wind energy facilities are clustered, bat fatality rates have generally been consistent among neighboring facilities. For example, in the Tehachapi Wind Resource Area in southern California, bat fatality rates range from zero to 1.28 bats/MW/year, and at the Shiloh and Montezuma projects located in close proximity to each other in the Montezuma Hills, bat fatality rates are consistently less than 4.0 bats/MW/year (Appendix A). Similar patterns are evident in the Pacific Northwest, where a majority of wind projects are located along the Columbia Plateau and bat fatality rates have been consistently less than 3.0 bats/MW/year (Appendix A).

The only wind energy facility in the western US with publicly available post-construction fatality data and habitat similar to the Project is the Hatchet Ridge facility, located less than two mi (3.2 km) northeast of the Project. Given the proximity of the Hatchet Ridge facility to the Project and similarities in geography, topography and habitat, it is likely that bat fatality rates documented at the Hatchet Ridge facility are among the best indicators of potential risk at the Project. For the three years of fatality monitoring conducted at the Hatchet Ridge facility, bat fatality rates were estimated to be 2.23, 5.22, and 4.20 bats/MW/year in years 1, 2, and 3, respectively (Tetra Tech 2014). Although the three years of data at Hatchet Ridge suggest some annual variability in fatality rates, 90% confidence intervals for all three years of estimates overlapped, indicating no statistical difference among years. Documented fatalities at the Hatchet Ridge facility were highest from July – September and primarily comprised hoary bats, silver-haired bats, and Mexican free-tailed bats, similar to patterns of bat fatalities throughout the US (Cryan and Barclay 2009, Arnett and Baerwald 2013, Tetra Tech 2014, Thompson et al. 2017, AWWI 2018). The species found as fatalities at the Hatchet Ridge facility are consistent with the species most commonly detected in bat acoustic surveys conducted for the Project, and the timing of peak fatalities at Hatchet Ridge aligns with peak activity rates documented at the Project.

Given that the species composition and temporal patterns of bat activity documented at the Project align with the results of fatality studies conducted at the nearby Hatchet Ridge facility; pre-construction bat acoustic data suggest that bat fatality patterns at the Project would likely be similar to those documented at the Hatchet Ridge facility. Based on the available data, fatality rates are anticipated to be similar to those documented at the Hatchet Ridge facility (2.23 – 5.22 bats/MW/year) and primarily consist of fatalities of hoary bats, silver-haired bats, and Mexican free-tailed bats during the late summer and fall migration period.

REFERENCES

Adams, R. A. and K. M. Thibault. 2006. Temporal partitioning by bats at water holes. Journal of Zoology 270: 466–472.

Adams, R. A. and M. A. Hayes. 2008. Water availability and successful lactation by bats as related to climate change in arid regions of western North America. Journal of Animal Ecology 77: 1115–1121.

Adams, A. M., M. K. Jantzen, R. M. Hamilton, and M. B. Fenton. 2012. Do You Hear What I Hear? Implications of Detector Selection for Acoustic Monitoring of Bats. Methods in Ecology and Evolution 3(6): 992-998. doi: 10.1111/j.2041-210X.2012.00244.x.

AECOM. 2013. Annual Monitoring Report: July 2012 - June 2013. Solano Wind Project - Phase 3. Prepared for SMUD - Environmental Management, Sacramento, California. Prepared by AECOM, Sacramento, California. September 2013.

American Wind Wildlife Institute (AWWI). 2018. AWWI Technical Report: A Summary of Bat Fatality Data in a Nationwide Database. Washington, DC. Available at www.awwi.org.

Amorim, F., H. Rebelo, and L. Rodrigues. 2012. Factors Influencing Bat Activity and Mortality at a Wind Farm in the Mediterranean Region. Acta Chiropterologica 14(2): 439-457.

Analook. 2004. Bat call analysis program. © 2004, C. Corben.

Anderson, R., N. Neuman, J. Tom, W. P. Erickson, M. D. Strickland, M. Bourassa, K. J. Bay, and K. J. Sernka. 2004. Avian Monitoring and Risk Assessment at the Tehachapi Pass Wind Resource Area, California. Period of Performance: October 2, 1996 - May 27, 1998. NREL/SR-500-36416. September 2004. National Renewable Energy Laboratory. Golden, Colorado. Available online: http://www.nrel.gov/docs/fy04osti/36416.pdf

Arnett, E. B., K. Brown, W. P. Erickson, J. Fiedler, B. L. Hamilton, T. H. Henry, A. Jain, G. D. Johnson, J. Kerns, R. R. Koford, C. P. Nicholson, T. O'Connell, M. Piorkowski, and R. Tankersley, Jr. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. Journal of Wildlife Management 72(1): 61-78.

Arnett, E. B. and E. F. Baerwald. 2013. Impacts of Wind Energy Development on Bats: Implications for Conservation. Chapter 21. Pp. 435-456. *In*: R. A. Adams and S. C. Pederson, eds. Bat Ecology, Evolution and Conservation. Springer Science Press, New York.

Arnett, E. B., G. D. Johnson, W. P. Erickson, and C. D. Hein. 2013. A Synthesis of Operational Mitigation Studies to Reduce Bat Fatalities at Wind Energy Facilities in North America. A report submitted to the National Renewable Energy Laboratory (NREL), Golden Colorado. Bat Conservation International (BCI), Austin, Texas. March 2013.

Arnett, E. B., Baerwald, E. F., Mathews, F., Rodrigues, L., Rodriguez-Duran, A., Rydell, J., Villegas-Patraca, R., and C. C. Voight. 2016. Impacts of wind energy development on bats: a global perspective. In: Voight, C., Kingston, K. (Eds.), Bats in the Anthropocene: Conservation of Bats in a Changing World. Springer, New York, pp. 295–323.

Baerwald, E. F. 2008. Variation in the Activity and Fatality of Migratory Bats at Wind Energy Facilities in Southern Alberta: Causes and Consequences. Thesis. University of Calgary, Calgary, Alberta, Canada.

Baerwald, E. F., G. H. D'Amours, B. J. Klug, and R. M. R. Barclay. 2008. Barotrauma Is a Significant Cause of Bat Fatalities at Wind Turbines. Current Biology 18(16): R695-R696.

Baerwald, E. F. and R. M. R. Barclay. 2009. Geographic Variation in Activity and Fatality of Migratory Bats at Wind Energy Facilities. Journal of Mammalogy 90(6): 1341–1349.

Barclay, R. M. R., E. F. Baerwald, and J. Rydell. 2017. Bats. In: Perrow, M. R. (Ed.) Wildlife and Wind Farms, Conflicts and Solutions. Volume 1 Onshore: Potential Effects. Pelagic Publishing, pp. 191-221.

Britzke, E. R., E. H. Gillam, and K. L. Murray. 2013. Current State of Understanding of Ultrasonic Detectors for the Study of Bat Ecology. Acta Theriologica: doi: 10.1007/s13364-013-0131-3.

California Department of Fish and Wildlife (CDFW). 2018. Special Animals List. CDFW California Natural Diversity Database. Periodic publication. August 2018. 65 pp. Available online: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline

California Energy Commission (CEC) and California Department of Fish and Game (CDFG). 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. CEC, Renewables Committee, and Energy Facilities Siting Division, and CDFG, Resources Management and Policy Division. CEC-700-2007-008-CMF.

Chatfield, A., W. Erickson, and K. Bay. 2009. Avian and Bat Fatality Study, Dillon Wind-Energy Facility, Riverside County, California. Final Report: March 26, 2008 - March 26, 2009. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 3, 2009.

Chatfield, A., W. P. Erickson, and K. Bay. 2010. Avian and Bat Fatality Study at the Alite Wind-Energy Facility, Kern County, California. Final Report: June 15, 2009 – June 15, 2010. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Chatfield, A., M. Sonnenberg, and K. Bay. 2012. Avian and Bat Mortality Monitoring at the Alta-Oak Creek Mojave Project, Kern County, California. Final Report for the First Year of Operation March 22, 2011 – June 15, 2012. Prepared for Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 12, 2012.

Chatfield, A. and D. Russo. 2014. Post-Construction Avian and Bat Fatality Monitoring for the Pinyon Pines I & II Wind Energy Project, Kern County, California. Final Report for the First Year of Operation: March 2013 - March 2014. Prepared for MidAmerican Renewables, LLC, Des Moines, Iowa, and Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 28, 2014.

Chatfield, A. and K. Bay. 2014. Post-Construction Studies for the Mustang Hills and Alta VIII Wind Energy Facilities, Kern County, California. Final Report for the First Year of Operation: July 2012 - October 2013. Prepared for EverPower Wind Holdings, Inc. and Brookfield Renewable Energy Group. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 28, 2014.

Chatfield, A., D. Riser-Espinoza, and K. Bay. 2014. Bird and Bat Mortality Monitoring at the Alta Wind Energy Center, Phases I - V, Kern County, California. Final Report for the Second Year of Operation: March 4, 2013 - March 6, 2014. Prepared for Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 22, 2014.

Collins, J. and G. Jones. 2009. Differences in Bat Activity in Relation to Bat Detector Height: Implications for Bat Surveys at Proposed Wind Farms. Acta Chiropterologica 11: 343:350.

Cryan, P. M. 2008. Mating Behavior as a Possible Cause of Bat Fatalities at Wind Turbines. Journal of Wildlife Management 72(3): 845-849. doi: 10.2193/2007-371.

Cryan, P. M. and R. M. R. Barclay. 2009. Causes of Bat Fatalities at Wind Turbines: Hypotheses and Predictions. Journal of Mammalogy 90(6): 1330-1340.

Downes, S. and R. Gritski. 2012a. Harvest Wind Project Wildlife Monitoring Report: January 2010 – January 2012. Prepared for Harvest Wind Project, Roosevelt, Washington. Prepared by Northwest Wildlife Consultants, Inc., Pendleton, Oregon. May 1, 2012.

Downes, S. and R. Gritski. 2012b. White Creek Wind I Wildlife Monitoring Report: November 2007 - November 2011. Prepared for White Creek Wind I, LLC, Roosevelt, Washington. Prepared by Northwest Wildlife Consultants, Inc., Pendleton, Oregon. May 1, 2012.

Ellison, L. E. 2012. Bats and Wind Energy: A Literature Synthesis and Annotated Bibliography. Open-File Report No. 2012-1110. US Geological Survey (USGS).

Endangered Species Act (ESA). 1973. 16 United States Code (USC) §§ 1531-1544, Public Law (PL) 93-205, December 28, 1973, as amended, PL 100-478 [16 USC 1531 *et seq.*]; 50 Code of Federal Regulations (CFR) 402.

Enz, T., K. Bay, M. Sonnenberg, J. Baker, M. Kesterke, J. R. Boehrs, and A. Palochak. 2010. Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring Second Annual Report, Sherman County, Oregon. January 26, 2009 - December 11, 2009. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc.(WEST) Cheyenne, Wyoming, and Walla Walla, Washington. April 2010.

Enz, T., C. Derby, K. Bay, and M. Sonnenberg. 2011a. 2010 Post-Construction Fatality Monitoring Report, Elkhorn Valley Wind Farm, Union County, Oregon. January – December 2010. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Walla Walla, Washington, and Cheyenne, Wyoming. December 8, 2011.

Enz, T., K. Bay, M. Sonnenberg, J. Flaig, J. R. Boehrs, and A. Palochak. 2011b. Year 1 Post-Construction Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase II, Sherman County, Oregon. September 10, 2009 - September 12, 2010. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. January 7, 2011.

Enz, T., K. Bay, M. Sonnenberg, and J. R. Boehrs. 2012a. Year 1 Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase III, Sherman County, Oregon. September 13, 2010 - September 9, 2011. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. April 24, 2012.

Enz, T., K. Bay, M. Sonnenberg, and J. R. Boehrs. 2012b. Year 2 Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase II, Sherman County, Oregon. September 13, 2010 - September 15, 2011. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. April 23, 2012.

Enz, T. and K. Bay. 2010. Post-Construction Avian and Bat Fatality Monitoring Study, Tuolumne Wind Project, Klickitat County, Washington. Final Report: April 20, 2009 - April 7, 2010. Prepared for Turlock Irrigation District, Turlock, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 6, 2010.

Enz, T. and K. Bay. 2011. Post-Construction Monitoring at the Linden Ranch Wind Farm, Klickitat County, Washington. Final Report: June 30, 2010 - July 17, 2011. Prepared for EnXco. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. November 10, 2011.

Enz, T., K. Bay, S. Nomani, and M. Kesterke. 2011. Bird and Bat Fatality Monitoring Study, Windy Flats and Windy Point II Wind Energy Projects, Klickitat County, Washington. Final Report: February 1, 2010 - January 14, 2011. Prepared for Windy Flats Partners, LLC, Goldendale, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 19, 2011.

Enz, T., K. Bay, M. Sonnenberg, and A. Palochak. 2012. Post-Construction Monitoring Studies for the Combine Hills Turbine Ranch, Umatilla County, Oregon. Final Report: January 7 - December 2, 2011. Prepared for Eurus Energy America Corporation, San Diego, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Walla Walla, Washington.

Erickson, W. P., G. D. Johnson, M. D. Strickland, and K. Kronner. 2000. Avian and Bat Mortality Associated with the Vansycle Wind Project, Umatilla County, Oregon: 1999 Study Year. Prepared for Umatilla County Department of Resource Services and Development, Pendleton, Oregon. Prepared by Western EcoSystems Technology, Inc., (WEST). February 7, 2000.

Erickson, W. P., K. Kronner, and R. Gritski. 2003. Nine Canyon Wind Power Project Avian and Bat Monitoring Report: September 2002 - August 2003. Prepared for the Nine Canyon Technical Advisory Committee and Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants (NWC), Pendleton, Oregon. October 2003. Available online: http://www.west-inc.com/reports/nine_canyon_monitoring_final.pdf

Erickson, W. P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Annual Report: July 2001 - December 2003. Technical report peer-reviewed by and submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee. Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 2004. Available online: http://www.west-inc.com/reports/swp_final_dec04.pdf

Erickson, W. P., K. Kronner, and K. J. Bay. 2007. Stateline 2 Wind Project Wildlife Monitoring Report, January - December 2006. Technical report submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee.

Erickson, W. P., J. D. Jeffrey, and V. K. Poulton. 2008. Puget Sound Energy Wild Horse Wind Facility Avian and Bat Monitoring: First Annual Report: January–December, 2007. Prepared for Puget Sound Energy, Ellensburg, Washington. Prepared by by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 2008.

ESRI. 2017. World Street Map. ArcGIS Resource Center. ESRI, producers of ArcGIS software, Redlands, California. Data accessed January 2017. Information online: https://www.arcgis.com/home/item.html?id=3b93337983e9436f8db950e38a8629af

Fenton, M. B. 1980. Adaptiveness and Ecology of Echolocation in Terrestrial (Aerial) Systems. Pp. 427-446. *In*: R. G. Busnel and J. F. Fish, eds. Animal Sonar Systems. Plenum Press, New York.

Frick, W. F., E. F. Baerwald, J. F. Pollock, R. M. R. Barclay, J. A. Szymanski, T. J. Weller, S. C. Loeb, R. A. Medellin, and L. P. McGuire. 2017. Fatalities at wind turbines may threaten population viability of a migratory bat. Biological Conservation 209: 172-177.

Gannon, W. L., R. E. Sherwin, and S. Haymond. 2003. On the Importance of Articulating Assumptions When Conducting Acoustic Studies of Habitat Use by Bats. Wildlife Society Bulletin 31: 45-61.

Griffith, G. E., J. M. Omernik, D. W. Smith, T. D. Cook, E. Tallyn, K. Moseley, and C. B. Johnson. 2016. Ecoregions of California. Color poster with map, scale 1:1,100,000. US Geological Survey Open-File Report 2016–1021. Available online: ftp://newftp.epa.gov/EPADataCommons/ORD/Ecoregions/ca/CA_eco_front_ofr20161021_sheet1.pdf and ftp://newftp.epa.gov/ EPADataCommons/ORD/Ecoregions/ca/CA_eco_back_ofr20161021_sheet2.pdf

Gritski, R., K. Kronner, and S. Downes. 2008. Leaning Juniper Wind Power Project, 2006 − 2008. Wildlife Monitoring Final Report. Prepared for PacifiCorp Energy, Portland, Oregon. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 30, 2008.

Gritski, R. and K. Kronner. 2010a. Hay Canyon Wind Power Project Wildlife Monitoring Study: May 2009 - May 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Hay Canyon Wind Power Project LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. September 20, 2010.

Gritski, R. and K. Kronner. 2010b. Pebble Springs Wind Power Project Wildlife Monitoring Study: January 2009 - January 2010. Prepared for Iberdrola Renewables, Inc. (IRI), and the Pebble Springs Advisory Committee. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 20, 2010.

Gritski, R., S. Downes, and K. Kronner. 2010. Klondike III (Phase 1) Wind Power Project Wildlife Monitoring: October 2007-October 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon, for Klondike Wind Power III LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 21, 2010 (Updated September 2010).

Gritski, R., S. Downes, and K. Kronner. 2011. Klondike IIIa (Phase 2) Wind Power Project Wildlife Monitoring: August 2008 - August 2010. Updated Final. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon, for Klondike Wind Power III LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. Updated April 2011.

Grodsky, S. M., M. J. Behr, A. Gendler, D. Drake, B. D. Dieterle, R. J. Rudd, and N. L. Walrath. 2011. Investigating the Causes of Death for Wind Turbine-Associated Bat Fatalities. Journal of Mammalogy 92(5): 917-925.

Harvey & Associates. 2013. Montezuma II Wind Energy Center: Post Construction Monitoring Report, Year-1. Prepared by NextEra Montezuma II Wind, LLC, Juno Beach, Florida. Prepared by H.T. Harvey & Associates, Los Gatos, California. September 3, 2013.

Hayes, M. A. 2013. Bats Killed in Large Numbers at United States Wind Energy Facilities. Bioscience 63(12): 975-979.

Heffernan, L. 2016. Map of White-Nose Syndrome (WNS) Occurrence by County/District, March 31, 2016. Pennsylvania Game Commission. Map dated August 2, 2016. Available online: https://www.whitenosesyndrome.org/sites/default/files/wns_map_20160802.jpg

Hein, C. D., J. Gruver, and E. B. Arnett. 2013. Relating Pre-Construction Bat Activity and Post-Construction Bat Fatality to Predict Risk at Wind Energy Facilities: A Synthesis. A report submitted to the National Renewable Energy Laboratory (NREL), Golden Colorado. Bat Conservation International (BCI), Austin, Texas. March 2013. Available online: http://batsandwind.org/pdf/Pre-%20Post-construction%20Synthesis_FINAL%20REPORT.pdf

Homer, C. G., J. A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N. D. Herold, J. D. Wickham, and K. Megown. 2015. Completion of the 2011 National Land Cover Database for the Conterminous United States-Representing a Decade of Land Cover Change Information. Photogrammetric Engineering and Remote Sensing 81(5): 345-354. Available online: http://www.mrlc.gov/nlcd2011.php

ICF International. 2012. Montezuma Wind LLC (Montezuma I) 2011 Avian and Bat Fatality Monitoring Report. Prepared for NextEra Energy Resources. Prepared by ICF International, Sacramento, California. May 17, 2012.

ICF International. 2013. Montezuma Wind LLC (Montezuma I) 2012 Avian and Bat Fatality Monitoring Report. Prepared for NextEra Energy Resources. Prepared by ICF International, Sacramento, California. May 2013.

International Union for Conservation of Nature (IUCN). 2016. IUCN Red List of Threatened Species: Minnesota Bat Species. Version 2016-3. Information online: www.iucnredlist.org

Jeffrey, J. D., W. P. Erickson, K. Bay, M. Sonneberg, J. Baker, J. R. Boehrs, and A. Palochak. 2009a. Horizon Wind Energy, Elkhorn Valley Wind Project, Post-Construction Avian and Bat Monitoring, First Annual Report, January-December 2008. Technical report prepared for Telocaset Wind Power Partners, a subsidiary of Horizon Wind Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming, and Walla Walla, Washington. May 4, 2009.

Jeffrey, J. D., K. Bay, W. P. Erickson, M. Sonneberg, J. Baker, M. Kesterke, J. R. Boehrs, and A. Palochak. 2009b. Portland General Electric Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring First Annual Report, Sherman County, Oregon. January 2008 - December 2008. Technical report prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology (WEST) Inc., Cheyenne, Wyoming, and Walla Walla, Washington. April 29, 2009.

Johnson, G., W. Erickson, and J. White. 2003. Avian and Bat Mortality During the First Year of Operation at the Klondike Phase I Wind Project, Sherman County, Oregon. Technical report prepared for Northwestern Wind Power, Goldendale, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 2003.

Kerlinger, P., R. Curry, L. Culp, A. Jain, C. Wilkerson, B. Fischer, and A. Hasch. 2006. Post-Construction Avian and Bat Fatality Monitoring Study for the High Winds Wind Power Project, Solano County, California: Two Year Report. Prepared for High Winds LLC, FPL Energy. Prepared by Curry and Kerlinger, LLC, MacLean, Virginia. April 2006. Available online: http://www.co.solano.ca.us/civicax/filebank/blobdload.aspx?blobid=8915

Kerlinger, P., R. Curry, L. Culp, A. Hasch, and A. Jain. 2009. Revised Post-Construction Avian Monitoring Study for the Shiloh I Wind Power Project, Solano County, California. Final Report: October 2009. Third Year Report (Revised 2010). Prepared for Iberdrola Renewables, Inc. (IRI). Prepared by Curry and Kerlinger, LLC., McLean, Virginia. Available online: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=8914

Kerlinger, P., R. Curry, L. Culp, A. Hasch, and A. Jain. 2010. Post-Construction Avian Monitoring Study for the Shiloh II Wind Power Project, Solano County, California. Year One Report. Prepared for enXco Development Inc. Prepared by Curry and Kerlinger, LLC, McLean, Virginia. September 2010. Available online: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=12118

Kerlinger, P., R. Curry, A. Hasch, J. Guarnaccia, and D. Riser-Espinoza. 2013a. Post-Construction Bird and Bat Studies at the Shiloh II Wind Project, LLC, Solano County, California. Final Report. Prepared for EDF Renewable Energy (formerly known as enXco). Prepared by Curry and Kerlinger, LLC, McLean, Virginia. December 2012 (Revised June 2013).

Kerlinger, P., R. Curry, A. Hasch, J. Guarnaccia, and D. Riser-Espinoza. 2013b. Post-Construction Bird and Bat Studies at the Shiloh III Wind Project, LLC, Solano County, California. Report on Year 1 Results. Prepared for EDF Renewable Energy (formerly known as enXco). Prepared by Curry and Kerlinger, LLC, McLean, Virginia. August 2013.

Krauel, J., J.M. Ratcliffe, J.K. Westbrook, and G.F. McCracken. 2018. Brazilian free-tailed bats (*Tadarida brasiliensis*) adjust foraging behaviour in response to migratory moths. Canadian Journal of Zoology. Published on the web 11 January 2018, https://doi.org/10.1139/cjz-2017-0284.

Kronner, K., B. Gritski, and S. Downes. 2008. Big Horn Wind Power Project Wildlife Fatality Monitoring Study: 2006−2007. Final report prepared for PPM Energy and the Big Horn Wind Project Technical Advisory Committee by Northwest Wildlife Consultants, Inc. (NWC), Mid-Columbia Field Office, Goldendale, Washington. June 1, 2008.

Kunz, T. H., E. B. Arnett, B. M. Cooper, W. P. Erickson, R. P. Larkin, T. Mabee, M. L. Morrison, M. D. Strickland, and J. M. Szewczak. 2007a. Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. Journal of Wildlife Management 71(8): 2449-2486.

Kunz, T. H., E. B. Arnett, W. P. Erickson, A. R. Hoar, G. D. Johnson, R. P. Larkin, M. D. Strickland, R. W. Thresher, and M. D. Tuttle. 2007b. Ecological Impacts of Wind Energy Development on Bats: Questions, Research Needs, and Hypotheses. Frontiers in Ecology and the Environment 5(6): 315-324.

McCain, C. M. 2007. Could temperature and water availability drive elevational species richness patterns? A global case study for bats. Global Ecology and Biogeography 16: 1–13.

McLean, J.A. and J.R. Speakman. 1999. Energy budgets of lactating and non-reproductive brown long-eared bats (*Plecotus auritus*) suggest females use compensation in lactation. Functional Ecology 13: 360–372.

Miller, A. 2008. Patterns of Avian and Bat Mortality at a Utility-Scaled Wind Farm on the Southern High Plains. Thesis. Texas Tech University.

Müeller, J., R. Brandl, J. Buchner, H. Pretzsch, S. Seifert, C. Strätz, M. Veith, and B. Fenton. 2013. From Ground to above Canopy - Bat Activity in Mature Forests Is Driven by Vegetation Density and Height. Forest Ecology and Management 306: 179-184.

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Northwest Wildlife Consultants, Inc. (NWC) and Western EcoSystems Technology, Inc. (WEST). 2007. Avian and Bat Monitoring Report for the Klondike II Wind Power Project. Sherman County, Oregon. Prepared for PPM Energy, Portland, Oregon. Managed and conducted by NWC, Pendleton, Oregon. Analysis conducted by WEST, Cheyenne, Wyoming. July 17, 2007.

Peterson, T. 2017. Comparison of Pre-construction Bird/Bat Activity and Post-construction Mortality at Commercial Wind Projects in Maine. Prepared for Maine Renewable Energy Association. Prepared by Stantec Consulting Services, Inc. 40 pp.

Roemer, C., T. Disca, A. Coulon, and Y. Bas. 2017. Bat flight height monitored from wind masts predicts mortality risk at wind farms. Biological Conservation. 215 (116 – 122).

Rollins, K. E., D. K. Meyerholz, G. D. Johnson, A. P. Capparella, and S. S. Loew. 2012. A Forensic Investigation into the Etiology of Bat Mortality at a Wind Farm: Barotrauma or Traumatic Injury? Veterinary Pathology 49(2): 362-371.

Solick, D. I., C. Nations, and J. C. Gruver. 2011. Activity Rates and Call Quality by Full-Spectrum Bat Detectors. Presented at the 41st Annual Symposium of the North American Society for Bat Research, October 26-29, 2011, Toronto, Ontario.

Stantec Consulting, Inc. (Stantec). 2013. Palouse Wind Post-Construction Wildlife Monitoring Report, 2012-2013. Prepared for Palouse Wind, Whitman County, Washington. Prepared by Stantec, Topsham, Maine. December 2013.

Stantec Consulting Services, Inc. (Stantec Consulting). 2012. Post-Construction Monitoring, Summer 2011 - Spring 2012. Year 1 Annual Report. Kittitas Valley Wind Power Project, Cle Elum, Washington. Prepared for Sagebrush Power Partners, LLC, Houston, Texas. Prepared by Stantec Consulting, Salt Lake City, Utah.

Tetra Tech. 2014. Hatchet Ridge Wind Farm Post-Construction Mortality Monitoring Comprehensive Three Year Report. Submitted to: Hatchet Ridge Wind, LLC. Submitted by Tetra Tech, Portland, Oregon. May 2014.

Thompson, J., D. Solick, and K. Bay. 2011. Post-Construction Fatality Surveys for the Dry Lake Phase I Wind Project. Iberdrola Renewables: September 2009 - November 2010. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 10, 2011.

Thompson, J. and K. Bay. 2012. Post-Construction Fatality Surveys for the Dry Lake II Wind Project: February 2011 – February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 6, 2012.

Thompson, M., J.A. Beston, M. Etterson, J.E. Diffendorfer, and S.R. Loss. 2017. Factors Associated with Bat Mortality at Wind Energy Facilities in the United States. Biological Conservation 215: 241-245.

URS Corporation. 2010a. Final Goodnoe Hills Wind Project Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 16, 2010.

URS Corporation. 2010b. Final Marengo I Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

URS Corporation. 2010c. Final Marengo II Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

US Department of Agriculture (USDA). 2017. Imagery Programs - National Agriculture Imagery Program (NAIP). USDA, Farm Service Agency (FSA), Aerial Photography Field Office (APFO), Salt Lake City, Utah. Accessed November 2017. Information online: https://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/index

US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). 2017. Web Soil Survey. USDA NRCS, Washington, D. C. Last modified August 21, 2017. Accessed October 23, 2017. Information online: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

US Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf

US Fish and Wildlife Service (USFWS). 2015. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Northern Long-Eared Bat with 4(d) Rule; Final Rule and Interim Rule. Department of the Interior, Fish and Wildlife Service, 50 CFR Part 17. 80 Federal Register (FR) 63: 17974-18033. April 2, 2015.

US Geological Survey (USGS) National Land Cover Database (NLCD). 2011. National Land Cover Database 2011 (NLCD 2011). Multi-Resolution Land Characteristics Consortium (MRLC), National Land Cover Database (NLCD). USGS Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota. Available online: http://www.mrlc.gov/nlcd2011.php; Legend: http://www.mrlc.gov/nlcd11_leg.php

Ventus Environmental Solutions (Ventus). 2012. Vantage Wind Energy Center Avian and Bat Monitoring Study: March 2011- March 2012. Prepared for Vantage Wind Energy, LLC, Chicago, Illinois. Prepared by Ventus, Portland, Oregon. May 16, 2012.

Weller, T. J. and J. A. Baldwin. 2012. Using Echolocation Monitoring to Model Bat Occupancy and Inform Mitigations at Wind Energy Facilities. Journal of Wildlife Management 76: 619-631.

Western EcoSystems Technology, Inc. (WEST). 2006. Diablo Winds Wildlife Monitoring Progress Report, March 2005 - February 2006. Technical report submitted to FPL Energy and Alameda County California. WEST. Cheyenne, Wyoming.

Western EcoSystems Technology, Inc. (WEST). 2008. Diablo Winds Wildlife Monitoring Progress Report: March 2005 – February 2007. Prepared by WEST, Cheyenne, Wyoming. August 2008.

White, E. P. and S. D. Gehrt. 2001. Effects of Recording Media on Echolocation Data from Broadband Bat Detectors. Wildlife Society Bulletin 29(3): 974-978.

Young, D. P., Jr., J. Jeffrey, W. P. Erickson, K. Bay, V. K. Poulton, K. Kronner, R. Gritski, and J. Baker. 2006. Eurus Combine Hills Turbine Ranch. Phase 1 Post Construction Wildlife Monitoring First Annual Report: February 2004 - February 2005. Technical report prepared for Eurus Energy America Corporation, San Diego, California, and the Combine Hills Technical Advisory Committee, Umatilla County, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla Washington, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. February 21, 2006. Available online: http://wind.nrel.gov/public/library/young7.pdf

Young, D. P., Jr., W. P. Erickson, J. Jeffrey, and V. K. Poulton. 2007a. Puget Sound Energy Hopkins Ridge Wind Project Phase 1 Post-Construction Avian and Bat Monitoring First Annual Report, January - December 2006. Technical report for Puget Sound Energy, Dayton, Washington and Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST) Cheyenne, Wyoming, and Walla Walla, Washington. 25 pp.

Young, D. O., Jr., G. D. Johnson, V. K. Poulton, and K. Bay. 2007b. Ecological Baseline Studies for the Hatchet Ridge Wind Energy Project, Shasta County, California. Prepared by Western EcoSystems Technology, Inc. (WEST) Cheyenne, Wyoming. 75 pp. Available online: https://tethys.pnnl.gov/publications/ecological-baseline-studies-hatchet-ridge-wind-energy-project-shasta-county-california

Appendix A: Western US Bat Fatality Table

Appendix A1. Wind energy facilities in the western US with comparable fatality data for bats, separated by geographic region.

Wind Energy Facility	Fatality Estimate	No. of Turbines	Total MW
California			
Hatchet Ridge, CA (2010-2011)	2.23	44	101.2
Hatchet Ridge, CA (2011-2012)	5.22	44	101.2
Hatchet Ridge, CA (2012-2013)	4.20	44	101.2
Shiloh I, CA (2006-2009)	3.92	100	150
Shiloh II, CA (2010-2011)	3.8	75	150
Shiloh II, CA (2011-2012)	3.4	75	150
Shiloh II, CA (2009-2010)	2.6	75	150
High Winds, CA (2003-2004)	2.51	90	162
Dillon, CA (2008-2009)	2.17	45	45
Montezuma I, CA (2011)	1.9	16	36.8
High Winds, CA (2004-2005)	1.52	90	162
Alta I, CA (2011-2012)	1.28	100	150
Montezuma II, CA (2012-2013)	0.91	34	78.2
Montezuma I, CA (2012)	0.84	16	36.8
Diablo Winds, CA (2005-2007)	0.82	31	20.46
Shiloh III, CA (2012-2013)	0.4	50	102.5
Solano III, CA (2012-2013)	0.31	55	128
Alite, CA (2009-2010)	0.24	8	24
Alta I-V, CA (2013-2014)	0.2	290	720 (150 GE, 570 vestas)
Mustang Hills, CA (2012-2013)	0.1	50	150
Alta II-V, CA (2011-2012)	0.08	190	570
Pinyon Pines I & II, CA (2013-2014)	0.04	100	NA
Alta VIII, CA (2012-2013)	0	50	150
Southwest			
Dry Lake I, AZ (2009-2010)	3.43	30	63
Dry Lake II, AZ (2011-2012)	1.66	31	65
Pacific Northwest			
Palouse Wind, WA (2012-2013)	4.23	58	104.4
Biglow Canyon, OR (Phase II; 2009-2010)	2.71	65	150
Nine Canyon, WA (2002-2003)	2.47	37	48.1
Stateline, OR/WA (2003)	2.29	454	299
Elkhorn, OR (2010)	2.14	61	101
White Creek, WA (2007-2011)	2.04	89	204.7
Biglow Canyon, OR (Phase I; 2008)	1.99	76	125.4
Leaning Juniper, OR (2006-2008)	1.98	67	100.5
Big Horn, WA (2006-2007)	1.9	133	199.5
Combine Hills, OR (Phase I; 2004-2005)	1.88	41	41
Linden Ranch, WA (2010-2011)	1.68	25	50
Pebble Springs, OR (2009-2010)	1.55	47	98.7
Hopkins Ridge, WA (2008)	1.39	87	156.6
Harvest Wind, WA (2010-2012)	1.27	43	98.9
Elkhorn, OR (2008)	1.26	61	101
Vansycle, OR (1999)	1.12	38	24.9
Klondike III (Phase I), OR (2007-2009)	1.11	125	223.6
Stateline, OR/WA (2001-2002)	1.09	454	299
Stateline, OR/WA (2006)	0.95	454	299
Tuolumne (Windy Point I), WA (2009-2010)	0.94	62	136.6
Klondike, OR (2002-2003)	0.77	16	24
Combine Hills, OR (2011)	0.73	104	104
Hopkins Ridge, WA (2006)	0.63	83	150

Appendix A1. Wind energy facilities in the western US with comparable fatality data for bats, separated by geographic region.

Wind Energy Facility	Fatality Estimate	No. of Turbines	Total MW
Biglow Canyon, OR (Phase I; 2009)	0.58	76	125.4
Biglow Canyon, OR (Phase II; 2010-2011)	0.57	65	150
Hay Canyon, OR (2009-2010)	0.53	48	100.8
Windy Flats, WA (2010-2011)	0.41	114	262.2
Klondike II, OR (2005-2006)	0.41	50	75
Vantage, WA (2010-2011)	0.4	60	90
Wild Horse, WA (2007)	0.39	127	229
Goodnoe, WA (2009-2010)	0.34	47	94
Marengo II, WA (2009-2010)	0.27	39	70.2
Biglow Canyon, OR (Phase III; 2010-2011)	0.22	76	174.8
Marengo I, WA (2009-2010)	0.17	78	140.4
Klondike IIIa (Phase II), OR (2008-2010)	0.14	51	76.5
Kittitas Valley, WA (2011-2012)	0.12	48	100.8

Facility	Fatality Estimate	Facility	Fatality Estimate
Alite, CA (09-10)	Chatfield et al. 2010	Klondike III (Phase I), OR (07-09)	Gritski et al. 2010
Alta Wind I, CA (11-12)	Chatfield et al. 2012	Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011
Alta Wind I-V, CA (13-14)	Chatfield et al. 2014	Leaning Juniper, OR (06-08)	Gritski et al. 2008
Alta Wind II-V, CA (11-12)	Chatfield et al. 2012	Linden Ranch, WA (10-11)	Enz and Bay 2011
Alta VIII, CA (12-13)	Chatfield and Bay 2014	Marengo I, WA (09-10)	URS Corporation 2010b
Big Horn, WA (06-07)	Kronner et al. 2008	Marengo II, WA (09-10)	URS Corporation 2010c
Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009b	Montezuma I, CA (11)	ICF International 2012
Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Montezuma I, CA (12)	ICF International 2013
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011b	Montezuma II, CA (12-13)	Harvey & Associates 2013
Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012b	Mustang Hills, CA (12-13)	Chatfield and Bay 2014
Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012a	Nine Canyon, WA (02-03)	Erickson et al. 2003
Combine Hills, OR (Phase I; 04-05)	Young et al. 2006	Palouse Wind, WA (12-13)	Stantec 2013
Combine Hills, OR (11)	Enz et al. 2012	Pebble Springs, OR (09-10)	Gritski and Kronner 2010b
Diablo Winds, CA (05-07)	WEST 2006, 2008	Pinyon Pines I&II, CA (13-14)	Chatfield and Russo 2014
Dillon, CA (08-09)	Chatfield et al. 2009	Shiloh I, CA (06-09)	Kerlinger et al. 2009
Dry Lake I, AZ (09-10)	Thompson et al. 2011	Shiloh II, CA (09-10)	Kerlinger et al. 2010, 2013a
Dry Lake II, AZ (11-12)	Thompson and Bay 2012	Shiloh II, CA (10-11)	Kerlinger et al. 2013a
Elkhorn, OR (08)	Jeffrey et a. 2009a	Shiloh II, CA (11-12)	Kerlinger et al. 2013a
Elkhorn, OR (10)	Enk et al. 2011a	Shiloh III, CA (12-13)	Kerlinger et al. 2013b
Goodnoe, WA (09-10)	URS Corporation 2010a	Solano III, CA (12-13)	AECOM 2013
Harvest Wind, WA (10-12)	Downes and Gritski 2012a	Stateline, OR/WA (01-02)	Erickson et al. 2004
Hatchet Ridge	Tetra Tech 2014	Stateline, OR/WA (03)	Erickson et al. 2004
Hay Canyon, OR (09-10)	Gritski and Kronner 2010a	Stateline, OR/WA (06)	Erickson et al. 2007
High Winds, CA (03-04)	Kerlinger et al. 2006	Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010
High Winds, CA (04-05)	Kerlinger et al. 2006	Vansycle, OR (99)	Erickson et al. 2000
Hopkins Ridge, WA (06)	Young et al. 2007a	Vantage, WA (10-11)	Ventus 2012
Hopkins Ridge, WA (08)	Young et al. 2009b	White Creek, WA (07-11)	Downes and Gritski 2012b
Kittitas Valley, WA (11-12)	Stantec Consulting Services 2012	Wild Horse, WA (07)	Erickson et al. 2008
Klondike, OR (02-03)	Johnson et al. 2003	Windy Flats, WA (10-11)	Enz et al. 2011
Klondike II, OR (05-06)	NWC and WEST 2007		

C10. 2017 Raptor Nest Survey Report

ENVIRONMENTAL & STATISTICAL CONSULTANTS

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TECHNICAL MEMORANDUM

DATE: September 19, 2018

TO: Kristen Goland - Pacific Wind Development LLC

FROM: Joel Thompson - WEST, Inc.

RE: 2017 Raptor Nest Survey Report for the Fountain Wind Project, California

Introduction

Pacific Wind Development LLC (Pacific Wind) is developing the proposed Fountain Wind Project (Project) in Shasta County, California. To address potential impacts to nesting golden eagles (*Aquila chrysaetos*) and/or bald eagles (*Haliaeetus leucocephalus*), the U.S. Fish and Wildlife Service (USFWS) recommends conducting eagle nest surveys within survey areas that extend up to 10-miles (mi; 16-kilometer [km]) from proposed wind energy facilities prior to construction, with at least two rounds of surveys completed a minimum of 30 days apart during the nesting season (USFWS 2013). In addition to eagle nest surveys, the USFWS (2012) and California Department of Fish and Wildlife (CDFW; CEC and CDFG 2007) recommend conducting nest surveys for other nesting raptors within proposed wind energy projects and a surrounding buffer of at least one mi (1.6 km).

Western EcoSystems Technology, Inc. (WEST) was contracted to provide biological support for development of the Project, including aerial surveys for raptor nests within the Project and a surrounding 10-mi buffer for eagles, and 2-mi (3.2-km) buffer for other raptors that build large, conspicuous stick nests. To aid in planning eagle survey efforts, WEST gathered data on previously documented bald and golden eagle nests within the 10-mi Survey Area from the California Natural Diversity Database (CNDDB 2017) and CDFW (C. Battistone, personal communication). This memorandum provides a summary of the methods and results of aerial raptor nest surveys conducted by WEST in March and May 2017 in support of the Project.

Survey Areas

The Survey Areas included the Project Area, provided as Geographic Information System (GIS) data by Pacific Wind, which encompassed all possible areas under consideration of development at the time, plus 2- and 10-mi buffers of the Project Area. The 2- and 10-mi Survey Areas included the Project Area and surrounding buffers in Shasta County, California, west of the community of Burney (Figure 1). East-west running California State Route 299 bisects the Survey Areas. The Lassen National Forest extends into the southeastern portion of the Survey Areas, and parts of the Shasta -Trinity National Forest extend into the western and northern portions of the Survey Areas (Figure 1). The dominant vegetation type in the Survey Areas is Sierran mixed conifer forest (post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use within the Project Area, and much of the Survey Areas outside of the national forests, is commercial timber production, which has resulted in a highly fragmented landscape across much of the Survey Areas.

The Survey Areas fall within the Cascades Ecological Region (ecoregion; Griffith et al. 2016), an area generally marked by steep ridges as well as both active and dormant volcanoes. The Cascades Ecoregion is characterized by a mesic, temperate climate, which supports productive coniferous forests. Topography within the Survey Areas includes gently rolling hills that transition to relatively steep, low mountains. The Pit River is the most significant waterway within the Survey Areas; however, numerous smaller creeks and several small reservoirs also are present (Figure 1).

Methods

The initial survey utilized an intuitive controlled survey method that focused on identifying and searching specific habitat features within the Survey Areas that held the highest potential to support the target species. Within the 2-mi Survey Area, efforts focused on habitat features typically used by raptors that build large, conspicuous stick nests (e.g., eagles, osprey [*Pandion haliaetus]*, and red-tailed hawk [*Buteo jamaicensis*]), while search efforts beyond the 2-mi buffer out to 10 mi focused on eagle nests specifically. Key habitat features within the Survey Areas included cliffs, rock outcrops, incised drainages and canyons, powerline structures, and large/dominant trees.

The second survey was conducted as described above for areas within the 2-mi buffer (i.e., an intuitive controlled search of key habitat features throughout the area), while surveys beyond the 2-mi buffer primarily focused on confirming the status of previously documented eagle nests. However, some additional effort was spent searching for eagle nests in a few specific areas identified during the initial survey as being most suitable for supporting eagle nests (e.g., cliffs, transmission line and river corridors) and in the vicinity of historical eagle nest locations where nests were not located during the initial survey.

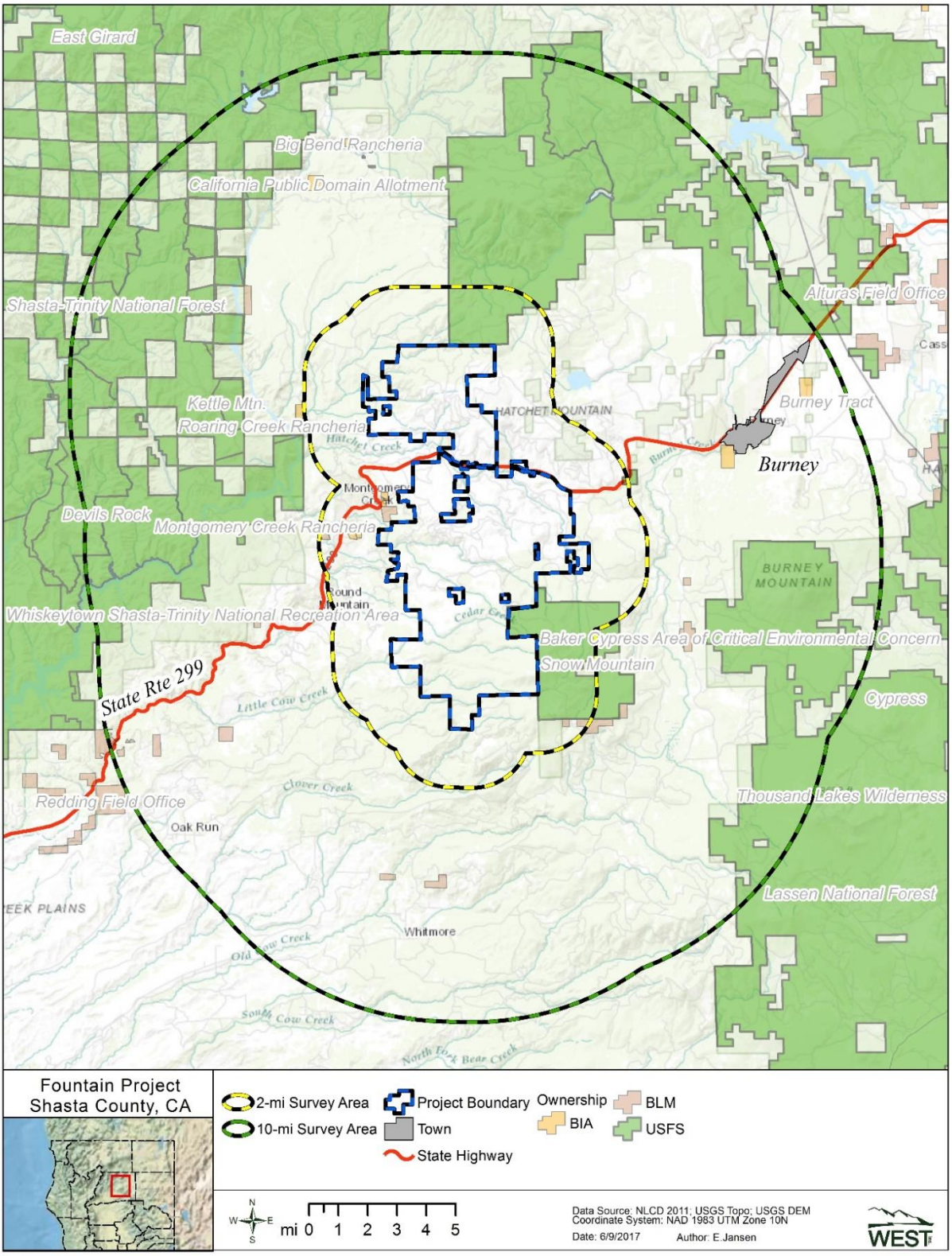

Figure 1. Overview of 2017 Fountain Wind Project raptor nest Survey Areas including 2-mile and 10-mile buffers (BIA = Bureau of Indian Affairs, BLM = Bureau of Land Management, USFS = U.S. Forest Service).

Two helicopter-based aerial nest surveys were conducted in 2017. The initial survey was conducted on March 20 and the second survey on May 9. Both surveys were conducted by two WEST biologists who have prior experience conducting similar surveys in California and elsewhere. The initial survey was conducted during a time period that overlapped the early reproductive period of eagles in northern California (e.g., nest initiation / early incubation), while the second survey was performed at a time when eagles and other raptor species would have been engaged in reproductive activities (e.g., incubating, brooding) at in-use nests.

During surveys, the helicopter was positioned to allow thorough visual inspection of appropriate habitat features. In general, the helicopter remained within a zone 100 feet (ft; 31 m) to 500 ft (152 m) above ground level (AGL) and moved at a relative air speed of approximately 50 mi per hour (80.5 km per hour). When nests were located, the helicopter reduced speed and adjusted flight to allow for a clear view of the nest for documentation and photographing. For each nest found, the location was recorded and nest attribute data were collected, including nest substrate, nest size, and nest condition, along with any comments useful in determining the nest status. Nest size was categorized as: small = small stick nest characteristic of corvids or accipiters (e.g., common raven [*Corvus corax*], sharp-shinned hawk [*Accipiter striatus*]); medium = medium stick nest characteristic of buteos and large owls (e.g., red-tailed hawk, great-horned owl [*Bubo virginianus*]); large = large stick nest that could support eagles, but may also be used by other large raptors (e.g., red-tailed hawk, great-horned owl, osprey); Very_Large = very large stick nest characteristic of eagle nests.

Nest suitability for eagles was also assessed. Bald eagle nests are usually placed in the top quarter of the tree, just below the crown, and against the trunk or in a fork of large branches near the trunk (Buehler 2000). On average, bald eagle nests are 5-6 ft (ft; 1.5-1.8 [m]) in diameter and 2-4 ft tall (0.6-1.2 m; Buehler 2000). Golden eagle nests are most commonly located on cliffs throughout most of North America, with trees nests more common in parts of Wyoming, Washington, and California (Kochert et al. 2002). Golden eagles tend to avoid building nests in dense stands of timber; however, when nesting in forested areas, nesting trees are usually the largest or one of the largest trees available, isolated or on the fringe of small stands of timber, and proximal (less than 0.3 mi [0.5 km]) to large openings (Kochert et al. 2002). Golden eagle nests are large, with nest size generally within the range of 3-8 ft (1.2–2.6 m) in diameter and 0.4-6.6 ft (0.13-2.0 m) tall (Kochert et al. 2002).

Nesting status was classified for the 2017 nesting season based on the recommended terminology of Steenhof et al. (2017), based on the most advanced level of nesting activity documented during the course of both surveys (i.e., status could change from unoccupied to occupied during subsequent surveys in a nesting season, but may not change from occupied to unoccupied in a season). A nest was considered “occupied” if it contained eggs, young, or an incubating eagle, or had a pair of eagles on or near it, or had been recently repaired or decorated (Steenhof et al. 2017). Occupied nests were further classified as “in-use” if eggs had been laid, as evidenced by the presence of an incubating bird, eggs, young, or any other indication that eggs had been laid in the current year (Steenhof et al. 2017). Nests not meeting the above criteria for “occupied” were classified as “unoccupied” if the nest had been visited at

least twice. A status of "unknown" was assigned to nests that could not be effectively monitored and therefore did not meet the criteria of occupied or unoccupied as described above.

Results and Discussion

Eleven occupied bald eagle nests were documented within the 10-mi Survey Area in 2017 (Figure 2, Table 1). Historical golden eagle nest locations provided by CDFW were surveyed, along with other suitable golden eagle nesting substrates; however, no golden eagle nests were documented. Of the 11 occupied bald eagle nests, nine were documented as in-use during at least one survey (Table 1). The two other occupied bald eagle nests showed no evidence of being used for egg-laying during the 2017 nesting season (Figure 2, Table 1). Six of the in-use bald eagle nests contained either one or two chicks estimated to be between 14 and 28 days of age as of the second survey on May 9. One additional in-use nest contained an incubating/brooding adult on May 9, but the number of eggs/young could not be determined (Table 1). Two other occupied nests that were in-use during the March survey apparently failed, showing no evidence of eggs or young during the May survey (Table 1). Two additional nests, both previously documented as historical bald eagle nests by CDFW, were located and determined to be unoccupied in 2017 (Table 1). All of the eagle nests documented were in good to excellent condition. Photographs of the 13 bald eagle nests are included in Appendix A.

Six of the 11 occupied bald eagle nests were located along the Pit River, while the closest occupied bald eagle nest to the Project was at Lake Margaret, approximately 2.9 mi (4.7 km) east of the Project Area boundary (Figure 2). The eagles at Lake Margaret are part of a USFWS movement study, and as such, are fitted with platform transmitting terminal (PTT) tags that help track their movements. Details on how the Lake Margaret pair utilizes the landscape may be available in the future; however data were not available for inclusion in this report. An adult was observed on the Lake Margaret nest (Nest 5; Figure 2, Table 1) in an incubating position during the March survey, but no evidence of continued use was observed during the follow-up survey in May, indicating the nesting attempt had failed. All other occupied bald eagle nests were more than 4.2 mi (6.8 km) from the Project Area boundary (Figure 2).

Nests of other raptor species identified during the aerial survey included two osprey nests (one occupied and one in-use) located within one mi of the Project Area boundary, one occupied red-tailed hawk nest located about 1.5 mi (2.4 km) from the Project Area boundary, and two unoccupied nests located within 1.3 mi (2.1 km) of the Project Area boundary (Figure 2, Table 1). These two unoccupied nests were of medium size and inconsistent with the characterization of bald eagle nests, as described in Buehler (2000).

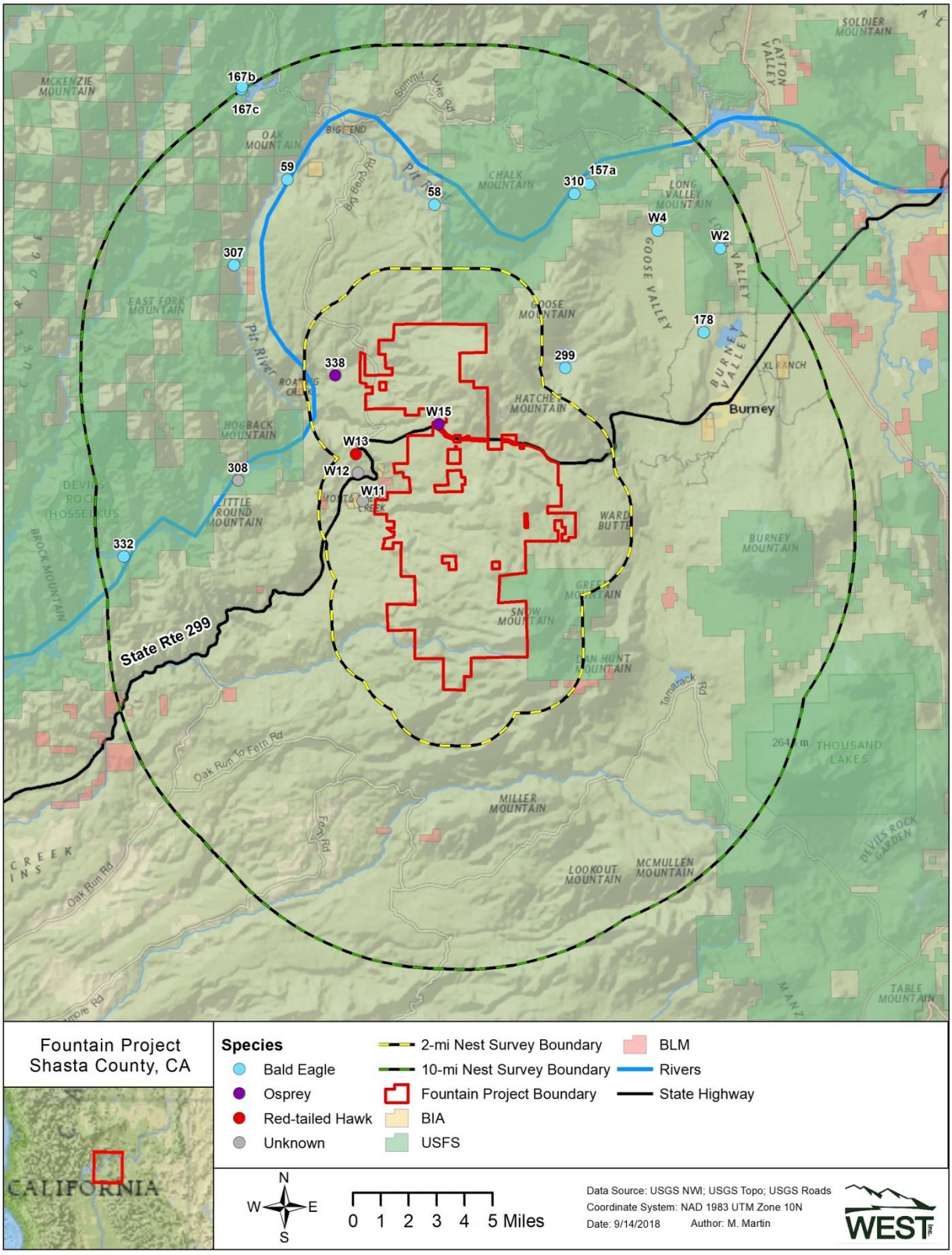

Figure 2. Eagle and other raptor nest locations documented during aerial surveys for the Fountain Wind Project, March 20 and May 9, 2017.

Table 1. Results of the 2017 eagle/raptor nest surveys conducted on March 20 and May 9 at the Fountain Wind Project in Shasta County, California.

			Nest Attributes		
Nest ID[1]	Species	2017 Nest Status[2]	Substrate	Size[3]	Comments
310	Bald eagle	Occupied / In-use	Tree	Very large	One chick in nest estimated to be 28 days old on May 9
178	Bald eagle	Occupied / In-use	Tree	Very large	Two chicks in nest estimated to be 21-28 days old on May 9
58	Bald eagle	Occupied / In-use	Tree	Very large	Two chicks in nest estimated to be 21-28 days old on May 9
59	Bald eagle	Occupied / In-use	Tree	Very large	One chick in nest estimated to be 21 days old on May 9
307	Bald eagle	Occupied / In-use	Tree	Very large	One chick in nest estimated to be 14 days old on May 9
157a	Bald eagle	Occupied / In-use	Tree	Very large	One chick in nest estimated to be 21 days old on May 9
W4	Bald eagle	Occupied / In-use	Tree	Very large	Adult in incubating/brooding position during May survey. No of young/eggs unknown
332	Bald eagle	Occupied / In-use	Tree	Very large	Adult observed in incubating position in March; no evidence of nesting in May indicate failed nesting attempt
299	Bald eagle	Occupied / In-use	Tree	Very large	Adult in incubating position in March; no sign of nesting in May indicate failed nesting attempt
W2	Bald eagle	Occupied	Tree	Very large	Adult observed tending nest in March; no evidence of nesting in May
167b	Bald eagle	Occupied	Tree	Very large	Adult observed tending nest in March; no evidence of nesting in May
167c	Bald Eagle	Unoccupied	Tree	Very large	Historical bald eagle nest in good condition; no evidence of use
308	Bald eagle	Unoccupied	Tree	Very large	Historical bald eagle nest in good condition; no evidence of use
W15	Osprey	Occupied / In-use	Tree	Large	Three eggs observed in nest during May survey
338	Osprey	Occupied	Powerline	Very large	Adult osprey observed tending nest in March; no evidence of nesting in May
W13	Red-tailed hawk	Occupied	Powerline	Medium	Medium-sized nest in good condition
W11	Unknown raptor	Unoccupied	Powerline	Medium	Medium-sized nest in good condition
W12	Unknown raptor	Unoccupied	Powerline	Medium	Medium-sized nest in good condition

[1] IDs preceded by W indicate nests newly discovered by WEST during surveys. All other IDs are consistent with historical IDs provided by California Department of Fish and Wildlife.

[2] Highest level of reproductive status determined for the current breeding season: **Occupied** = contained eggs, young, or an incubating eagle, or had a pair of eagles on or near it, or had been recently repaired or decorated. **In-use** = an occupied nest in which eggs were laid, as evidenced by the presence of an incubating bird, eggs, young, or any other indication that eggs had been laid in the current year. **Unoccupied** = no sign of nesting or territory occupancy in the current nesting season, based on at least two visits. **Unknown** = nest was not located or status as occupied/unoccupied could not be confirmed as defined herein.

[3] **Small** = small stick nest characteristic of corvids or accipiters; **Medium** = medium stick nest characteristic of buteos and large owls.; **Large** = large stick nest that could support eagles, but may also be used by other large buteos, osprey, large owls; **Very Large** = very large stick nest characteristic of eagle nests

Literature Cited

Buehler, D. A. (2000). Bald Eagle (*Haliaeetus leucocephalus*), version 2.0. In The Birds of North America (A.F. Poole and F.B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bna.506

California Energy Commission and California Department of Fish and Game. 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. California Energy Commission, Renewables Committee, and Energy Facilities Siting Division, and California Department of Fish and Game, Resources Management and Policy Division. CEC-700-2007-008-CMF.

Griffith, G.E., J.M. Omernik, D.W. Smith, T.D. Cook, E. Tallyn, Moseley, K. and C.B. Johnson. 2016. Ecoregions of California (2 sided color poster with map, descriptive text, and photographs). U.S. Geological Survey Open-File Report 2016-1021, map scale 1:1,100,000. Available online at: http://dx.doi.org/10.3133/ofr20161021

Kochert, M. N., K. Steenhof, C. L. McIntyre, and E. H. Craig (2002). Golden Eagle (*Aquila chrysaetos*), version 2.0. In The Birds of North America (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bna.684

North American Datum (NAD). 1983. Nad83 Geodetic Datum.

Steenhof, K. M.N. Kochert, C.L. McIntyre, and J.L. Brown. 2017. Coming to Terms about Describing Golden Eagle Production. Journal of Raptor Research, 51(3):378-390.

US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Executive Summary and frontmatter + 103 pp. Available online at: https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf

U.S. Fish and Wildlife Service (USFWS). 2012. Land-based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_uidelines_final.pdf

US Geological Survey (USGS). 2017. USGS Topographic Maps. Last updated January 17, 2017. Homepage available at: https://nationalmap.gov/ustopo/index.html

Appendix A: Photographs of Bald Eagle Nests Documented During Nest Surveys Conducted in 2017 at the Fountain Wind Project, Shasta County, California.

Nest 310, located approximately 5.5 miles northeast of the Fountain Wind Project.

Nest W2, located approximately 8.8 miles northeast of the Fountain Wind Project.

Nest 178, located approximately 6.0 miles east of the Fountain Wind Project.

Nest W4, located approximately 6.7 miles northeast of the Fountain Wind Project.

Nest 299, located approximately 2.9 miles east of the Fountain Wind Project.

Nest 58, located approximately 4.2 miles north of the Fountain Wind Project.

Nest 59, located approximately 6.5 miles northeast of the Fountain Wind Project.

Nest 307, located approximately 5.5 miles northeast of the Fountain Wind Project.

Nest 332, located approximately 9.1 miles west of the Fountain Wind Project.

Nest 157, located approximately 6.2 miles northeast of the Fountain Wind Project.

Nest 308, located approximately 5.0 mi (8.0 km) west of the Fountain Wind Project.

Nest 167c, located approximately 10.1 mi (16.3 km) north of the Fountain Wind Project.

Nest 167b, located approximately 10.1 mi (16.3 km) north of the Fountain Wind Project.

C11. 2018 Northern Goshawk Nest

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TECHNICAL MEMORANDUM

DATE: October 15, 2018

TO: Kristen Goland – Pacific Wind Development LLC

FROM: Joel Thompson and Kori Hutchison - WEST, Inc.

RE: 2018 Northern Goshawk Nest Survey Results, Fountain Wind Project, CA

Introduction

Pacific Wind Development LLC contracted Western EcoSystems Technology, Inc. (WEST) to provide biological survey support for the development of the proposed Fountain Wind Project (Project). The Project is located within a Project area that encompasses approximately 32,000 acres (12,950 hectares) of private land in central Shasta County, California. The primary land use within the Project area is commercial timber production. The dominant vegetation type in the Project area is early seral mixed coniferous forest (post-fire and unburned), with smaller amounts of mixed montane chaparral, and mixed montane riparian forest/scrub. Dominant overstory species include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*). Late seral forest is largely lacking within the Project area due to both fire and commercial timber harvest activities.

Northern goshawk (goshawk; *Accipiter gentilis*) is currently designated as a California Species of Special Concern (CDFW 2018), and according to the California Natural Diversity Database (CNDDB), occurrence areas that encompass historical nest sites associated with four goshawk territories (territories 54, 50, 66, and Cow Creek) have been documented within the Project area (Figure 1). The last documented nesting activity within these four occurrence areas, according to CNDDB data, was in 2003, 1997, 1997, and 2003, respectively (CDFW 2018). While surveys conducted by the timberland owners in the mid-2000s indicated some continued use of territory 54 by goshawks, surveys found no evidence of use at the other three territories at that time (R. Klug, LandVest Inc., personal communication). This is consistent with information provided in the Cedar Boots timber harvest plan (THP-16-077-SHA; CDF 2018a), which was approved in October 2017 and overlaps three of the goshawk occurrence areas (50, 66, and Cow Creek). The THP indicates that none of the three sites (50, 66, Cow Creek) are currently active and that the last known surveys were conducted on the southern site (Cow Creek based on the location

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description provided) in 2006, 2007, and 2008, with no detections (CDF 2018a). The THP further indicates that no goshawks were detected during layout of this THP or previous THPs in the area (CDF 2018a). No other surveys have been conducted more recently within the Project area (R. Klug, personal communication). The THP approval process is considered a certified equivalent of the California Environmental Quality Act (CEQA); therefore, consideration of impacts to northern goshawk provided during the THP approval process for the Cow Creek THP should be considered equivalent to meeting the CEQA standards for that THP (CDF 2018b).

Given that the Project is located on private lands managed for timber production and the most likely direct impact to potentially suitable goshawk nesting habitat would be timber harvest in preparation of turbine pads or road construction, the California Forest Practice Rules (CFPR; CDF 2018b) were consulted in regard to protection of goshawk nests that could be impacted by timber harvest activities, and how those protections may influence survey efforts. According to the CFPR (sections 919.3, 939.3, 959.3), a minimum buffer area of five to 20 acres (equivalent to a 262- to 525-ft [80- to 160-m] radius circle) should be maintained around active goshawk nests when considering timber harvest in proximity to known active nests. Any such buffer applied should include known nest and perch trees, along with screen trees and replacement trees (CDF 2018b).

Northern goshawks have been detected within the Project area during fixed-point large bird use surveys and incidentally by WEST biologists in 2017 and 2018, totaling five observations between April 2017 and May 2018. Potential risk to goshawks from Project operations (i.e., potential collision impact with turbines) will be evaluated based on flight height and abundance data collected during fixed-point bird use surveys. However, goshawk nest sites have been documented historically within the Project area (CDFW 2018), and although the most recent survey data indicate that at least three of the four occurrence areas have been inactive in recent years, surveys for goshawk were conducted in 2018 to provide a more current assessment of potential presence of active nests within the four historical occurrence areas. Based on reviews of aerial imagery within the Project area, habitat within these historical occurrence areas appear to represent the most suitable nesting stands in close proximity (e.g., within 160 m) to areas of potential disturbance based on the most current Project layout as of the date of this report. This memo provides the methods and results of the 2018 surveys.

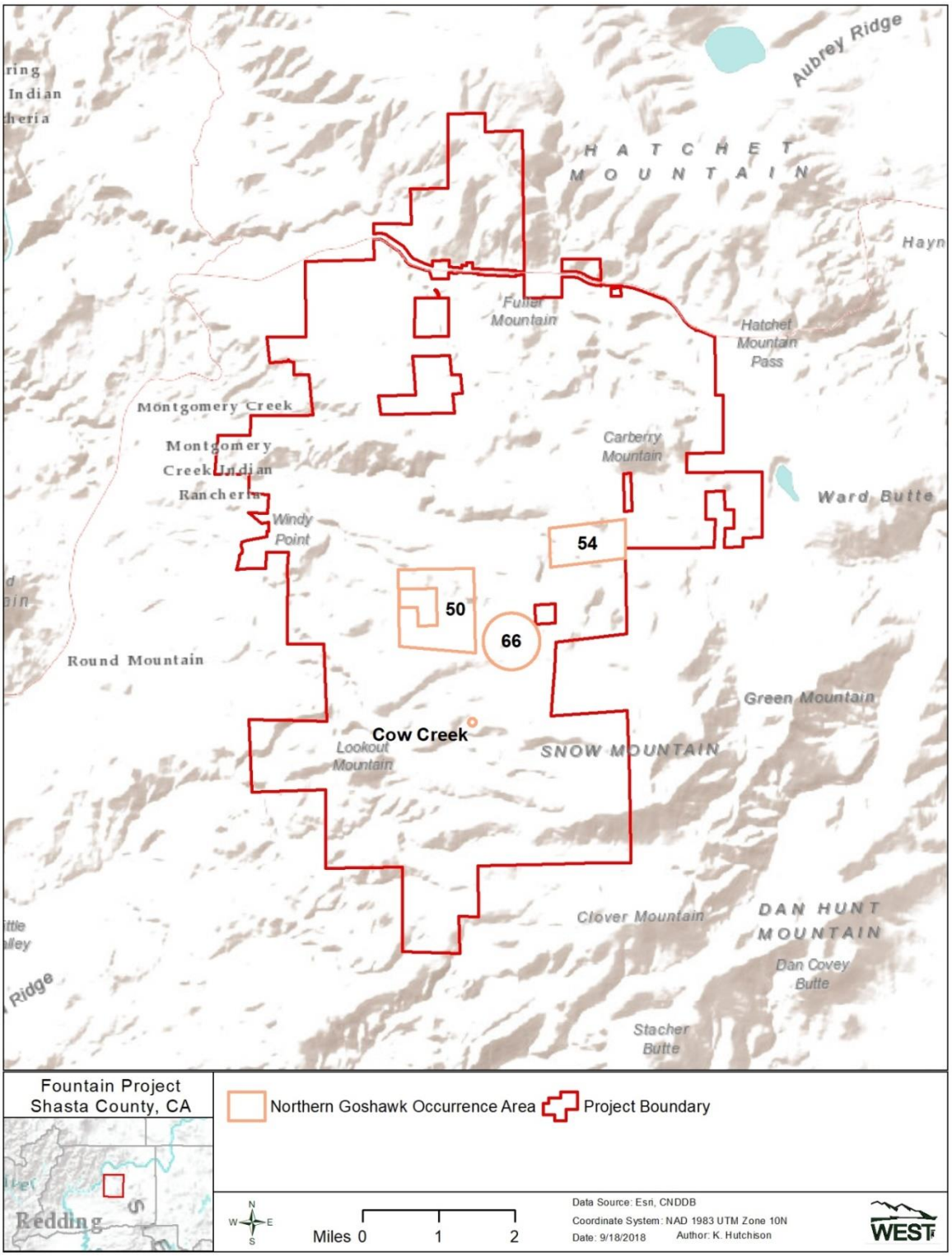

Figure 1. Historical northern goshawk occurrence areas, as depicted by the California Natural Diversity Database (CNDDB), within the Fountain Wind Project, Shasta County, California. Occurrence areas are labeled consistent with CNDDB territory names (i.e., territories, 50, 54, 66, and Cow Creek).

Methods

Field surveys were conducted in the four historical goshawk occurrence areas to assess the potential for occupancy in 2018 utilizing survey techniques described in the Northern Goshawk Inventory and Monitoring Technical Guide (Woodbridge and Hargis 2006). Surveys included two separate methods implemented during the two most vocal stages in the breeding chronology of this species. Dawn acoustical surveys were conducted during the courtship/nest-building stage (February – April), and broadcast acoustical surveys were conducted during the nestling/fledging stage (June – July; Woodbridge and Hargis 2006).

Dawn acoustical surveys are a passive monitoring technique where surveyors are positioned at "listening stations" in close proximity to known nests or patches of suitable habitat (Woodbridge and Hargis 2006). Dawn acoustical surveys were conducted at listening stations in April 2018 and consisted of an approximately 2-hour listening session beginning 0.5-hour prior to sunrise in each of the four occurrence areas (CDFW 2018; Figure 2). Prior to conducting dawn acoustical surveys, WEST biologists searched within the historical occurrence areas for the presence of previously marked nest trees and nests suitable for use by goshawks. Listening stations were located at known nest trees when possible or in close proximity to historical nest tree locations if the known nest tree could not be found (Figure 2).

Broadcast acoustical surveys were conducted in June in all four historical goshawk occurrence areas (CDFW 2018). These surveys consisted of walking transects spaced 200 meters apart in all suitable habitat within the occurrence areas as depicted by the CNDDB data. Surveyors searched for signs of nesting (e.g., nest structures, whitewash, prey remains) while walking transects and stopped periodically (e.g., approximately every 200 m) to broadcast goshawk calls and listen for responses (Woodbridge and Hargis 2006).

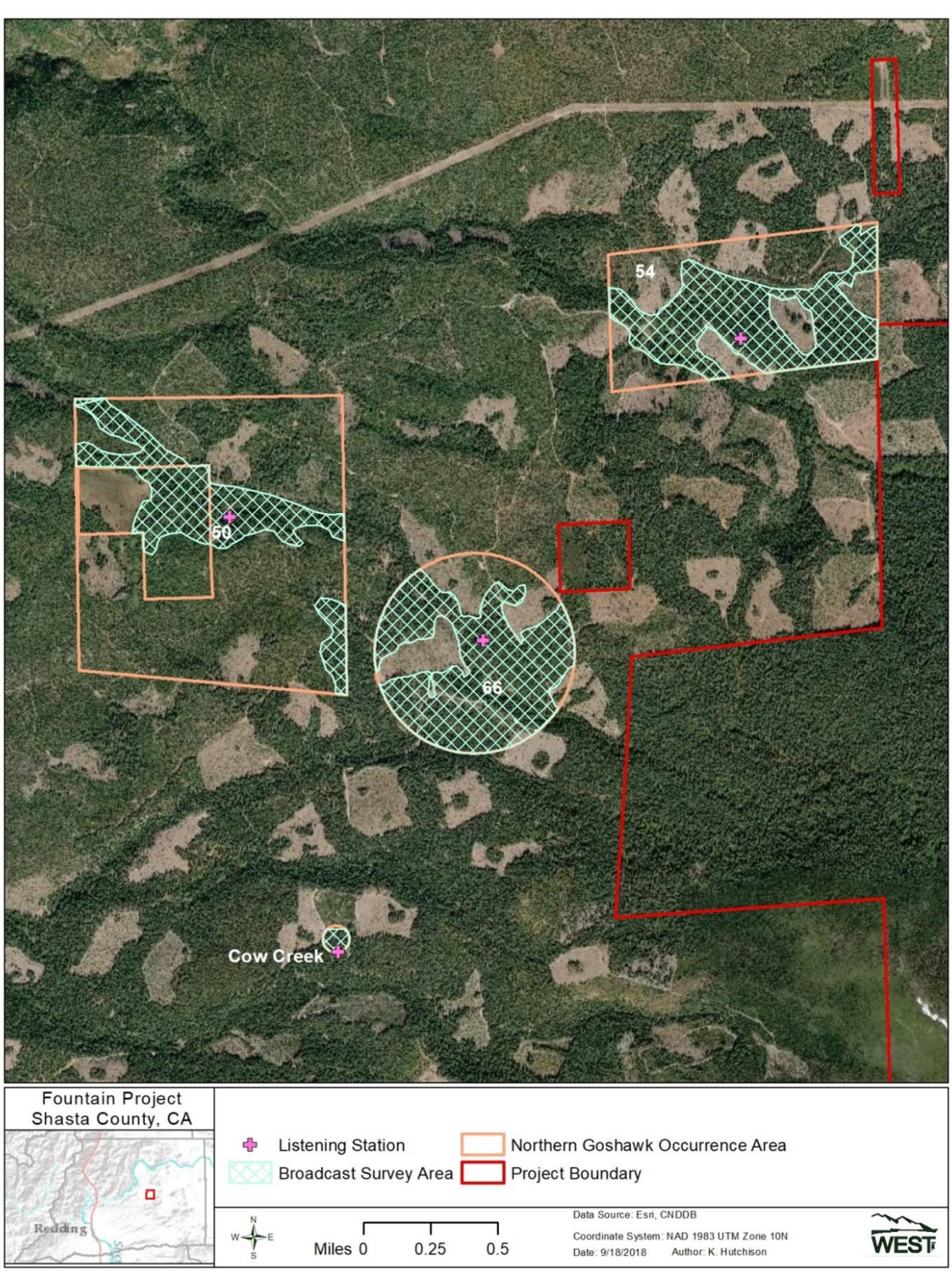

Figure 2. Location of northern goshawk occurrences as provided by the CNDDB, listening stations, and broadcast survey areas within the Fountain Wind Project, Shasta County, California. Occurrence areas are labeled consistent with CNDDB territory names (i.e., territories, 50, 54, 66, and Cow Creek).

Results

Two previously documented nest trees were located during field surveys, one each in occurrence areas associated with territories 50 and 54. One nest tree contained a nest that was occupied by a great horned owl (*Bubo virginianus*) and the other was a broken-top snag no longer capable of supporting a nest.

Dawn acoustical surveys were conducted in each of the four historical goshawk occurrence areas from April 18 – 20, 2018 (Table 1). No visual or auditory detections of goshawks were recorded and no evidence of nesting goshawks was observed during the dawn acoustical surveys.

Table 1. Results of dawn acoustical surveys conducted in historical northern goshawk occurrence areas, as provided by the CNDDB, from April 18 – 20, 2018 at the Fountain Wind Project, Shasta County, California.

Occurrence Area / Territory ID	Survey Date	Survey Time (minutes)	Detections
50	18 April 2018	137	0
54	18 April 2018	120	0
Cow Creek	19 April 2018	120	0
66	20 April 2018	120	0
Total		**497**	**0**

Broadcast acoustical surveys were conducted in suitable habitat within the four historical goshawk occurrence areas from June 23 – 25, 2018 (Table 2). No visual or auditory detections of northern goshawks were recorded and no evidence of nesting northern goshawks was observed during the broadcast acoustical surveys.

Table 2. Results of broadcast acoustical surveys conducted in historical northern goshawk occurrence areas, as provided by the CNDDB, from June 23 – 25, 2018 at the Fountain Wind Project, Shasta County, California.

Occurrence Area / Territory ID	Survey Date	Survey Time (minutes)	Detections
50	23 June 2018	124	0
54	24 June 2018	146	0
Cow Creek	25 June 2018	139	0
66	25 June 2018	127	0
Total		**536**	**0**

Discussion and Conclusions

Previously documented goshawk nest trees were only found in two of the four historical goshawk occurrence areas, one of which was no longer suitable for supporting a goshawk nest and the other which contained a nest that was occupied by a great horned owl. No other marked historical nest trees were located during searches conducted prior to or during surveys, nor

were any other stick nests located that were consistent with the size, structure, and placement of nests typically used by goshawks. Based on the results of surveys conducted in historical goshawk occurrence areas in 2018, the likelihood of nesting goshawks appears to be low within the surveyed areas. This data supports the findings reported in THP-2-16-077-SHA (CDF 2018a), which indicate a lack of goshawk activity in the vicinity of the occurrence areas in recent years.

Surveys focused on historical goshawk occurrence areas, therefore the results are not broadly applicable across the Project area. However, habitat within the historical occurrence areas appears to represent the most suitable nesting stands in close proximity to areas of potential disturbance as of the date of this report, with much of the goshawk habitat in closest proximity to the Project slated for harvest as a part of the Cedar Boots THP (2-16-077-SHA). The CFPR (CDF 2018b) provide guidance on the protection of goshawk nests to ensure protection of both the nest site and nesting birds from the effects of timber operations. If final Project layouts result in direct impacts (e.g., harvesting) to suitable goshawk nesting habitat, then additional surveys, as described in Woodbridge and Hargis (2006), may need to be completed prior to construction to ensure nesting sites are appropriately protected (e.g., consistent with CFPR guidance [CDF 2018b]).

Literature Cited

California Department of Fish and Wildlife, Natural Diversity Database (CDFW). April 2018. Special Animals List. Periodic Publication. 66pp.

California Department of Forestry and Fire Protection (CDF). 2018a. Timber Harvest Plan No. 2-16-077-SHA, Cedar Boots. Approved October 23, 2017. Available online at: ftp://thp.fire.ca.gov/THPLibrary/Cascade_Region/THPs/THPs2016/2-16-077SHA/

California Department of Forestry and Fire Protection (CDF). 2018b. California Forest Practice Rules 2018. Title 14, California Code of Regulations, Chapters 4, 4.5, and 10. with the Z'berg-Nejedly Forest Practice Act; Pertinent Excerpts from Protection of Forest, Range and Forage Lands – Prohibited Activities and the Wild and Scenic Rivers Act; the Professional Foresters Law and Registration of Professional Foresters Rules, and with information related to Forest Roadbed Materials. Prepared for: California Licensed Timber Operators and California Registered Professional Foresters. Compiled by: The California Department of Forestry and Fire Protection, Resource Management, Forest Practice Program, Sacramento, California.

Woodbridge, B. and Hargis, C.D. 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

C12. 2018 Eagle Nest Status Survey Report

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TECHNICAL MEMORANDUM

DATE: September 19, 2018

TO: Kristen Goland –Pacific Wind Development LLC

FROM: Joel Thompson - WEST, Inc.

RE: 2018 Eagle Nest Status Survey Report, Fountain Wind Project, California

Introduction

Pacific Wind Development LLC (Pacific Wind) is developing the proposed Fountain Wind Project (Project) in Shasta County, California. To address potential impacts to nesting golden eagles (*Aquila chrysaetos*) and/or bald eagles (*Haliaeetus leucocephalus*), the U.S. Fish and Wildlife Service (USFWS) recommends conducting eagle nest monitoring within survey areas that extend up to 10 miles (mi; 16 kilometers [km]) from proposed wind energy facilities prior to construction (USFWS 2013). Pacific Wind contracted Western EcoSystems Technology, Inc. (WEST) to provide biological support for the development of the proposed Project, and in 2017 WEST conducted aerial surveys for eagle and other raptor nests within 10- and 2-mi buffers of the Project, respectively (WEST 2018). In 2018, due to concerns raised by California Department of Wildlife (CDFW) regarding the need for a Memorandum of Understanding to conduct aerial surveys for eagles, 2018 eagle nest status surveys were conducted from the ground, as discussions regarding aerial surveys had not been resolved prior to the nesting season. The following memorandum describes the methods and results of eagle nest surveys conducted in support of the Project in 2018.

Methods

Ground-based eagle nest status surveys were conducted by WEST biologists in April 2018 at all previously documented bald eagle nests within the 10-mi survey area that were accessible by public road and viewable from a public access-point. Each survey lasted for a minimum of four hours, unless the nest was documented as being occupied earlier in the survey period (USFWS 2013). Each accessible bald eagle nest was visited once during the 2018 nesting season.

Nest status for the 2018 nesting season was classified based on the terminology of Steenhof et al. (2017). A nest was considered "occupied" if it contained eggs, young, or an incubating eagle, or had a pair of eagles on or near it, or had been recently repaired or decorated (Steenhof et al. 2017). Occupied nests were further classified as "in-use" if eggs had been laid, as evidenced by the presence of an incubating bird, eggs, young, or any other indication that eggs had been laid in the current year (Steenhof et al. 2017). For 2018, a status of "unknown" was assigned to any nest that could not be surveyed due to access issues, or that was not confirmed as occupied, as a single visit in April was considered insufficient to classify a nest as unoccupied for the season.

Results and Discussion

Ten bald eagle nests previously documented in 2017 were surveyed in 2018 (Table 1, Figure 1). Five of the 10 nests were determined to be occupied, two of which were further classified as in-use (Table 1; Figure 1). The occupancy status could not be confirmed for the five remaining nests surveyed in 2018; therefore they were classified as unknown status in 2018 (Table 1, Figure 1). Three nests surveyed in 2017 were not surveyed in 2018 due to lack of access (Table 1; Figure 1).

At each occupied nest, adult(s) were observed in incubating or brooding position, or perched in close proximity to the nest (e.g., in the nest tree; Table 1). For the two nests further classified as in-use, two nestlings were observed in Nest 178 (age not determined) and an adult was observed in incubating/brooding posture at Nest 308. Photographs of the five occupied eagle nests are included in Appendix A.

Adult bald eagles were observed during surveys conducted at 167b, 167c, and 157; however, no adults were observed visiting any of the three nests, nest trees, or trees in the immediate vicinity of these nests during the 4- or 6-hr long surveys conducted at these nest sites (Table 1). These three nests were therefore all classified as status unknown.

The five bald eagle nests documented as being occupied during 2018 surveys were all 5.0 mi (8.0 km) or more from the Project area boundary (Figure 1). Nest 299 (2.9 mi [4.7 km]) and Nest 58 (4.2 mi [6.8 km]) are both closer to the Project area boundary, but the status of both were unknown in 2018.

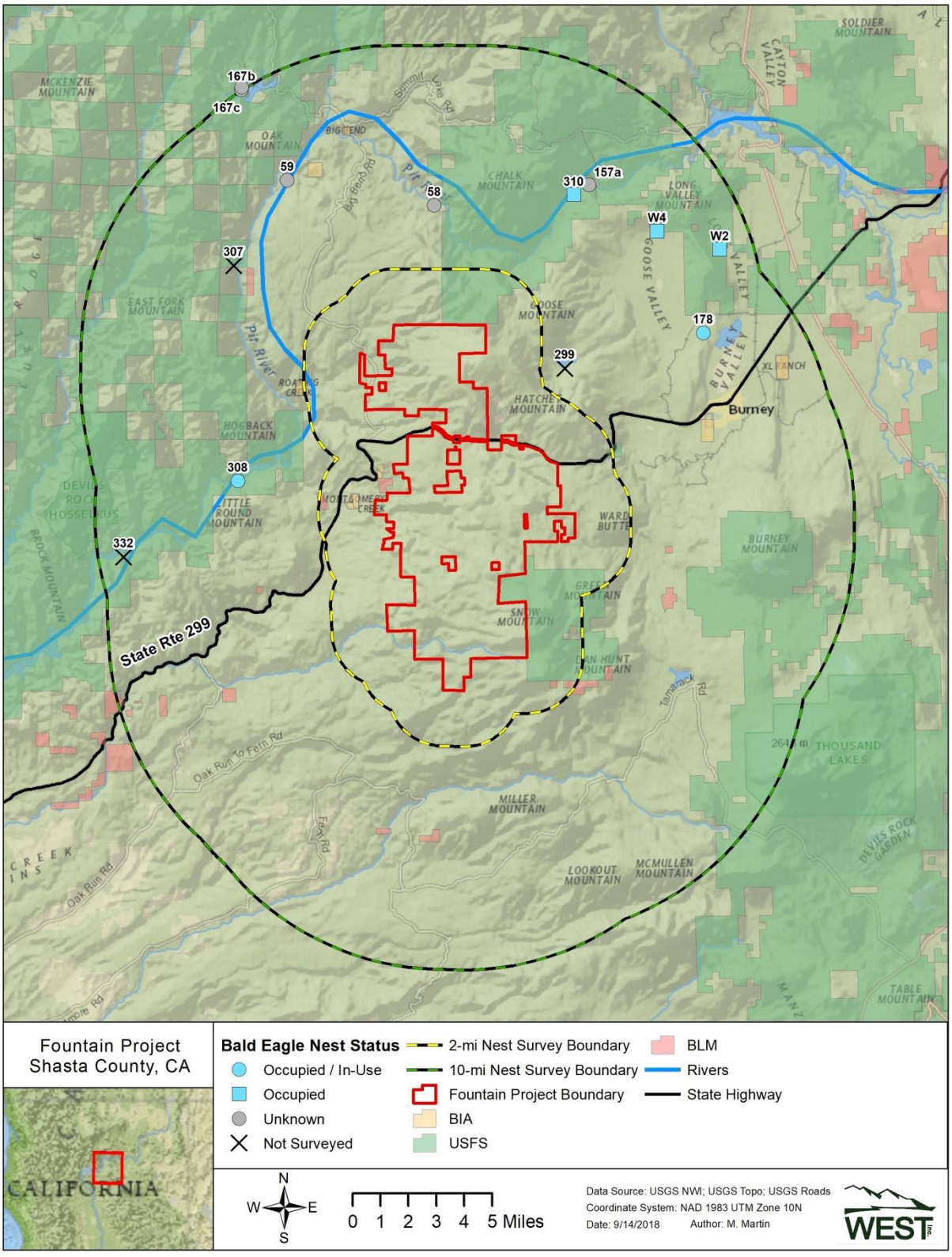

Figure 1. Summary of the 2018 eagle nest status survey results for the Fountain Wind Project, Shasta County, California. (BIA = Bureau of Indian Affairs, BLM = Bureau of Land Management, USFS = U.S. Forest Service)

Table 1. Summary of the 2018 bald eagle nest status surveys conducted within a 10-mile buffer of the Fountain Wind Project, Shasta County, California. Additional details on 2017 nest status surveys are available in the 2017 nest survey report (WEST 2018).

Nest ID[1]	Species	2017 Nest Status[2]	2018 Nest Status[2]	2018 Survey Date	Comments
310	Bald eagle	Occupied / In-use	Occupied	April 19	Two adults observed perched in nest tree, but not on nest
W4	Bald eagle	Occupied / In-use	Occupied	April 22	Adult observed landing on nest, but not confirmed as incubating/brooding/tending young
W2	Bald eagle	Occupied	Occupied	April 21	Adults seen in nest tree, but not on the nest
178	Bald eagle	Occupied / In-use	Occupied / In use	April 21	Adult(s) observed, two nestlings
308	Bald eagle	Unoccupied	Occupied / In use	April 19	Adult(s) in incubating/brooding position
58	Bald eagle	Occupied / In-use	Unknown	April 19	No activity observed during 4-hour survey
59	Bald eagle	Occupied / In-use	Unknown	April 25	Nest not visually located, but no activity observed in area during 4-hour survey
157	Bald eagle	Occupied / In-use	Unknown	April 18	Pair observed flying in the area, but no adults visited the nest or nest tree during the 4-hour survey
167b	Bald eagle	Occupied	Unknown	April 23	Nest not visually located; Nest is close to Nest 167c; Pair of adults observed flying on one occasion, but no activity observed at nest location during 6-hour survey
167c	Bald eagle	Unoccupied	Unknown	April 23	Nest not visually located; Nest is close to Nest 167b; Pair of adults observed flying on one occasion, but no activity observed at nest location during 6-hour survey
307	Bald eagle	Occupied / In-use	Not surveyed / Unknown	not surveyed	Not accessible
332	Bald eagle	Occupied / In-use	Not surveyed / Unknown	not surveyed	Not accessible
299	Bald eagle	Occupied / In-use	Not surveyed / Unknown	not surveyed	Not accessible

[1] IDs preceded by W indicate nests newly discovered by WEST during surveys. All other IDs are consistent with historical IDs provided by California Department of Fish and Wildlife.
[2] Highest level of reproductive status determined for a breeding season: **Occupied** = contained eggs, young, or an incubating eagle, or had a pair of eagles on or near it, or had been recently repaired or decorated. **In-use** = an occupied nest in which eggs were laid, as evidenced by the presence of an incubating bird, eggs, young, or any other indication that eggs had been laid in the current year. **Unoccupied** = no sign of nesting or territory occupancy in the current nesting season, based on at least two visits. **Unknown** = nest was not located or status as occupied/unoccupied could not be confirmed as defined herein (e.g., only a single visit in 2018).

REFERENCES

Pagel, J.E., D.M. Whittington, and G.T. Allen. 2010. Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Golden Eagle Management and Permit Issuance. US Fish and Wildlife Service (USFWS). February 2010. Available online at: http://steinadlerschutz.lbv.de/fileadmin/www.steinadlerschutz.de/terimGoldenEagleTechnicalGuidanceProtocols25March2010_1_.pdf

Steenhof, K. M.N. Kochert, C.L. McIntyre, and J.L. Brown. 2017. Coming to Terms about Describing Golden Eagle Production. Journal of Raptor Research, 51(3):378-390.

US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Executive Summary and frontmatter + 103 pp. Available online at: https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf

Western EcoSystems Technology, Inc. (WEST). 2018. 2017 Raptor Nest Survey Report for the Fountain Wind Project, California. Technical Memorandum - Prepared for Pacific Wind Development LLC. Prepared by WEST, Inc. September 14, 2018.

Appendix A: Photographs of Occupied Bald Eagle Nests Documented During Nest Status Surveys Conducted in 2018 at the Fountain Wind Project, Shasta County, California.

Nest 308, located approximately 5.0 mi (8.0 km) west of the Fountain Wind Project, Shasta County, California.

Nest 310, located approximately 5.6 mi (9.0 km) northeast of the Fountain Wind Project, Shasta County, California.

Nest 178, located approximately 7.8 miles (12.6 km) east of the Fountain Wind Project, Shasta County, California.

Nest W4, located approximately 7.0 mi (11.3 km) northeast of the Fountain Wind Project, Shasta County, California.

Nest W2, located approximately 8.8 mi (14.2 km) northeast of the Fountain Wind Project, Shasta County, California.

C13. Golden Eagle Clarification

Andrea Chatfield <achatfield@west-inc.com>

Fwd: Eagle Info for N. Cal Survey Area

2 messages

Joel Thompson <jthompson@west-inc.com> Mon, Jan 7, 2019 at 11:28 AM
To: Andrea Chatfield <achatfield@west-inc.com>

GOEA info email

---------- Forwarded message ---------
From: **Keiser, Kate@Wildlife** <Kate.Keiser@wildlife.ca.gov>
Date: Thu, Mar 16, 2017 at 11:24 AM
Subject: RE: Eagle Info for N. Cal Survey Area
To: Joel Thompson <jthompson@west-inc.com>, Battistone, Carie@Wildlife <Carie.Battistone@wildlife.ca.gov>

Hi Joel,

I've attached a zipped shapefile for the GOEA data. There are only 3 records so if you find anything be sure to let us know!

As for BAEA, you could also check Unprocessed Data from CNDDB Online Field Survey Form (ds1002) in the BIOS Viewer. It contains information that has been submitted but not yet entered into the CNDDB.

Kate

Kate Whitney Keiser

Environmental Scientist

California Department of Fish and Wildlife

Biogeographic Data Branch

(916) 445-5006, FAX (916) 324-0475

Mailing Address:

1416 9th Street, Suite 1266

Sacramento, CA 95814

Kate.Keiser@wildlife.ca.gov

From: Joel Thompson [mailto:jthompson@west-inc.com]
Sent: Thursday, March 16, 2017 9:11 AM
To: Battistone, Carie@Wildlife <Carie.Battistone@wildlife.ca.gov>
Cc: Keiser, Kate@Wildlife <Kate.Keiser@wildlife.ca.gov>
Subject: Re: Eagle Info for N. Cal Survey Area

Thanks Carie. That may/may not be. The heli was available Tues/Wed, so if we get it by then we'll be OK. Also looks like a fair chance that weather could play in and post-pone us, so it might be fine either way. Regardless, we'd be flying a second round later so even if we don't have all the dots for this one, we could make sure we check all them on the second. Hopefully we'd find them all anyway, but big timber country can be challenging. Also, there are a number of BAEA sites we have from CNDDB, but I'm guessing they could be old and there's better current info. We don't have any GOEA info from CNDDB so that will be a great to have.

Thank you much for the help.

Joel

On Thu, Mar 16, 2017 at 8:52 AM, Battistone, Carie@Wildlife <Carie.Battistone@wildlife.ca.gov> wrote:

> Hi Joel,
>
> Kate will be sending you something for GOEA. I will work on BAEA for you, but it requires me working with staff that are out of the office until next week. Is that too late?
>
> Carie

From: Joel Thompson [mailto:jthompson@west-inc.com]
Sent: Wednesday, March 15, 2017 10:09 AM
To: Battistone, Carie@Wildlife; Keiser, Kate@Wildlife
Subject: Eagle Info for N. Cal Survey Area

Hello Carie and Kate

I have a last minute request (seems like the usual in this day and age) for info on GOEA/BAEA nests in a survey area in N. Cal that we need to fly ASAP (just got a go to fly next Tues/Wed). Any chance you might be able to provide nest site info for BAEA and GOEA in the area by then? Attached is the survey area of interest. We have data from CNDDB, but any updates to that would be greatly appreciated.

Thanks so much.

Joel

--

Joel Thompson

Wildlife Biologist / Project Manager

Environmental & Statistical Consultants

456 SW Monroe Ave, Suite 106

Corvallis, OR 97333

(541) 230-1790 Office

(307) 214-2799 Cell
jthompson@west-inc.com

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GoldenEagleExport.zip
15K

Joel Thompson <jthompson@west-inc.com> Mon, Jan 7, 2019 at 11:29 AM
To: Andrea Chatfield <achatfield@west-inc.com>

the BAEA correspondence

---------- Forwarded message ---------
From: **Battistone, Carie@Wildlife** <Carie.Battistone@wildlife.ca.gov>
Date: Mon, Apr 3, 2017 at 1:29 PM
Subject: RE: Eagle Info for N. Cal Survey Area
To: Joel Thompson <jthompson@west-inc.com>
Cc: McIntyre, Patrick@Wildlife <Patrick.McIntyre@wildlife.ca.gov>

Hello Joel,

I apologize for the delay. The bald eagle database is in draft form right now and I took some time to go through. Attached is a map of the bald eagle locations from CNDDB and from the bald eagle database (points called “Data Provided” in attached). The location data in the bald eagle database has not been cleaned up. Some of the points may be off, or they may be duplicate of what is in CNDDB. This is the best we can do at this point. I hope this helps you in your surveys! If you detect any nests (new of old) please do let us know.

Thanks,

Carie

From: Joel Thompson [mailto:jthompson@west-inc.com]
Sent: Wednesday, March 15, 2017 10:09 AM
To: Battistone, Carie@Wildlife; Keiser, Kate@Wildlife
Subject: Eagle Info for N. Cal Survey Area

Hello Carie and Kate

I have a last minute request (seems like the usual in this day and age) for info on GOEA/BAEA nests in a survey area in N. Cal that we need to fly ASAP (just got a go to fly next Tues/Wed). Any chance you might be able to provide nest site info for BAEA and GOEA in the area by then? Attached is the survey area of interest. We have data from CNDDB, but any updates to that would be greatly appreciated.

Thanks so much.

Joel

--

Joel Thompson

Wildlife Biologist / Project Manager

Environmental & Statistical Consultants

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Draft BAEA locations.pdf
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C14. Response to Informal Consultation Request for Use Permit 16-007

ENVIRONMENTAL & STATISTICAL CONSULTANTS

2725 NW Walnut Boulevard, Corvallis, OR 97330
Phone: 575-802-3959 ◆ www.west-inc.com

6 November 2018

To: Lio Salizar
Planning Division
Shasta County Department of Resource Management
1855 Placer Street, Suite 103
Redding, CA 96001

Re: Response to Informal Consultation Request for Use Permit 16-007, Fountain Wind Project, Shasta County

To Whom It May Concern:

Western EcoSystems Technology, Inc. (WEST) was contracted by Pacific Wind Development LLC (Pacific Wind) to perform a variety of biological resource studies in support of the proposed Fountain Wind Project (Project) in Shasta County, CA. This letter addresses comments and recommendations provided by the California Department of Fish and Wildlife (CDFW) in a letter to the Shasta County Planning Division, Department of Resource Management, dated 2 March 2018 (Letter) as they pertain to biological studies of interest.

A summary matrix of the biological comments provided by CDFW in their Letter and responses provided by WEST and Pacific Wind is provided in Table 1, with additional details and discussion provided later in this response letter, as applicable. A number of desktop analyses and field studies have been completed as of the writing of this letter (Site Characterization Study, great gray owl habitat assessment, nocturnal migration assessment, fixed-point bird use surveys, raptor nest surveys, acoustic bat surveys, rare plant surveys, northern goshawk surveys, willow-flycatcher surveys, foothill yellow-legged frog surveys). Recently finalized reports are provided along with and in support of this response letter. Remaining reports associated with surveys currently underway or to be completed in 2019 will be provided to the County and CDFW as they become available. While additional field studies are ongoing at the Project, survey guidelines (e.g., CEC 2007, USFWS 2012) only recommend one year of surveys for most biological surveys at projects, with two or more survey years generally recommended in areas with high potential for annual variation (e.g., California Central Valley). Biological studies conducted to date have already achieved some of these minimum requirements (e.g., one year of avian use, raptor nest, and acoustic bat surveys). While CDFW recommended that all biological surveys be completed and reports provided in advance of the draft Environmental Impacts Report (EIR), there is little support from past studies to suggest that risk to biological resources will change substantially with the addition of a second year of data, and any minor changes to risk could readily be addressed prior to release of the final EIR or through stipulations attached to the County Permit.

Table 1. Matrix of California Department of Fish and Wildlife (CDFW) biological comments to the Shasta County Planning Division, Department of Resource Management in a letter March 2, 2018 and responses from Pacific Wind Development LLC and Western EcoSystems Technology, Inc. (WEST).

CDFW Comment Section	Pacific Wind / WEST Response	Report Reference
Biological Resources Work Plan	WEST and Pacific Wind expanded and/or implemented additional surveys at the Project in response to CDFW comments on the Work Plan. Methods and results of all additional studies can be found in the accompanying reports.	• Methods and results of additional/expanded studies in response to CDFW comments are available in the accompanying reports.
Special Status Species and Habitat Surveys	Flora and fauna within the Project area have been/are being addressed through a combination of desktop analyses (Site Characterization Study and species-specific habitat analyses) and field studies (rare plant and habitat survey, wetland delineations, willow flycatcher surveys, foothill yellow-legged frog surveys, northern goshawk surveys, fixed-point avian use surveys, and acoustic bat surveys).	• Site Characterization Study (January 2017) • Rare Plant and Natural Vegetation Community Survey Report (October 2018) • Avian Use Survey and Risk Assessment Report (November 2018) • Bat Acoustic Surveys Report (October 2018) • 2017 and 2018 Raptor Nest Surveys (September 2018) • Yellow-legged Frog Survey Report (October 2018) • Willow Flycatcher Assessment and Survey Report (October 2018) • Northern Goshawk Survey Report (October 2018)
CESA-Listed Species		
Foothill Yellow-legged Frog and Cascades Frog	Habitat assessment and initial field surveys completed in 2018. Future coordination with CDFW on need for additional surveys.	• Yellow-legged Frog Survey Report (October 2018)
Willow Flycatcher (WIFL)	Desktop assessments of potential habitat and WIFL surveys completed in 2018.	• Willow Flycatcher Assessment and Survey Report (October 2018)
Northern spotted owl (NSO)	Project is >4 mi from NSO range therefore no surveys are required or planned.	• Not applicable. See additional details later in this response letter.
Great gray owl (GGOW)	Desktop and field assessment of potential great gray owl habitat conducted in 2018. No suitable habitat was identified that would necessitate surveys.	• Great Gray Owl Habitat Assessment Memo (October 2018)

Gray Wolf	Wolves and/or evidence of wolves traveling through or adjacent to the Project area have been documented (WEST 2018, CDFW 2013, 2018); therefore, there is potential for additional use of Project area in the future. However, gray wolf specific surveys are not planned.	• Not applicable; see additional details later in this response letter.
State Listed and Fully Protected Avian Species	Fixed-point large bird use surveys are being conducted for two consecutive years throughout the project area, which will be used to assess the potential for impacts to the state-listed bald eagle and sandhill crane.	• Year 1 Avian Survey and Risk Assessment Report (November 2018)
Fully Protected Species	Potential occurrence of Fully Protected species is addressed in the SCS. Fixed-point large bird use surveys are being conducted for two consecutive years throughout the project area. While a second year of data is being collected, an avian risk assessment has been prepared to address impacts to these species based on the first year of data, which is consistent with agency guidelines. While additional data could influence the risk assessment to some extent, substantial changes to the potential for impacts to Fully Protected avian species are not anticipated. Should the second year of data indicated substantial changes in risk to Fully Protected species, such changes will clearly be identified in an updated risk assessment .	• Site Characterization Study (January 2017) • Year 1 Avian Survey and Risk Assessment Report (November 2018) • 2017 and 2018 Raptor Nest Surveys (September 2018)
Species of Special Concern (SSC)	A number of SSC were identified in the SCS as having some potential to occur in the Project area during some time of the year, although habitat for many species is restricted (e.g., ponds, streams, meadows, riparian thickets) and impacts avoided through project design. Species-specific surveys have been conducted for some species (e.g., northern goshawk). Others will be addressed based on the standardized fixed-point avian use surveys and associated risk assessments.	• Site Characterization Study (January 2017) • Year 1 Avian Survey and Risk Assessment Report (November 2018) • Northern Goshawk Survey Report (October 2018)

Northern goshawk	Surveys conducted in historical occurrence areas in 2018. Limited nesting habitat in areas of potential impacts. Additional surveys dependent on final project layouts.	• Northern Goshawk Survey Report (September 2018) • Year 1 Avian Survey and Risk Assessment Report (November 2018)
Avian point count surveys	Avian point count surveys are being conducted year round within the Project area to assess risk to avian species.	• Year 1 Avian Survey and Risk Assessment Report (November 2018)
Eagle / Large Bird Use Surveys	Eagle / large bird use surveys are being conducted year round within the Project area to assess risk to eagles and other large bird species.	• Year 1 Avian Survey and Risk Assessment Report (November 2018)
Nocturnal avian surveys	Collision mortality of nocturnal migrant birds has generally been low at wind energy facilities, particularly in the western US, and multi-bird fatality events are extremely rare. This is consistent with data from the nearby Hatchet Ridge Wind Project. Nocturnal radar studies at proposed wind energy projects have been implemented as a method to characterize migration patterns and potential exposure levels for nocturnal migrants, but no correlation has been found between radar-measured passage rates of avian targets and post-construction fatality rates, indicating that preconstruction radar studies are not an effective tool for assessing risk to migrating birds at wind energy facilities. Nocturnal migration (i.e., radar) surveys are not planned.	• Nocturnal Radar Synthesis / Summary Report (October 2018)
Bat monitoring	Acoustic bat monitoring was conducted in 2017 within the Project area, including additional detectors placed in the field following meetings with CDFW in 2017.	• Bat Acoustic Surveys Report (October 2018)
Wildlife Movement Study	The project will not impede wildlife movement via installation of fencing or other physical impediments. No specific wildlife movement studies are planned.	• See additional discussion in later in this letter.
Deer Habitat.	Development of the Project is not expected to result in levels of activity that exceed what regularly occurs at the Project during timber harvest operations or associated activities	• See additional discussion in later in this letter.

	including road maintenance or construction. No deer-specific surveys are planned.	
Rare Plants and Natural Communities	Rare plant surveys and mapping of Natural Vegetation Communities was completed in 2018. No rare plants were documented and no Sensitive Natural Vegetation Communities were identified.	• Rare Plant and Natural Vegetation Community Survey Report (October 2018)
Invasive Species	Invasive plant species were documented during rare plant surveys in 2018 and are discussed in the rare plant report.	• Rare Plant and Natural Vegetation Community Survey Report (October 2018)
Proposed Survey Corridors	Survey Corridors were utilized and incorporated various buffers to guide surveys for taxa and habitats most vulnerable to ground disturbance activities (e.g., rare plants, yellow-legged frog, and willow flycatcher). Much more broad areas were used to guide survey efforts for taxa (e.g., large and small birds) that are more at risk of collision impacts from turbines.	• See additional discussion later in this letter.

Biological Resources Work Plan

Summary of Comments and Recommendations:

CDFW requested an updated Biological Resources Work Plan which addresses issues documented in their Letter.

Response:

Based on discussions with CDFW and USFWS in 2017 regarding the initial study plan, WEST and Pacific Wind expanded several studies (e.g., moved to year-round small bird surveys) and added a number of additional survey efforts (e.g., willow flycatcher, foothill yellow-legged frog). Because most all surveys that were added or expanded in response to agency comments have been completed (in whole or in part), the methods and results are provided in the accompanying survey reports. Table 1 and this response letter provide a summary of how WEST and Pacific Wind addressed concerns over the initial work plan and provides a reference for all studies completed to date and/or planned at Fountain. Given that study methods (and results) are available in the accompanying survey reports, a revised Work Plan has not been prepared.

Special-Status Species and Habitat Surveys

Summary of Comments and Recommendations:

CDFW recommended completion of a comprehensive baseline survey including a complete assessment of the flora and fauna within and adjacent to the Project area, with emphasis on special-status species.

Response:

Flora and fauna within the Project area have been/are being addressed through a combination of desktop analyses and field studies to provide a comprehensive baseline of species occurrence within the Project area. Prior to initiation of biological resource studies at the Project, WEST drafted a desktop Site Characterization Study utilizing publicly available resources. The overall purpose of the Site Characterization Study was to identify the biotic and abiotic environmental characteristics of the Project and surrounding Evaluation Areas, evaluate potential impacts to these resources from wind energy development, and inform whether additional environmental resource surveys or assessments were warranted. The Site Characterization Study focused on the potential occurrence of special-status plant and animal species, and the habitats that support special-status species, including landcover/vegetation maps. In addition, WEST has conducted surveys for birds and bats (e.g., fixed-point avian use surveys and acoustic bat survey) to document use by special-status birds and bats, as well as species-specific surveys for several special status species with predicted possible occurrence in the Project area (e.g., willow flycatcher, northern goshawk, foothill yellow-legged frog, and rare plants). Results of surveys conducted to date are available in the various reports (see Table 1 and the following sections).

CESA-Listed Species

Candidate Amphibian Species – Foothill Yellow-legged Frog and Cascades Frog

Summary of Comments and Recommendations:

Foothill yellow-legged frog (*Rana boylii*) habitat and Cascades frog (*R. cascadae*) habitat occurs at the Project; the Department recommended completion of a habitat assessment and subsequent focused surveys for these species in all area of the Project where species' habitat may be impacted.

Response:

WEST conducted a desktop assessment for foothill yellow-legged frog habitat at the Project and confirmed that models predict the possible occurrence of habitat for this species. In 2018, WEST conducted initial visual encounter surveys (i.e., sub-adult) for foothill yellow-legged frog in modelled potential habitat areas potentially at risk of disturbance through Project development. While surveys in 2018 did not meet full protocol (e.g., surveys during multiple life stages), surveys were conducted following methods for conducting visual encounter surveys as described in *Considerations for Conserving the Foothill Yellow-legged Frog* (CDFW 2018a). Suitable habitat was limited within the Project area and no foothill yellow-legged frogs were detected. Survey results and methodologies are detailed in a stand-alone survey report. The data available from historical work in support of timber management activities within the Project area, and 2018 habitat assessments and surveys for foothill yellow-legged frog, suggest that foothill yellow-legged frog do not currently occur in, nor will they likely colonize the generally low-quality habitats present in the Project Survey Corridors (i.e., areas of potential disturbance based on possible project layouts). Therefore, no impacts to foothill yellow-legged frog are expected as a result of the Project. The need, scope, and timing of additional surveys for this species will be determined in coordination with CDFW.

The Project Survey Corridors have been located entirely outside the occupied range of Cascades frog and the modeled low-quality potential habitat that does occur within the larger Project area was confirmed as non-suitable; therefore, species-specific surveys are not warranted. Cascades frog habitat is distinctly different from foothill yellow-legged frog; Cascades frog prefers lentic waterbodies and associated meadows and wetlands. Based on range maps, the current range of Cascades frog overlaps with only a small area at the southern extent of the Project area, while all Survey Corridors are located more than two mi from the known range. According to the California Natural Diversity Database (CDFW 2018b), no known occurrences of Cascades frog have been documented within the Project area and the closest known occurrence are approximately 1.2 mi (1.9 km) southeast of the Project area boundary and 6.3 mi (10.1 km) north of the Project area boundary. A desktop analysis of the California Wildlife Habitat Relationships (CWHR; CDFW 2018c) database indicated approximately 75 acres (30 hectares) of low quality habitat potentially exists in the southern portion of the Project area, more than two miles south of the Project Survey Corridors. Results from field-based habitat mapping of this area verified that this predicted low quality habitat does not currently include the habitat elements necessary to support Cascades frog (e.g., ponds or wet meadows).

Because the Project Survey Corridors are entirely outside the Cascades frog range and the modeled low-quality potential habitat that does occur within the larger Project area was confirmed as non-suitable, formal surveys for Cascades frog are not warranted.

Willow Flycatcher Protocol Surveys

Summary of Comments and Recommendations**:**

CDFW commented that they were aware of known breeding occurrences of willow flycatcher (*Empidonax traillii*) on or near the Project, and potential habitat may occur at the Project based on the CDFW willow flycatcher habitat model. CDFW recommended that a qualified biologist conduct willow flycatcher habitat delineation and field surveys at the Project to determine site occupancy.

Response**:**

WEST conducted a desktop assessment of willow flycatcher occurrences and potentially suitable habitat at the Project, followed by field surveys that resulted in no willow flycatcher detections. According to the California Natural Diversity Database (CDFW 2018b) the closest occurrences of willow flycatcher are approximately 20 miles (mi) northeast of the Project. Habitat models (Timossi et al. 1995) predict that potentially suitable habitat occurs at the Project in several areas. A qualified WEST biologist conducted a reconnaissance-level site visit to evaluate modelled habitat for potential suitability in June 2018. Following this field assessment, willow flycatcher surveys were conducted at the Project in areas of modelled and field-confirmed potentially suitable habitat during the 2018 breeding season. Protocol-level surveys were conducted following recommendations in *A Willow Flycatcher Survey Protocol for California* (Bombay et al. 2003) by a biologist experienced in conducting surveys for this species in California. No willow flycatchers were detected at the Project during these surveys. Survey results and details on the survey methodology are detailed in a stand-alone survey report.

Northern Spotted Owl Protocol Surveys

Summary of Comments and Recommendations:

CDFW recommended surveys for northern spotted owls (*Strix occidentalis caurina*) because designated critical habitat for this species and known northern spotted owl territories are located in close proximity to the Project.

Response:

The Project is located outside the range of the northern spotted owl and based on survey protocols, surveys are not warranted. The Project is more than 4.3 mi south of the Pit River, which is the established southern boundary for the northern spotted owl range in California (Gutierrez and Barrowclough 2005). The California Forest Practice Rules require surveys for northern spotted owls only in suitable habitat, and require habitat protection up to 1.3 mi from a known activity center. Because the project is outside of the northern spotted owl range and the distance to any potentially occupied northern spotted owl activity centers far exceeds the 1.3 mi habitat protection buffer, no northern spotted owl surveys are proposed for the Project.

Great Gray Owl

Summary of Comments and Recommendations:

CDFW recommended a habitat assessment and surveys for great gray owl (*Strix nebulosi*) be conducted as habitat is modeled within and near the Project.

Response:

WEST conducted a desktop assessment of potential great gray owl occurrences and habitats in the Project area, which indicated that no suitable great gray owl nesting habitat existed within the Project area and that no documented records of great gray owl exist in or near the Project area (CDFW 2018b); therefore, species-specific surveys for great gray owl were not warranted. CDFW's Great Gray Owl Habitat Model (CDFW 2011) indicated that potentially suitable foraging and nesting habitat was located within the Project area; however, based on a field assessment of the modelled potentially suitable habitats , it was determined that habitat conditions were not suitable for great gray owl. Consistent with the CDFW Model, criteria for inclusion as potential foraging habitat included the following Wildlife Habitat Relationship (WHR) types: wet meadows, annual grasslands, and perennial grasslands; criteria for inclusion as potential nesting habitat included trees of WHR size 4M (11-24 inches diameter at breast height, 12-24 foot (ft) crowns, and 40-59% canopy cover) and larger/denser (CDFW 2011, CDFW 2014). The CDFW Model nesting habitat criteria are generally consistent with criteria identified in the survey protocol for great gray owl within the Northwest Forest Plan (NWFP) Area (Huff and Godwin 2016), which indicates that suitable nesting habitat must include mature or old-growth conifer stands with greater than 50% canopy cover containing potential nest trees (broken-top snags greater than 16-in diameter at breast height, trees containing pre-existing stick nests from hawks, ravens, or squirrels; or mistletoe brooms). Suitable nesting habitat for great gray owl needs to be adjacent to suitable foraging habitat (i.e., meadows greater than 10 acres; Huff and Goodwin 2016). Based on desktop and field reviews of potentially suitable habitats, these conditions do not occur within the Project area. In addition, there are no known occurrences of great gray owl within or adjacent to the Project (CDFW 2018b), and great gray owl has not been detected by biologists conducting a variety of surveys at the Project over the past approximately 18 months. The closest occurrence of great gray owl documented in the California Natural Diversity Database (CDFW 2018b) is approximately 85 mi northeast of the Project. Due to the absence of suitable habitat or great gray owl presence, no further great gray owl habitat assessments or surveys are proposed at the Project. Additional details on the habitat assessment are available in a stand-alone memo.

Gray Wolf

Summary of CDFW Comments and Recommendations:

No localized gray wolf (*Canis lupus*) activity is currently known from within or near the Project area, although wolves have been detected in California, including western Lassen and eastern Siskiyou counties. If gray wolf activity is detected during Project surveys, the Project proponent should consult with CDFW.

Response:

The Project area comprises a working commercial forest landscape, with active timber harvest operations, and numerous well-maintained and well-traveled roads, which results in a landscape unlikely to be used for establishing dens or rendezvous sites by gray wolves, relative to other less disturbed landscapes in the region (e.g., National Forests and National Park lands). Because wolves are highly mobile, particularly dispersing individuals, the species may traverse the Project area and records indicate that some transient individuals may have passed through the Project area in the past (CDFW 2018d), and WEST documented what appeared to be tracks of a single wolf in the snow in the Project area in late winter 2018. Should wolves begin to use the Project area with any regularity as populations increase, such use would be expected to be compatible with current surface uses, which includes high levels of habitat fragmentation and high levels of vehicle and human activity during some seasons. If future wolf activity at the Project is confirmed through visual or auditory detections, or other definitive means, Pacific Wind will report such information to CDFW.

State Listed and Fully Protected Avian Species

Summary of CDFW Comments and Recommendations

Bald eagle (*Haliaeetus leucocephalus;* State Endangered) and greater sandhill crane (*Grus canadensis;* State Threatened) are both listed pursuant to CESA and are Fully Protected under FGC section 3511; therefore the Department is not authorized to issue permits for their incidental take as discussed below.

Response:

WEST and Pacific Wind acknowledge the status of these two state listed and Fully Protected species and the lack of available permits for their incidental take. Fixed-point large bird use surveys are being conducted for two consecutive years throughout the project area, which will provide the data necessary to assess the potential for impacts to the state-listed bald eagle and greater sandhill crane. Additional discussion related to these two species is provided in the following sections.

Fully Protected Species

Summary of CDFW Comments and Recommendations:

Fully protected avian species, including but not limited to bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), greater sandhill crane (*Grus canadensis*), and American peregrine falcon (*Falco peregrinus anatum*) may be impacted by the Project. Project-related impacts on these species and all other fully protected species identified during the environmental review process should be mitigated to a less than significant level.

Response:

WEST conducted a comprehensive Site Characterization Study intended to identify special status species that may occur or are known to occur on the Project and may be at risk from Project development, and is currently conducting a variety of biological studies that aim to identify occurrence of wildlife species, including fully protected species, at the Project. Surveys

have been and are still being conducted to assess risk to fully protected species. These surveys include two years of large bird use surveys to address risk to large birds, including eagles, sandhill cranes, and peregrine falcon, along with other raptor and large bird species. Raptor nest surveys were also conducted to gain additional information on the potential risk to both bald and golden eagles, as well as other raptors. Additional information on Fully Protected species can be found in the Site Characterization Study and survey-specific reports (e.g., 2017 and 2018 raptor nest surveys and the year 1 avian study report).

Species of Special Concern

Summary of CDFW Comments and Recommendations:

The Project has the potential to impact a number of Species of Special Concern (SSC); additional research, including database queries, is necessary to identify the full list of SSC with potential to occur on the Project. Additional surveys will be necessary to identify impacts to these species.

Response:

WEST conducted a comprehensive Site Characterization Study intended to identify special status species that may occur or are known to occur on the Project and may be at risk from Project development, and is currently conducting a variety of biological studies that aim to identify occurrence of wildlife species, including SSC, at the Project. Fixed-point avian use surveys are the primary field survey being implemented to address impacts to avian species and are being conducted for two years, which will address impacts to avian SSC potentially resulting from collision with turbines. In addition, species-specific surveys were conducted for northern goshawk to assess the potential presence of historical nests within the Project area. While avian SSC are being addressed through specific surveys (e.g., fixed-point avian and/or species specific surveys), most other SSC are largely confined to habitats unlikely to be significantly impacted by Project development (e.g., aquatic species such as western pond turtle [*Emys marmorata*] and Pacific tailed frog [*Ascaphus truei*]) or are highly mobile and more likely to be transient through the Project area (e.g., fisher [*Pekania pennanti*]). Additional information on SSC can be found in survey specific reports (e.g., Site Characterization Study; year 1 avian study report, and northern goshawk nest survey report). No additional species-specific surveys are planned to assess risk to SSC.

Northern Goshawk Protocol Surveys

Summary of CDFW Comments and Recommendations:

Northern goshawk (*Accipiter gentilis*) occurrences are documented on and near the Project. CDFW requests completion of focused protocol-level northern goshawk surveys following the *Northern Goshawk Inventory and Monitoring Technical Guide*.

Response:

WEST conducted goshawk nest surveys in the four historical goshawk occurrence areas identified within the Project area to assess the potential for occupancy in 2018. Surveys were consistent with techniques described in the Northern Goshawk Inventory and Monitoring Technical Guide (Woodbridge and Hargis 2006). Surveys included two separate methods

implemented during the two most vocal stages in the breeding chronology of this species. Dawn acoustical surveys were conducted during the courtship/nest-building stage (February – April), and broadcast acoustical surveys were conducted during the nestling/fledging stage (June – July; Woodbridge and Hargis 2006). No evidence of nesting northern goshawks was documented, which is consistent with the findings reported in Cedar Boots Timber Harvest Plan (THP-2-16-077-SHA; CDF 2018), which indicated a lack of goshawk activity in the vicinity of three of the occurrence areas in recent years (the fourth area was not assessed in the THP). Survey results and details on the survey methodology are detailed in a stand-alone survey report. In addition to the nest surveys, the first year of comprehensive avian use study at the Project has been completed, with year 2 of that study ongoing. As of September 2018 (17 months of surveys), six northern goshawk observations have been recorded during fixed-point avian use surveys (4 observations) or incidentally (2 observations). Information related to northern goshawks observed during those surveys is, or will be available in the applicable avian use reports.

Avian Point Count Surveys

Summary of CDFW Comments and Recommendations:

Bird Use Counts (BUC) are intended to provide baseline data on avian species richness and relative abundance and to estimate the spatial and temporal use of the Project by all birds. The Department requests that a protocol for BUC be developed and addressed in the Work Plan, which should, at a minimum, meet the requirements outlined in the CEC/CDFG Guidelines.

Response:

Agency guidelines regarding the study of wildlife and how to assess potential impacts of wind energy on wildlife have evolved over the past 10 years, with the most current agency guidance provided by the USFWS in the Land-based Wind Energy Guidelines (WEG; USFWS 2012) and Eagle Conservation Plan Guidance (ECPG; USFWS 2013). Avian use surveys at the Project were designed to address the questions posed under Tier 3 of the WEG (USFWS 2012) and Stage 2 of the ECPG (USFWS 2013), while also collecting data comparable to what is recommended in the more dated California Wind Energy Guidelines (CEC Guidelines; CEC and CDFG 2007). Similar to the WEG, the CEC Guidelines identify modified point counts surveys (i.e., bird use counts) as the primary survey technique to collect data on bird species composition, relative abundance, and bird behavior that might influence vulnerability to collisions with wind turbines (see top of page 44 of the CEC Guidelines). Recommendations in the WEG, ECPG, and CEC Guidelines all result in data sufficient to document species composition, relative abundance, and behavior; therefore, to reconcile the differing protocols as presented in the various guidelines, implementation of the more current ECPG (and WEG) were given precedent over strict interpretation of the CEC Guidelines. WEST is currently conducting a comprehensive avian use study at the Project, including focused small bird and large bird surveys, which adhere to the best available science regarding survey and/or monitoring techniques for wind energy project development as provided in the WEG and ECPG, while also collecting data to satisfy the intent of the older CEC Guidelines. The comprehensive avian use study is intended to provide baseline data on avian species richness and relative abundance at the Project and to estimate the spatial and temporal use of the Project by avian species.

Surveys are being conducted at all 39 plot locations once per month, year-round (to the extent practicable), for a total of two full years. Survey locations were selected to survey representative habitats and topography within the Project, while achieving relatively even spatial coverage, as possible and practicable. The avian use study includes separate surveys for small birds and large birds, with focused small bird surveys conducted immediately prior to large bird surveys at a given survey plot location. In total, the two years of avian use survey will result in more than 1,200 hours of survey effort. The final report for the first year of avian use surveys was finalized in October 2018 and has been provided for review along with this letter. The second year of surveys will be completed in June 2019, with a final report to follow in summer 2019.

Eagle/Large Bird Use Surveys

Summary of CDFW Comments and Recommendations:

The Department requested information as to how large bird use of the Project will be documented in addition to the proposed surveys for eagle and raptor nests and commented that the initial study plan indicated surveys did not meet CEC/CDFG guidelines.

Response:

WEST is currently conducting a comprehensive avian use study at the Project, including focused small bird and large bird surveys, which adhere to the best available science regarding survey and/or monitoring techniques for wind energy project development as provided in the WEG (USFWS 2012) and/or ECPG (USFWS 2013), while also collecting data to satisfy the intent of the more dated CEC Guidelines (CEC and CDFG 2007). The large bird / eagle use surveys were specifically designed to address the needs of the ECPG, while also collecting data to satisfy the intent of the CEC guidelines, which is to collect data on bird species composition, relative abundance, and bird behavior that might influence vulnerability to collisions with wind turbines (see top of page 44 of the CEC Guidelines). Recommendations in the 2013 ECPG and the 2007 CEC guidelines both result in data sufficient to document species composition, relative abundance, and behavior; therefore, to reconcile the two slightly differing protocols for eagles/raptors/large birds as presented in the various guidelines, implementation of the more current ECPG were given precedent over strict interpretation of the older CEC recommendations. Surveys under the ECPG (60-min duration) are twice as long as those recommended by the CEC guidelines (30-min), thereby providing twice the survey effort per survey. Additionally, while all survey points are not surveyed weekly, surveyors are on site weekly conducting surveys (1-2 days a week depending on number of technicians) at approximately 9-10 points per week. The survey schedule ensures surveys are spread across the entire survey year and that extended periods of time do not go unsurveyed. Surveys are being conducted for two full years, which further aids in satisfying the intent of the CEC guidelines. The survey design being implemented will result in approximately 1,000 hours of survey effort for large birds specifically during the 2-year survey period (about 500 hours each year).

The final report for the first year of avian use surveys, which includes the large bird use surveys, was finalized in October 2018 and has been provided for review along with this letter. The

second year of surveys will be completed in June 2019, with a final report to follow in summer 2019.

Nocturnal Avian Surveys

Summary of CDFW Comments and Recommendations:

The Department recommends utilizing multiple survey methods to conduct a nocturnal migration survey at the Project. The Department also recommends the completion of focused nocturnal owl surveys, designed to detect all species of owls potentially present within the Project.

Response:

Although nocturnal radar studies at proposed wind energy projects have been implemented as a method to characterize migration patterns and potential exposure levels for nocturnal migrants, no correlation has been found between radar-measured passage rates of avian targets and post-construction fatality rates, indicating that preconstruction radar studies are not an effective tool for assessing risk to migrating birds at wind energy facilities (Tidhar et al. 2012, Stantec 2017). As such, nocturnal radar studies at Fountain are unlikely to inform risk at the Project and are unwarranted. Collision mortality of nocturnal migrant birds has generally been low at wind energy facilities, particularly in the western U.S., and multi-bird fatality events are extremely rare. This trend is supported by the results of the 3-year fatality study at Hatchet Ridge (Tetra Tech 2014), located adjacent to the Project and on the highest ridgeline in the immediately surrounding area, where nocturnal migrant fatality rates have been very low. Relatively large numbers of nocturnal migrant fatalities, such as those found at communication towers, have not been documented at wind energy facilities (Kerlinger et al. 2010), likely due to the use of a different type of lighting. Even at facilities within a well-defined migration corridor, such as along the Texas Gulf Coast, migrant fatalities were relatively low and not quantitatively different from facilities further inland in the region (Erickson et al. 2016). While nocturnal migration studies at Fountain would provide data on nocturnally migrating birds and bats, the data would not be informative in predicting post-construction mortality risk at the Project; therefore, nocturnal migration surveys are not planned. WEST has prepared an analysis of peer-reviewed studies and state of the science surrounding nocturnal avian migration studies related to wind energy development, which has been provided to Pacific Wind in support of this conclusion.

In regard to CDFWs recommendation of conducting nocturnal owl surveys, in lieu of conducting nocturnal owl surveys throughout the Project area, we assume that some owl species occur in the Project area (the Site Characterization Study notes nine owls as likely to occur). To date, two species of owl (great-horned owl [*Bubo virginianus*] and northern pygmy-owl [*Glaucidium gnoma*]) have been detected within the Project area during avian use surveys and/or incidentally, and it is assumed that other species of owl likely also occur in the Project area (e.g., western screech owl [*Megascops kennicottii],* long-eared owl *[Asio otus],* and northern saw-whet owl *[Aegolius acadicus]).* However, most all of the owls likely present in the Project are forest species that spend most of their time below the rotor-swept-zone of modern wind turbines, either in the forest canopy or foraging/traveling in open areas at low flight heights. While nocturnal surveys could confirm presence of some of the owl species likely occurring in the Project area, the surveys would provide no means of assessing risk to these species.

Consistent with the assumed low risk to owls from turbine collision, no owls were documented among fatalities during the three years of fatality monitoring at the adjacent Hatchet Ridge Wind Project (Tetra Tech 2014).

Bat Monitoring

Summary of CDFW Comments and Recommendations:

The Department recommends the placement of additional bat detectors at the Project in order to provide broader coverage of the Project area. The Department also recommends completion of year-round bat surveys at the Project.

Response:

At the request of CDFW, additional acoustic detectors were deployed during the 2017 bat acoustic surveys to expand the spatial coverage of areas representative of future turbine locations within the Project area. The bat acoustic study was conducted during the known period of highest bat activity in the region (spring through late fall), and data from the study shows that bat activity at the Project declined markedly in the late fall, near completion of the survey effort. This trend in documented activity at the Project is consistent with fatality monitoring results at the adjacent Hatchet Ridge Wind Project (Tetra Tech 2014), which documented 58 bat fatalities during three full years of surveys, none of which were found during the winter period of mid-December through mid-March, and demonstrates the adequacy of temporal coverage during the bat acoustic study effort and that year-round acoustic studies are not warranted in this part of California. Furthermore, acoustic bat detectors are not designed or intended to function in snow or in extended periods of below-freezing temperatures, and bats are rarely active in such conditions, making year-round surveys both difficult and uninformative in predicting post-construction risk. A comprehensive report on the bat acoustic study conducted at the Project, including a detailed discussion of survey methodology (e.g., spatial and temporal coverage) and associated analyses has been prepared and provided to Pacific Wind.

Wildlife Movement Study

Summary of CDFW Comments and Recommendations:

The Department recommends the completion of a focused wildlife movement study to document movement corridors within the Project.

Response:

No evidence exists suggesting that the Project serves as a significant movement corridor for wildlife species. WEST is currently conducting a suite of biological resource studies at the Project, including documentation of incidental wildlife observations, as possible and practicable. Most available data indicate that big game, such as pronghorn and elk, are not significantly impacted by wind energy projects and continue to utilize habitats within and move through operational wind farms (Piorkowski and Diamond 2016, Taylor 2014, Walter et al. 2006, Johnson et al. 2000). Furthermore, the Project area comprises a working forest landscape, with active timber harvest operations, and numerous maintained and well-traveled roads, suggesting that resident big game, or big game that move through this area are likely accustomed to relatively high levels of disturbance. Fencing or other physical barriers that may impede wildlife

movements will be extremely limited (i.e., fencing around O&M building or other secure structures) and should have limited impacts on terrestrial species. Should any evidence suggesting the Project area is serving as a significant wildlife corridor or movement area be discovered, WEST will provide this information to Pacific Wind and CDFW as appropriate.

Deer Habitat

Summary of CDFW Comments and Recommendations:

The Project is located within deer fawning habitat; impacts to deer should be identified in subsequent documents, including impacts from fencing, construction, noise and/or lighting.

Response:

Deer occur at the Project, and have persisted in the Project area despite the working forest nature of the area. Development of the Project, including construction and operation, is not expected to exceed levels of activity that regularly occur at the Project during timber harvest operations or associated activities such as road maintenance or construction. Fencing or other physical barriers that may impede deer movements will be extremely limited (i.e., fencing around O&M building or other secure structures). Given the historical management of the timberlands on which the Project is located, long term impacts to deer or deer fawning habitats are not expected. Should impacts occur as a result of Project construction (e.g., due to disturbance resulting from increased activity), the impacts should be of short duration and limited to the construction phase of the Project.

Rare Plants and Sensitive Natural Communities

Summary of CDFW Comments and Recommendations:

Rare plant surveys should be conducted following the *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* at the Project. Surveys should cover CESA and California Rare Plant Rank 1, 2 and 3 species, and should occur at the appropriate time of year and under the correct conditions to identify species with potential to occupy the Project. Surveys should also identify any natural communities with a rank of S1-S3.

Response:

Comprehensive and seasonally appropriate rare plant surveys were conducted at the Project in 2018 following *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFW 2018e). No rare plants (i.e., Rank 1, 2 and 3 species) were documented in Survey Corridors at the Project or within appropriate buffer distances of Survey Corridors during these surveys. Natural vegetation communities were also mapped; of which none were considered to be Sensitive (i.e., having a ranking of S1-S3). A comprehensive report on rare plant surveys conducted at the Project has been provided to Pacific Wind.

Invasive Species

Summary of CDFW Comments and Recommendations:

The Department recommends completion of invasive plant species mapping in order to document locations of invasive species and avoid or minimize the potential spread of invasive species during Project construction. Invasive species control measures should be developed, including post-construction monitoring to ensure that invasive species are not spread or introduced during construction activities.

Response:

During the rare plant survey effort described above, a complete floristic inventory was maintained, as possible and practicable, including occurrence of invasive species. Comprehensive and seasonally appropriate rare plant surveys were conducted at the Project in 2018 following protocol provided in *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFW 2018e). The Project is a working forest and timber-harvest operations across the Project are ongoing. As such, the Project should be considered a high disturbance area, and construction activities related to development of wind facilities at the Project are not expected to exceed levels of disturbance which currently occur. The comprehensive report on plant surveys conducted at the Project includes documentation of invasive species.

Proposed Survey Corridors

Summary of CDFW Comments and Recommendations:

The Department requests additional information regarding the use of Survey Corridors, including the width of the corridors, location of corridors in relation to Project activities, and the surveys proposed to be conducted within these corridors.

Response:

Where appropriate, WEST utilized Survey Corridors provided by Pacific Wind to guide some species- and taxa-specific surveys. Details on the use of corridors are contained in the various survey reports provided to Pacific Wind. Corridors were primarily used to guide surveys for non-mobile taxa (e.g., plants) or for species-specific surveys where impacts were most likely to result from ground clearance activities (e.g., habitat assessments, nest surveys). For the broader based survey efforts (e.g., avian and bats), surveys were not confined to corridors and were more widely dispersed to assess avian and bat use throughout a broader Project area. If Project impacts expand beyond the Survey Corridors or larger Project area due to future changes in Project layout, additional field studies would be implemented to address those changes.

Additional Concerns

Additional issues raised in the Letter are beyond the purview of WEST's involvement in the Project, and as such, have not been addressed here.

Literature Cited

Bombay, H.L., T.M. Benson, B.E. Valentine, and R.A Stefani. 2003. A willow flycatcher survey protocol for California. May 29, 2003. Available online at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=84019&inline

California Department of Fish and Wildlife (CDFW). 2018a. Considerations for conserving the foothill yellow-legged frog. Compiled by M. Van Hattem and M. Mantor; California Department of Fish and Wildlife. 47 pp.

California Department of Fish and Wildlife (CDFW). 2018b. California Natural Diversity Database. Available online at: https://www.wildlife.ca.gov/data/cnddb

California Department of Fish and Wildlife (CDFW). 2018c. California Interagency Wildlife Task Group. CWHR version 9.0 personal computer program. Sacramento, CA. Available at: https://www.wildlife.ca.gov/Data/CWHR

California Department of Fish and Wildlife (CDFW). 2018d. Gray Wolf. News archives. Available online at: https://www.wildlife.ca.gov/conservation/mammals/gray-Wolf

California Department of Fish and Wildlife (CDFW). 2018e. Protocols for surveying and evaluating impacts to special status native plant populations and sensitive natural communities. State of California Natural Resources Agency, Department of Fish and Wildlife. March 20, 2018. Available online at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959&inline

California Department of Fish and Wildlife (CDFW). 2014. California Interagency Wildlife Task Group. CWHR version 9.0 personal computer program. Sacramento, CA. Available at: https://www.wildlife.ca.gov/Data/CWHR/Wildlife-Habitats. Accessed 15 April, 2018.

California Department of Fish and Wildlife (CDFW). 2011. Great Gray Owl Habitat Model – Northern California CWHR version 9.0 (DS0280_20110128) personal computer program. Sacramento, CA. Available at: https://map.dfg.ca.gov/metadata/sec/ds0280.html?5.66.18

California Department of Forestry and Fire Protection (CDF). 2018a. Timber Harvest Plan No. 2-16-077-SHA, Cedar Boots. Approved October 23, 2017. Available online at: ftp://thp.fire.ca.gov/THPLibrary/Cascade_Region/THPs/THPs2016/2-16-077SHA/

California Energy Commission (CEC) and California Department of Fish and Game (CDFG). 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. CEC, Renewables Committee, and Energy Facilities Siting Division, and CDFG, Resources Management and Policy Division. CEC-700-2007-008-CMF.

Erickson, W.P., V. Poulton, E. Baumgartner, K. Bay, and G. Johnson. 2016. Avian Mortality at Three Wind Energy Facilities on the Gulf Coast of Texas. Manuscript submitted for publication.

Gutiérrez, R.J., and G.F. Barrowclough. (2005). Redefining the distributional boundaries of the Northern and California Spotted Owls: Implications for conservation. *Condor*, *107*(1), 182-187. DOI: 10.1650/7670

Huff, R., and S. Godwin, S. 2016. Survey protocol for great gray owl (*Strix nebulosi*) within the range of the Northwest Forest Plan, Version 4.0. Portland, OR. U.S. Department of the Interior, Bureau of

Land Management, Oregon, and U.S. Department of Agriculture, Forest Service Regions 5 and 6. 42p.

Johnson, G.D., D.P. Young, W.P. Erickson, C.E. Derby, M.D. Strickland, and R.E. Good. 2000. Wildlife monitoring studies – Seawest Windpower Project, Carbon County WY. Western EcoSystems Technology, Inc. Technical Report.

Kerlinger, P., J.L. Gehring, W.P. Erickson, R. Curry, A. Jain, and J. Guarnaccia. 2010. Night Migrant Fatalities and Obstruction Lighting at Wind Turbines in North America. Wilson Journal of Ornithology 122(4): 744-754.

Piorkowski, M.D. and J.M. Diamond. 2016. An Evaluation of Potential Pronghorn (Antilocapra americana) Habitat Use and Responses to Wind Energy Development Near the Dry Lake Wind Facility in North-Central Arizona. Draft Report, Arizona Game and Fish Department, Wildlife Contracts Branch, Phoenix, Arizona, USA.

Stantec Consulting, Inc. (Stantec). 2017. Comparison of Pre-construction Bird/Bat Activity and Post-construction Mortality at Commercial Wind Projects in Maine. Prepared for Maine Renewable Energy Association. Prepared by Stantec Consulting Services, Inc. March 2017.

Taylor, K.L. 2014. Pronghorn (*Antilocapra americana*) response to wind energy development on winter range in south-central Wyoming. MS Thesis, University of Wyoming, Department of Ecosystem Science and Management Pp 140.

Tetra Tech. 2014. Hatchet Ridge Wind Farm Post-Construction Mortality Monitoring: Comprehensive Three Year Report. Prepared for Hatchet Ridge Wind, LLC. Prepared by Tetra Tech, Portland, Oregon. May 2014.

Tidhar, D., C. Nations, and D.P. Young. 2012. What Has Been Learned from Pre-Construction Radar Studies Conducted at Proposed Wind-Energy Projects? Prepared by Western EcoSystems Technology, Inc. (WEST).

Timossi, I.C., E.L. Woodard, and R.H. Barrett. 1995. Habitat suitability models for use with ARC/INFO: Willow flycatcher. California Department of Fish and Game, California Wildlife Habitat Relationships Program, Sacramento, California. Technical Report No. 26. 24 pp.

US Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf

US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Executive Summary and frontmatter + 103 pp. Available online: https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf

Walter, W.D., D.M. Leslie Jr., and J.A. Jenks. 2006. Response of Rocky Mountain Elk (*Cervus elaphus*) to wind-power development. American Midland Naturalist, 156: 363-375.

Woodbridge, B., and C.D. Hargis. 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

C15. California Spotted Owl Risk Assessment

ENVIRONMENTAL & STATISTICAL CONSULTANTS

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TECHNICAL MEMORANDUM

DATE: February 24, 2020

TO: John Kuba, ConnectGen Operating LLC

FROM: Kori Hutchison and Andrea Chatfield, WEST, Inc.

RE: California Spotted Owl Risk Assessment for the Proposed Fountain Wind Project, Shasta County, California

INTRODUCTION

Fountain Wind LLC (Fountain Wind) contracted Western EcoSystems Technology, Inc. (WEST) to provide biological study support for Shasta County in its review of the proposed Fountain Wind Project (Project) in Shasta County, California, under the California Environmental Quality Act (CEQA). The proposed Project falls within the range of the California spotted owl (*Strix occidentalis occidentalis*; CSO) which is designated as a Species of Special Concern (SCC) in California by the California Department of Fish and Wildlife (CDFW; 2019). While the CSO was recently petitioned for listing at the federal level, the US Fish and Wildlife Service (USFWS) determined that the listing was not warranted in a 12-month finding released on November 8, 2019 (USFWS 2019). This finding was based on a thorough review of the best available scientific and commercial information regarding the past, present, and future threats to the CSO (USFWS 2019). In their assessment, the USFWS found that the primary threats to the CSO are large-scale, high-severity fire, increased tree mortality, drought, effects of climate change, and the barred owl (*Strix varia*) invasion (USFWS 2019). The following memorandum provides an assessment of the potential risk to CSO posed by development and operation of the proposed Project.

PROJECT SITE

The Project Site, defined as all areas where Project facilities could be sited, encompasses approximately 4,463 acres (ac; 1,806 hectares [ha]]) of privately-owned commercial timberlands within Shasta County in northern California (Figure 1). The Project is located west of the community of Burney and northeast of the larger community of Redding. The east-west running California State Route 299 bisects the northern portion of the Project Site, and the Hatchet Ridge Wind Farm (Hatchet Ridge), in operation since 2010, is located immediately to the northeast (Figure 1). The Lassen National Forest is located to the southeast of the Project and the Shasta-

Trinity National Forest is located to the north and west. The majority of the remaining areas surrounding the Project Site are privately-owned lands managed for commercial timber harvest.

The dominant vegetation type in and around the Project Site is mixed coniferous forest (both post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use in this area is commercial timber production, which has resulted in a highly fragmented landscape with no large tracts of undisturbed wildlife habitat across much of the area. Commercial timber operations currently and will continue to alter the landscape within and surrounding the Project Site, with areas of older forest being harvested and replanted with conifer seedlings that eventually transition from a scrub-shrub cover type to densely treed early-seral forest over 10-20 years. Dominant overstory species include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*). Topography within the Project Site is characterized by gently rolling hills that transition to relatively steep, low mountains, with elevations ranging from approximately 3,700 feet (ft; 1,128 meters [m]) on the western extent of the Project Site to 5,400 ft (1,646 m) near Snow Mountain in the southeast (Figure 2).

In late August, 1992, the Fountain Fire burned approximately 64,000 ac (25,900 ha) in and around the Project Site, including an area encompassing the northern two-thirds of the Project Site (Figure 1). Post-fire management included salvage logging, site preparation, and planting in the year following the fire. In the 27 years since the fire, the previously burned areas within the Project Site are now predominantly covered by dense stands of regenerating, early-seral mixed conifer forest. Management activities in the burned areas is primarily restricted to pre-commercial thinning, while commercial timber harvest operations are currently being conducted only within the southeastern third of the Project Site.

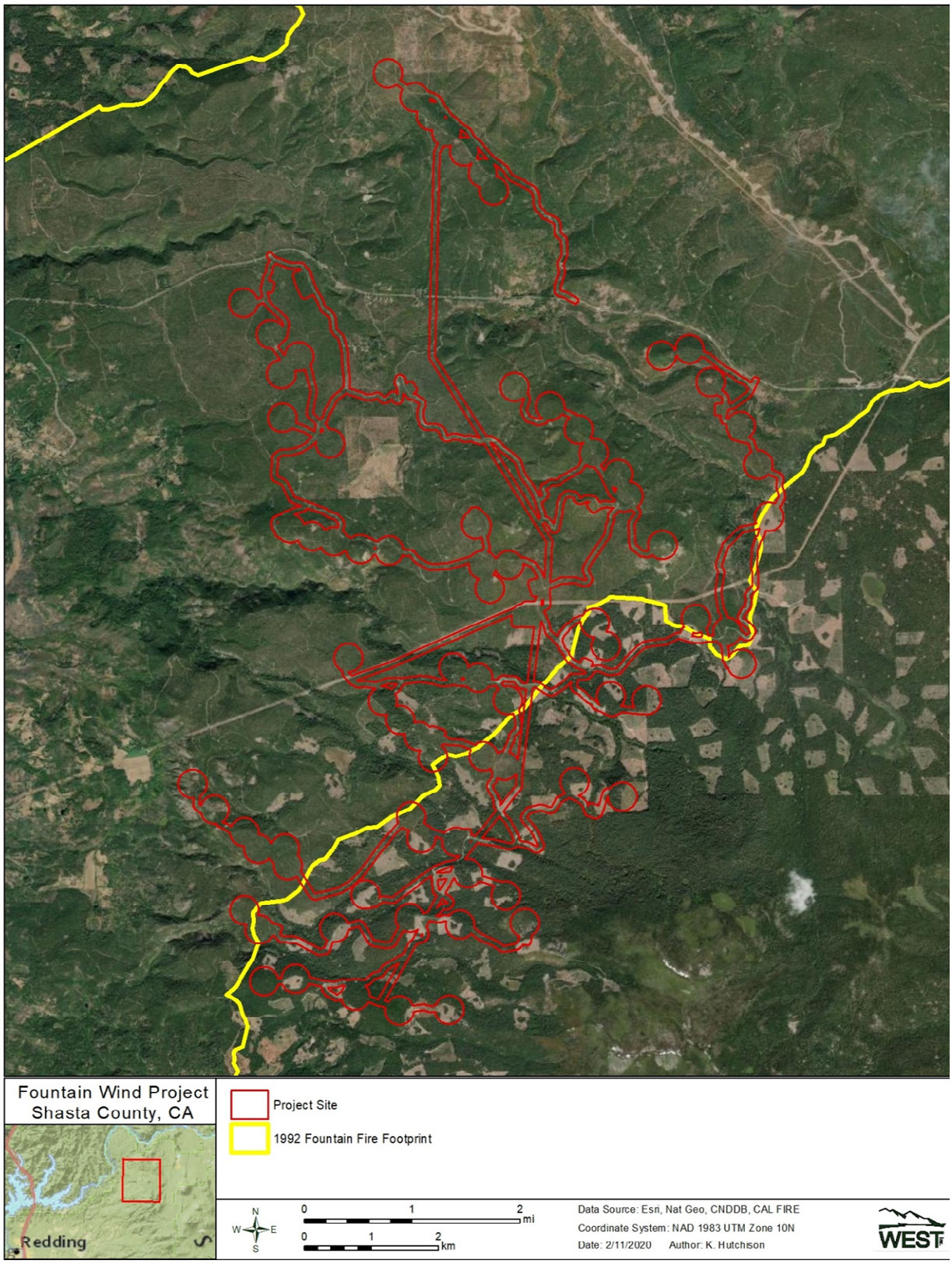

Figure 1. Proposed Fountain Wind Project Site in Shasta County, California.

SPECIES BACKGROUND

Spotted owls are large, brown-eyed owls that inhabit mature forests of western North America. The CSO is one of three subspecies of spotted owl and occurs in the Sierra Nevada mountain range in California and Nevada; in the Coastal, Transverse, and Peninsular mountain ranges in southern and coastal California; and in Sierra San Pedro Martir in Baja California Norte, Mexico (USFWS 2019). For purposes of owl management and conservation, the Pitt River in Shasta County is recognized as the dividing line between the CSO range to the south and the state and federally listed northern spotted owl (*Strix occidentalis caurina*; NSO) to the north (Gutiérrez and Barrowclough 2005). At its closest point, the Pitt River runs approximately 4.7 miles (mi; 7.6 kilometers [km]) north of the Project Site. The majority of CSOs in the Sierra Nevada are found in mid-elevation ponderosa pine, white fir, and mixed-conifer forest types (USFWS 2019). Using various criteria to define a core area (i.e., the area of concentrated use around a nest or roost location), researchers have estimated CSO core areas of between 347 and 2,009 ac (140 and 813 hectares [ha]; Bingham and Noon 1997; Seamans and Guitérrez 2007, Tempel et al. 2014, Berigan et al. 2012). Suitable nesting/roosting habitat for CSO includes areas of complex-structured/multi-layered forest, high canopy cover, and the presence of old and decadent trees, large snags, and coarse downed woody debris (Gutiérrez et al. 2017). The CSO forages in forested habitats generally similar to nesting/roosting habitat, where their primary prey items are medium-sized small mammals, particularly woodrats (*Neotoma* spp.) and flying squirrels *(Glaucomys sabrinus*; Verner et al. 1992). The species tends to avoid crossing brushy and clearcut forest areas, although they may hunt along the edges (Ward 1990).

Historical Occurrence in the Project Site Vicinity

According to the California Natural Diversity Database (CNDDB), several occurrences of CSO have been documented in the vicinity of the Project (CDFW 2020b). Three historical activity centers are located within 2.0 mi (3.2 km) southeast of the Project Site (SHA0046, SHA0051, and SHA0124), and one historical activity center is located near the center of the Project Site (SHA0063; Figure 2). The last known positive detections associated with SHA0046 and SHA0051 were individual birds observed in 1994 and 1990, respectively (CDFW 2020b). The last known active nest at SHA0046 was documented in 1992, when a female CSO was observed with two young. No juvenile birds were ever observed at the SHA0051 activity center; however, a pair was observed in 1987. The most recent positive detection near the Project (SHA0124) was an incidental observation of an adult bird with two young reported by a Sierra Pacific Industries forester in 2008, approximately 1.2 mi (1.9 km) southeast of the Project Site between Ward Butte and Green Mountain (CDFW 2020b; Figure 2).

The SHA0063 activity center, located near the center of the Project Site, was based on a 1990 observation of an individual bird of unknown age and sex reported by Roseburg Forest Products (CDFW 2020b); however, this activity center was completely burned in the 1992 Fountain Fire. During a site visit in 2018, a WEST biologist field-verified that there is no remaining suitable habitat for CSO at that location.

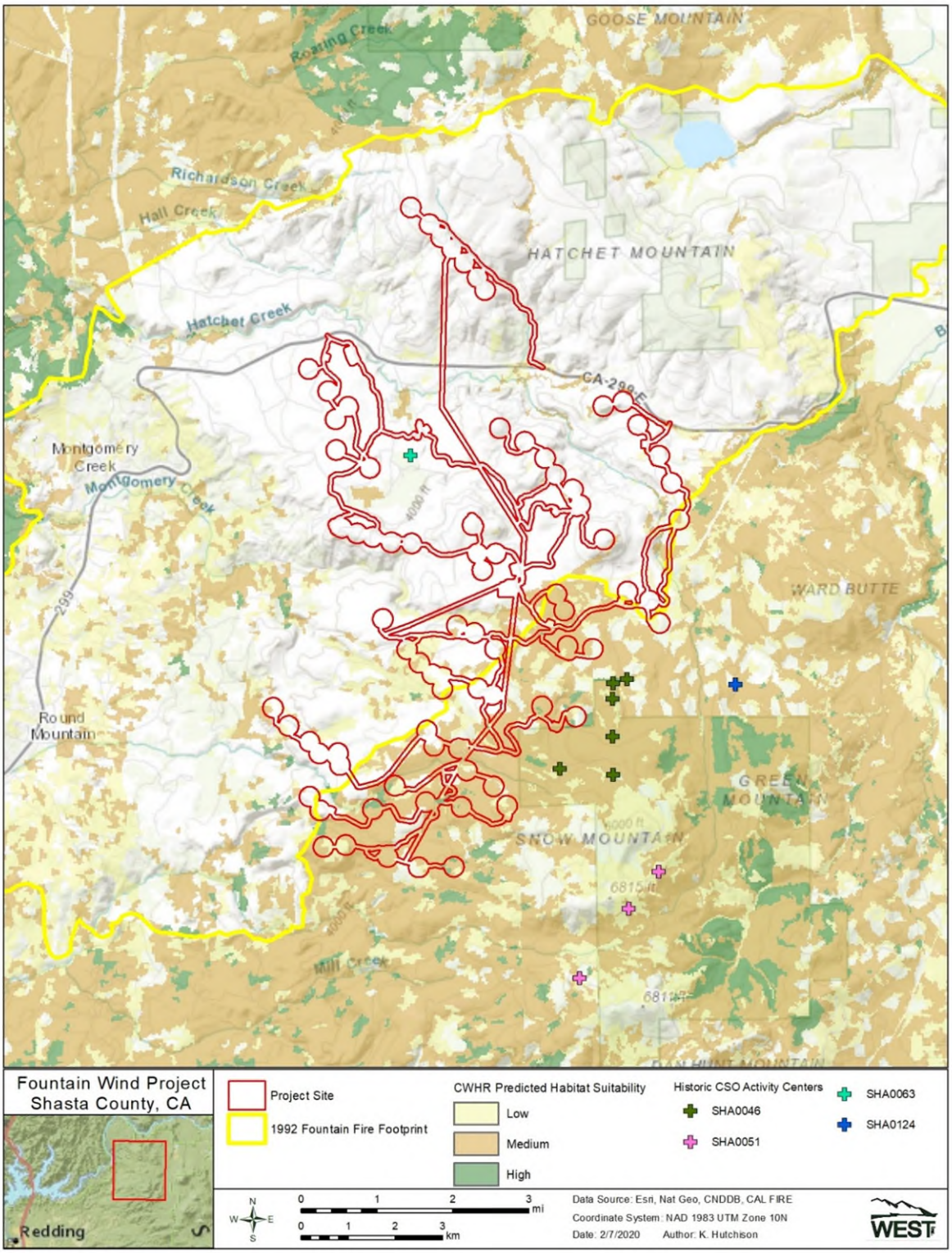

Figure 2. Historic California spotted owl (CSO) occurrences and predicted suitable spotted owl habitat in the vicinity of the Fountain Wind Project in Shasta County, California, as obtained from the California Natural Diversity Database (CNDDB) and California Wildlife Habitat Relationships (CWHR).

RISK ASSESSMENT

Habitat Suitability and Potential for Occurrence

The Project Site lies on the northern edge of the CSO range, in the transition zone between the CSO and NSO subspecies ranges. Geographic information system (GIS) data from the California Wildlife Habitat Relationships (CWHR) Predicted Habitat Suitability dataset (CDFW 2020a) and examination of aerial imagery were used to conduct a desktop review of potential CSO habitat overlap with the Project. The CWHR's GIS-based habitat model analyzes and compiles several remotely sensed GIS coverages to predict habitat suitability. The majority of the Project Site (about 3,300 ac [1,335 ha]; 73.9%) falls within the Fountain Fire footprint, which is predominantly classified as non-habitat for CSO in the CWHR dataset (Figures 1 and 2). The southeastern portion of the Project Site, outside of the fire perimeter, does include areas of predicted moderate to high suitability habitat. Based on the CWHR model, approximately 945 ac (382 ha) of the Project Site (21.2%) are classified as having moderate suitability for CSO, with much smaller, isolated patches of high suitability habitat interspersed (Figure 2). These small patches of predicted high suitability habitat amount to only 50 ac (20 ha), or 1.1 % of the total Project Site (Figure 2). While the Project Site overlaps approximately 995 ac (403 ha) of moderate to high suitability CSO habitat, this is a conservative estimate of the amount of habitat that could potentially be removed during Project development as the Project Site encompasses a larger area than that typically required for road and turbine construction to allow for greater flexibility in micrositing.

Based on historical spotted owl occurrence data from the CNDDB, the most recent spotted owl detections within 2.0 mi of the Project Site date back to 2008, with the spotted owl detections closest to the Project Site last reported in the early 1990s prior to the Fountain Fire (CDFW 2020b). While historical CSO detections are absent from the unburned portions of the Project Site, it is important to note that focused surveys for CSO have likely not been conducted within Project Site. Given the Project's proximity to much larger and contiguous areas of high suitability habitat on protected public lands (Lassen National Forest to the southeast and Shasta Trinity National Forest to the north and west; Figure 2), it is unlikely that CSOs would select the less suitable habitats within the heavily managed timberlands present within the Project Site.

Potential for Turbine Collisions

Few collision fatalities of forest-dwelling owl species have been documented at wind energy facilities in North America (AWWI 2019, WEST 2019). Because operational wind energy projects are sparse within the range of spotted owls, the potential susceptibility of spotted owls to collisions with turbines was evaluated for the congeneric barred owl, which occurs in similar forested habitats but occupies a much larger range across North America. In a review of publicly available mortality data from 482 studies conducted at 221 North American wind energy facilities between 2014 and 2018, only four barred owl fatalities were documented, out of a total 20,168 avian fatalities (WEST 2019). Two of these barred owl fatalities occurred at facilities in Maine, one occurred at a facility on the border of Oregon and Washington, and one occurred in west-central California (WEST 2019). Other forest-dwelling owl species found as fatalities at North American

wind energy facilities included two flammulated owls (*Psiloscops flammeolus*), two western screech owls (*Megascops kennicottii*), one eastern screech owl (*M. asio*), and one northern saw-whet owl (*Aegolius acadicus*; WEST 2019). Based on AWWI's (2019) recent analysis of 193 post-construction monitoring studies at 130 wind energy facilities in the US between 2002 and 2017, owls compose approximately 1.2% of unadjusted bird fatality incidents; however, the majority of these are barn owls (*Tyto alba*), great horned owls (*Bubo virginianus*), and short-eared owls (*Asio flammeus*; 69 fatality incidents composing 1.0% of overall avian mortality; AWWI 2019). The only forest owl fatality in the AWWI dataset is a single flammulated owl (AWWI 2019). Those species that have been most at risk of turbine collisions (e.g., red-tailed hawk [*Buteo jamaicensis*], American kestrel [*Falco sparverius*], golden eagle [*Aquila chrysaetos*]) are often observed flying within the rotor swept height, or the height of the turbine blades. Spotted owls conduct almost all of their flights within or below the canopy of forests, and tend to avoid flying over large brushy or clearcut areas (Ward 1990). Regardless, there is at least some potential for CSOs to collide with turbine blades while moving between habitat patches, particularly in areas of older forest where the minimum rotor swept height (ranging from 46 to124 ft [14 to 38 m] depending on turbine model selected) overlaps with the height of the adjacent forest canopy. However, given the generally low quality and fragmented nature of forest habitat present within and immediately adjacent the Project Site, as well as the low documented occurrence of CSO in the Project vicinity, the risk of collision is considered to be low.

CONCLUSION

The majority (about 75%) of the Project Site contains vegetation communities unsuitable, or of low suitability, for CSO. Areas of the Project Site containing moderate to high suitability habitat are present only within the southeastern third of the Project Site, with approximately 945 ac classified as having moderate suitability for CSO and only 50 ac classified as having high suitability for CSO. Furthermore, these areas of predicted high suitability, more suitable for nesting and roosting, are present in very small, isolated patches in the Project Site which may limit the potential for these areas to support CSO roosts or nests. Compared to the Project Site, protected public lands to the north, west, and southeast contain much larger areas of predicted high and moderate suitability habitat for CSO. Although approximately 995 ac of moderate to high suitability CSO habitat occurs within the Project Site, only a portion of this area may need to be cleared for the construction and operation of the Project. The loss of this potential habitat is not likely to have a significant impact to spotted owls in the region. This is supported by the lack of recent (since mid-1990's) CSO detections in areas within or surrounding the Project Site. Given the low anticipated use of the Project site by CSO, the limited extent of mature, complex-structured forest stands within and adjacent to the Project Site, the flight behavior of spotted owls, and the low number of collision fatalities of forest-dwelling owl species documented at wind energy facilities to date, potential impacts to CSO resulting from collision with Project turbines is anticipated to be low.

LITERATURE CITED

American Wind Wildlife Institute (AWWI). 2019. AWWI Technical Report: A Summary of Bird Fatality Data in a Nationwide Database. February 25, 2019.

Berigan, W.J.; Gutiérrez, R.J.; Tempel, D.J. 2012. Evaluating the efficacy of protected habitat areas for the California spotted owl using long-term monitoring data. Journal of Forestry. 110: 299–303.

Bingham, B.B.; Noon, B.R. 1997. Mitigation of habitat "take": application to conservation planning. Conservation Biology. 11: 127–139.

CalFire. 2018. Fire Perimeters (fire18_1). Available online at: https://frap.fire.ca.gov/frap-projects/fire-perimeters/

California Department of Fish and Wildlife (CDFW). 2019. Special Animals List. California Natural Diversity Database. August 2019. Available online: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline

California Department of Fish and Wildlife (CDFW). 2020a. California Interagency Wildlife Task Group. CWHR version 9.0 personal computer program. Sacramento, CA. Available at: https://www.wildlife.ca.gov/Data/CWHR

California Department of Fish and Wildlife (CDFW). 2020b. California Natural Diversity Database (CNDDB). Available at: http://bios.dfg.ca.gov and https://map.dfg.ca.gov/rarefind/view/RareFind.aspx. Accessed 15 January 2020.

California Endangered Species Act (CESA). 1984. California Fish and Game Code Sections (§§) 2050-2115.5. (Added by Statutes 1984, chapter 1240, § 2.).

Gutiérrez, R.J. and G.F. Barrowclough. 2005. Redefining the distributional boundaries of the northern and California spotted owls: implications for conservation. Condor. 107: 182–187.

Gutiérrez, R.J.; Tempel, Douglas J.; Peery, M. Zachariah. 2017. The biology of the California spotted owl. In: Gutiérrez, R.J.; Manley, Patricia N.; Stine, Peter A., tech. eds. The California spotted owl: current state of knowledge. Gen. Tech. Rep. PSW-GTR-254. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 11-47. Chapter 2.Forsman, E. D. 1976. A preliminary investigation of the spotted owl in Oregon. M.S. Thesis, Oregon State Univ., Corvallis. 127pp.

National Geographic Society (National Geographic). 2020. World Maps. Digital topographic map. PDF topographic map quads. Available online: http://www.natgeomaps.com/trail-maps/pdf-quads

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Seamans, M.E.; Gutiérrez, R.J. 2007. Habitat selection in a changing environment: the relationship between habitat alteration and spotted owl territory occupancy and breeding dispersal. Condor. 109: 566–576.

Tempel, D.J.; Gutiérrez, R.J.; Whitemore, S.A.; Reetz, M.J.; Stoelting, R.E.; Berigan, W.J.; Seamans, M.E.; Peery, M.Z. 2014. Effects of forest management on California spotted owls: implications for reducing wildfire risk in fire-prone forests. Ecological Applications. 24: 2089–2106.

US Fish and Wildlife Service. 2019. Endangered and Threatened Wildlife and Plants; 12-month Finding for the California Spotted Owl. Federal Register 84(217):60371-60372.

Verner, J., R. J. Gutierrez and G. I. Gould. (1992). "The California Spotted Owl: general biology and ecological relations." In The California Spotted Owl: a technical assessment of its current status., edited by J. Verner, K. S. McKelvey, B. R. Noon, R. J. Gutierrez, Jr G. I. Gould and T. W. Beck, 55-78. Albany, CA: Gen. Tech. Rep. PSW-GTR-133, U.S. Forest Serv.

Ward, Jr., J. P. (1990). Spotted Owl reproduction, diet and prey abundance in northwest California. Master's Thesis, Humboldt State Univ., Arcata, CA.

Western EcoSystems Technology, Inc. (WEST). 2019. Regional Summaries of Wildlife Fatalities at Wind Facilities in North America. 2019 Report from the Renew Database. Published by WEST, Inc., Cheyenne, Wyoming. December 31, 2019.

C16. 2018 Willow Flycatcher Survey Results

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TECHNICAL MEMORANDUM

DATE: October 17, 2018

TO: Kristen Goland, Pacific Wind Development LLC

FROM: Joel Thompson, Andrea Chatfield, and Kori Hutchison, WEST, Inc.

RE: 2018 Willow Flycatcher Survey Results, Fountain Wind Project, CA

Introduction

Pacific Wind Development LLC contracted Western EcoSystems Technology, Inc. (WEST) to provide biological survey support for the development of the proposed Fountain Wind Project (Project). Willow flycatcher (*Empidonax traillii*) is currently designated as endangered by the state of California (California Department of Fish and Wildlife [CDFW] 2018). While once considered common, willow flycatcher is now considered rare to locally uncommon across its breeding range (Craig and Williams 1998). Willow flycatcher breeding habitat consists of dense deciduous riparian shrub and willow thickets (Bombay et al. 2003). According to the California Natural Diversity Database (CNDDB), there are no known occurrences of willow flycatcher within or immediately adjacent to the Project; the nearest known occupied territories are located approximately 20 miles (mi; 32.2 kilometers [km]) to the northeast of the Project (CDFW 2018). However, while CNDDB data does not indicate any known occurrences of nesting willow flycatcher within the Project area, an assessment of potential willow flycatcher habitat and surveys of the most suitable habitat were conducted at the request of CDFW. This memorandum describes the methods and results of willow flycatcher surveys conducted at the Project during the 2018 nesting season.

Survey Area

The Project is located on privately owned commercial timberlands in central Shasta County, California. The dominant vegetation type in and around the Project is mixed coniferous forest (post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use in this area is commercial timber production, which has resulted in a highly fragmented landscape across much of the area. Dominant overstory species include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*).

For the purpose of assessing willow flycatcher habitat and conducting field surveys, survey corridors were provided in a Geographic Information System (GIS) format by Pacific Wind (Figure 1). The surveys corridors included areas that could be subject to direct impacts during Project construction. The survey corridors varied in size and included buffers of all areas of proposed infrastructure that may be subject to ground disturbance (e.g., newly proposed roads, roads that may be expanded, turbine pads, and underground collection lines).

Methods

CDFW's Willow Flycatcher Habitat Model and examination of aerial imagery were used to conduct a desktop review of potential willow flycatcher habitat within the Project area. This GIS-based model analyzes and compiles several remotely sensed GIS coverages to predict habitat suitability. Areas of modeled habitat occurring in the Project area were then buffered by 300 feet (ft; 91 meters [m]) to ensure that the habitat assessment and any surveys covered any potential territories located within 300 ft of the survey corridors. The 300 ft provided coverage that exceeds the average territory size (roughly 164 by 262 ft [50 by 80 m) of willow flycatchers in northern California (Bombay et al. 2003). Buffered habitat areas were then reviewed on aerial imagery to eliminate areas that were unsuitable (e.g., areas of early seral conifer forest away from streams). The remaining areas of modeled habitat considered potentially suitable were then overlaid on the Project survey corridors in a GIS, which resulted in the identification of several areas of potential willow flycatcher breeding habitat within or adjacent to the survey corridors. A WEST biologist with prior experience assessing willow flycatcher habitat suitability then performed a field reconnaissance at the Project to evaluate the areas of potentially suitable habitat that overlapped the survey corridors and to identify areas of potential habitat not predicted by the model. Criteria for inclusion as potential habitat as defined by the CDFW model included cover component (i.e., primary vegetative cover type), distance to perennial water, and species range (i.e., known species occurrences; Timossi et al. 1995). Based on the desktop review and field reconnaissance, two areas of predicted habitat and one additional field-identified area met the criteria for suitable willow flycatcher habitat. Two of the areas (Survey Areas 1 and 2) were of lower quality, both being small (less than 1.5 ac [0.6ha] each) and having limited or sparse willow components compared to Survey Area 3 (approximate 3.0 ac [1.2 ha]; Figure 1).

Protocol-level presence/absence surveys were conducted at each of the three identified potential willow flycatcher habitat areas (Survey Areas 1-3; Figures 2-4). Surveys were conducted by a WEST biologist with prior experience conducting willow flycatcher surveys. Surveys followed the CDFW-recommended protocol (Bombay et al. 2003), which requires a minimum of two separate field surveys at each site during the breeding season; one during survey period 2 (June 15-25) and one during either survey period 1 (June 1-14), or survey period 3 (June 26-July 15). Consistent with this requirement, an initial survey was conducted during survey period 2 and a follow-up survey was conducted during survey period 3, with successive surveys conducted at least five days apart.

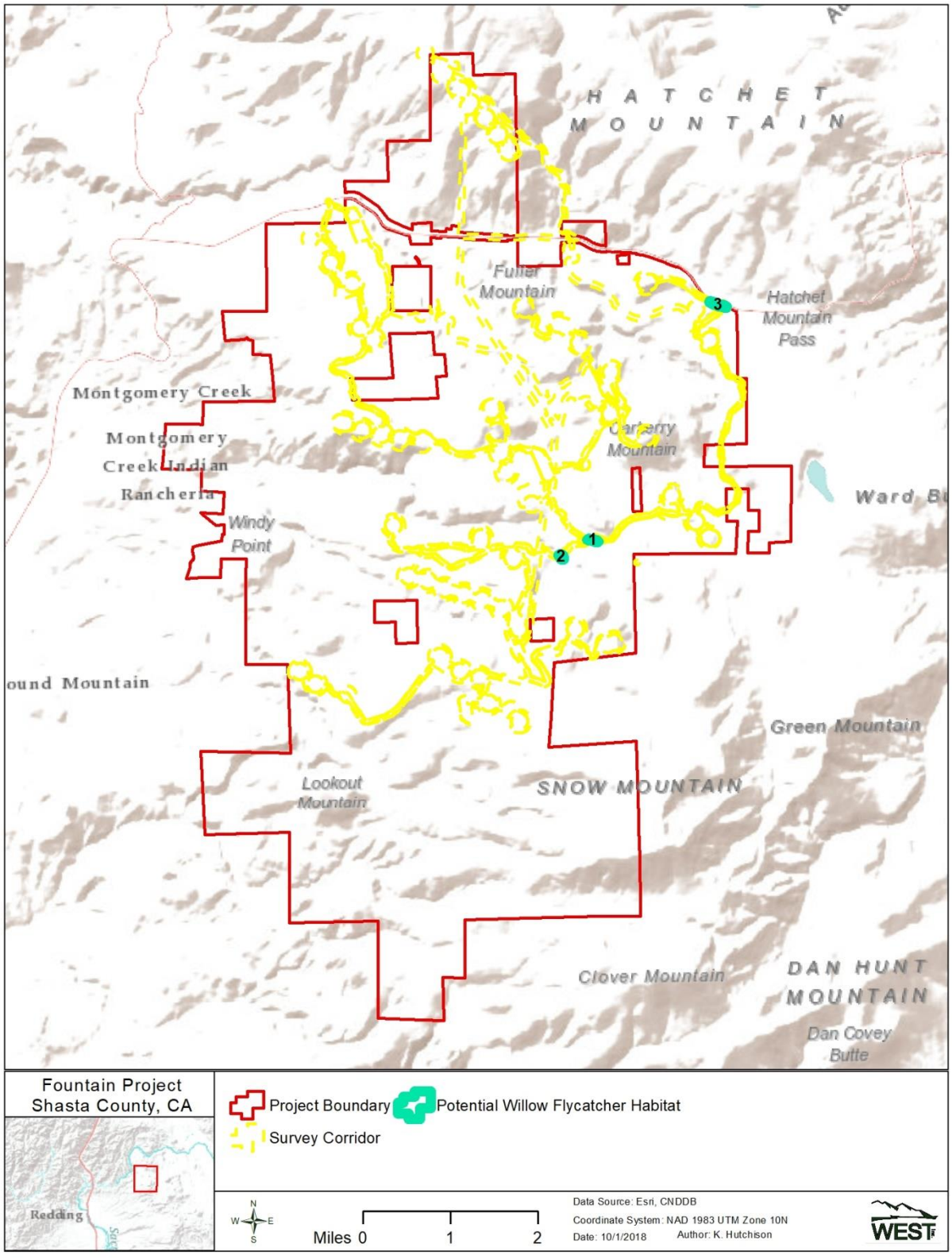

Figure 1. Survey corridors and areas of potential willow flycatcher habitat as provided by the California Natural Diversity Database and verified by field reconnaissance within the Fountain Wind Project, Shasta County, California.

Seventeen survey stations were established within the three survey areas: four in Survey Area 1 (Figure 2), six in Survey Area 2 (Figure 3) and seven in Survey Area 3 (Figure 4). Survey stations were established within suitable willow flycatcher habitat no more than 98 ft (30 m) apart in dense vegetation, and 164 ft (50 m) apart in open vegetation in order to ensure adequate coverage (Bombay et al. 2003). Ten-minute listening periods to document spontaneous singing were conducted at each survey area prior to initiating broadcast surveys. Following the listening period, recorded willow flycatcher songs were broadcast while the observer listened for responses for a minimum of six minutes (Bombay et al. 2003).

Results

Two rounds of willow flycatcher surveys were completed in the three survey areas on June 23-24 and July 6, for a total of 34 surveys (Table 1). Surveys on June 23-24 corresponded to survey period 2 and surveys on July 6 corresponded to survey period 3, as defined in the survey protocol. No willow flycatchers were detected during surveys (Table 1).

Table 1. Results of willow flycatcher surveys conducted in June and July 2018, during survey periods 2 and 3, at the Fountain Wind Project, Shasta County, California.

Survey Area	Survey Date	Number of Survey Points	Detections
	Survey Period 2		
1	23 June	4	0
2	23 June	6	0
3	24 June	7	0
	Survey Period 3		
1	6 July	4	0
2	6 July	6	0
3	6 July	7	0

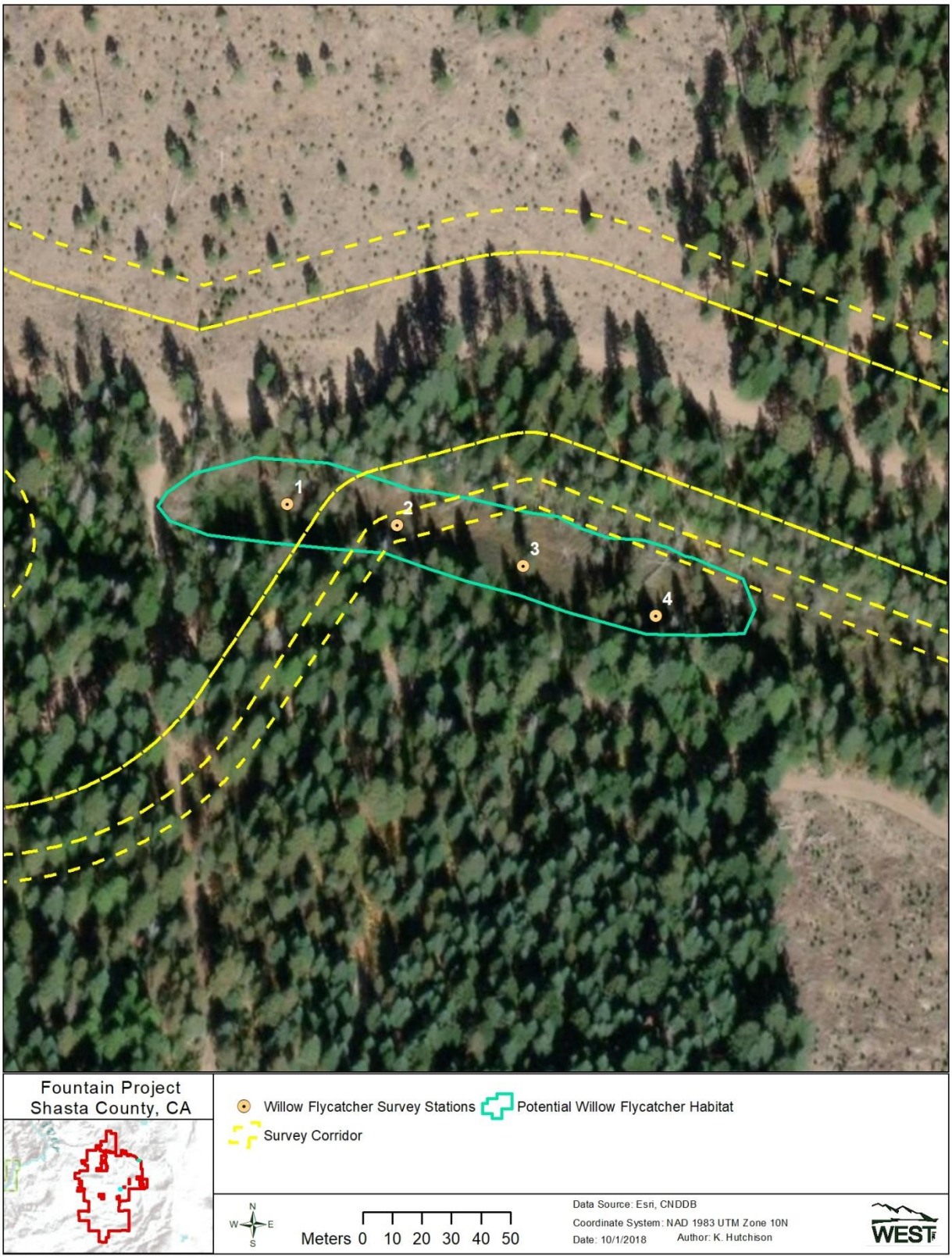

Figure 2. Willow flycatcher survey stations within Survey Area 1 at the Fountain Wind Project, Shasta County, California.

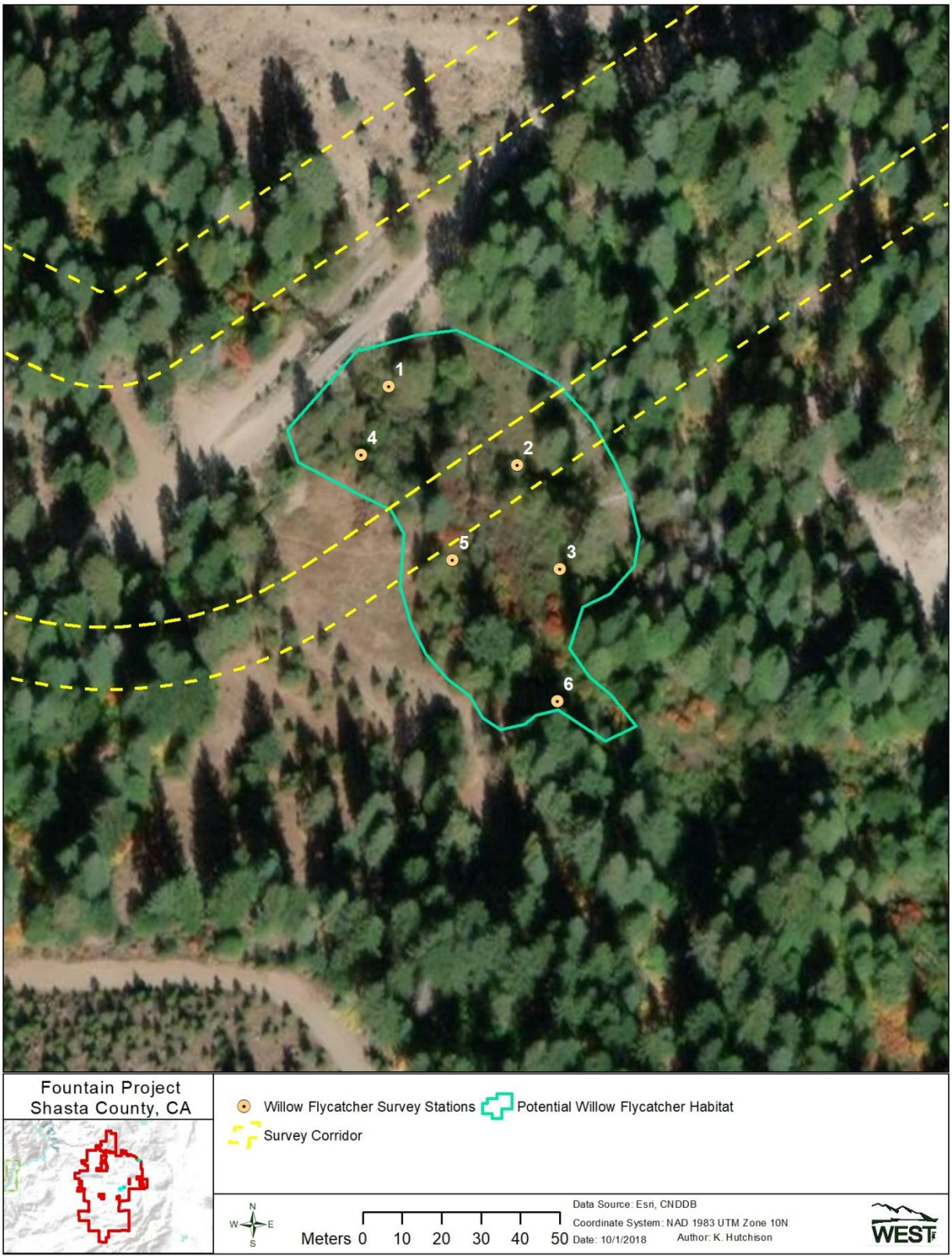

Figure 3. Willow flycatcher survey stations within Survey Area 2 at the Fountain Wind Project, Shasta County, California.

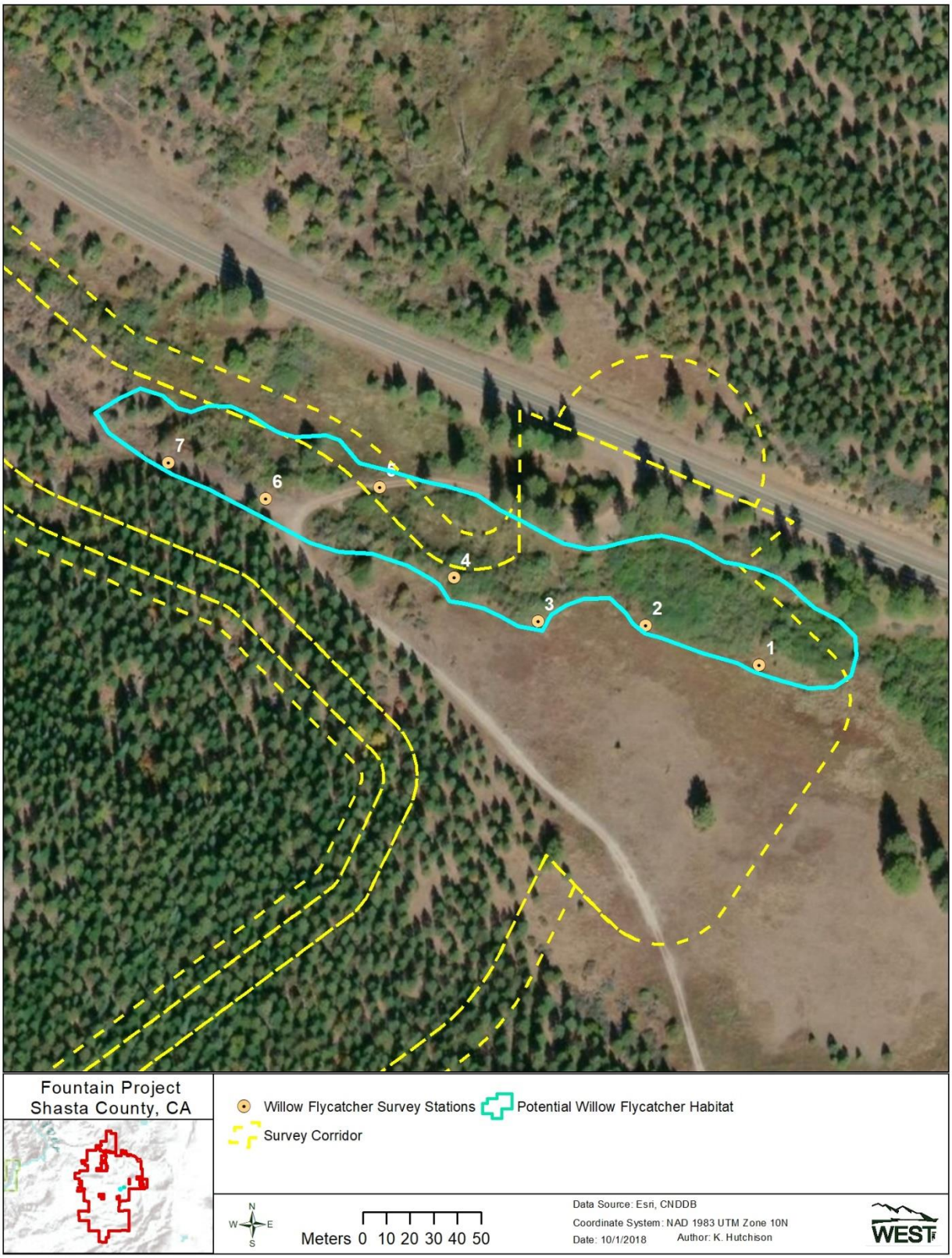

Figure 4. Willow flycatcher survey stations within Survey Area 3 at the Fountain Wind Project, Shasta County, California.

Discussion and Conclusions

The absence of willow flycatcher detections within the three potentially suitable willow flycatcher habitat areas indicates that these areas were not occupied during the 2018 nesting season. In general, habitat for willow flycatcher in Survey Areas 1 and 2 was of lower quality than in area 3. It is unlikely that these two areas could support breeding willow flycatcher in future years. Survey Area 3 contained more extensive patches of dense vegetation (willow) and had a greater potential to support breeding willow flycatchers. Although the survey corridors (i.e., area of potential impact) depicted in Figure 4 encompass the majority of identified willow flycatcher habitat in Survey Area 3, recent updates to the Project layout indicate that this area may not be used as an access point to Highway 299. As such, the riparian habitat associated with Survey Area 3 may not be directly impacted by construction or operation of the Project and would remain intact and available for use by willow flycatcher. Additionally, given the location of this habitat patch immediately adjacent of State Route 299 (within 30 m [98 ft] in places), as well as the existing logging road running through the habitat, disturbance related impacts from vehicle traffic within the Project should be minimal relative to ongoing disturbance to this habitat patch resulting from vehicle activity on State Route 299 and permitted logging activities.

Although willow flycatcher was not detected within the Project during the 2018 breeding season surveys, willow flycatchers may fly over the Project during migration and may use patches of riparian/wetland and meadow habitat as stopover habitat in spring and fall, such as those identified during this survey effort. In general, willow flycatchers are not expected to have a high risk of collision with wind turbines. In their breeding and stopover habitats, willow flycatcher are not expected to fly at rotor-swept heights (i.e., above 30 m [98 feet]), preferring to stick close to willow thickets and other brushy areas where they perch on the edge or top of shrubs and low trees and fly out from their perch to catch insects, or flit between willows and other shrubs in the understory (Sedgwick 2000). In a comprehensive analysis of small-passerine fatalities resulting from collisions with turbines during 116 studies conducted at 71 wind energy facilities in the US and Canada, Erickson et al. (2014) found no willow flycatcher fatalities among the 3,110 small-passerine fatalities documented. Of the more than 3,000 small-passerine fatalities, just 79 (1.6%) were flycatchers (family=Tyrannidae), and of these, only 25 (0.8%) were *Empidonax* flycatchers (Erickson et al. 2014).

If construction activities have the potential to directly impact areas of potential willow flycatcher habitat within the Project area, additional protocol-level breeding surveys may be warranted if construction is to occur during the breeding season (approximately June 15 to September 15). If areas of potentially suitable habitat will not be directly impacted during Project construction, then no further willow flycatcher surveys are likely warranted.

Literature Cited

Bombay H. L., T. M. Benson, B. E. Valentine, and R. A. Stefani. 2003. Willow flycatcher survey protocol for California. California Department of Fish and Wildlife.

California Department of Fish and Wildlife. 2018. Special Animals List. Natural Diversity Database. April. *Available at*: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline. Periodic Publication. *Accessed* 15 July, 2018.

Craig, D. and P. L. Williams. 1998. Willow Flycatcher (Empidonax traillii). In The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. *Available at*: http://www.prbo.org/calpif/htmldocs/riparian_v-2.html. *Accessed* 15 July 2018

Erickson, W.P., M.M. Wolfe, K.J. Bay, D.H. Johnson, and J.L. Gehring. 2014. A Comprehensive Analysis of Small Passerine Fatalities from Collisions with Turbines at Wind Energy Facilities. PLoS ONE 9(9): e107491.

Sedgwick, J. A. (2000). Willow Flycatcher (*Empidonax traillii*), version 2.0. In The Birds of North America (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bna.533

Timossi, I. C., E. L. Woodard, and R. H. Barrett. 1995. Habitat suitability models for use with ARC/INFO: Willow flycatcher. California Department of Fish and Game, California Wildlife Habitat Relationships Program, Sacramento, California. Technical Report No. 26. 24 pp.

C17. 2018/2019 Foothill Yellow-legged Frog Assessment

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TECHNICAL MEMORANDUM

DATE: October 22, 2018

TO: Kristen Goland, Pacific Wind Development LLC.

FROM: Joel Thompson, WEST, Inc.

RE: 2018 Foothill yellow-legged frog and Cascades frog habitat assessments and surveys, Fountain Wind Project, CA

INTRODUCTION

Pacific Wind Development LLC (Pacific Wind) has contracted Western EcoSystems Technology, Inc. (WEST) to provide biological support for development of the proposed Fountain Wind Project (Project). Foothill yellow-legged frog (FYLF; *Rana boylii*) and Cascades Frog (CF; *Rana cascadae*) are currently listed as candidates for listing under the California Endangered Species Act (CESA), and have been petitioned for listing under the Federal Endangered Species Act (ESA). Although neither species has been documented within the Project area, the California Wildlife Habitat Relationships (CWHR) database, maintained by the California Department of Fish and Wildlife (CDFW), indicates that potential habitat for both species may be present within the Project area, with the Project area defined in this report as all lands within the Project area boundary. As such, and at the request of CDFW, WEST conducted desktop assessments of potentially suitable habitat for both species and conducted visual encounter surveys (VES) for subadult FYLF in 2018 in the most suitable habitats identified within the Project area. This memorandum describes the methods and results of the habitat suitability assessments and the VES conducted in 2018.

PROJECT AND SURVEY AREAS

The Project is located on privately owned commercial timberlands in central Shasta County, California. The dominant vegetation type in and around the Project is mixed coniferous forest (post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use in this area is commercial timber production, which has resulted in a highly fragmented landscape across much of the area. Dominant overstory species include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*),

incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*).

Vegetation communities identified during rare plant and vegetation community mapping efforts (Flaig et al. 2018) and considered potentially suitable for occurrence of special status FYLF in the Project area include mixed montane riparian forest (MMRF) and mixed montane riparian scrub (MMRS; Flaig et al. 2018). The MMRF community was documented primarily in the southern half of the Project area along perennial streams, but also occurred along intermittent streams in some locales. Plant species within the MMRF community included a variety of mid-story species such as bigleaf maple (*Acer macrophyllum*) and thinleaf alder (*Alnus incana* ssp. *tenuifolia*), with a shaded, woody understory of Rocky Mountain maple (*Acer glabrum*), vine maple (*Acer circinatum*), and other species. The MMRS community was primarily mapped throughout the northern half of the Project. Similar to the MMRF community type it occurred along perennial and intermittent drainages, but was distinguished from MMRF by the absence of a tree-dominated canopy and the presence of a shrub-dominated canopy that included several willow species (*Salix* spp.). Riparian species commonly observed along the immediate channel included arroyo willow (*Salix lasiolepis*), shining willow (*S. lucida*), scouler willow (*S. scouleriana*), thinleaf alder, and mountain dogwood (*Cornus nuttallii*).

An additional vegetation community identified in the Project area and considered potentially suitable for occurrence of special status amphibians was wet montane meadow (WMM). The majority of WMM communities identified were associated with streams, though a few areas were mapped adjacent to small ponds, springs, or seeps with high water tables. The WMM community was composed of a diversity of hydrophytic plant species including grasses, sedges, rushes, and perennial forbs (Flaig et al. 2018).

For the purpose of assessing FYLF and CF habitat and conducting field surveys, construction corridors were provided in a Geographic Information System (GIS) format by Pacific Wind (Figure 1). The construction corridors included areas within the larger Project area that could be subject to direct impacts during Project construction. The corridors varied in size and included buffers of all areas of proposed infrastructure that may be subject to ground disturbance (e.g., newly proposed roads, roads that may be expanded, turbine pads, and underground and overhead collection lines) to provide for some flexibility in final project design. The corridors provided by Pacific Wind were buffered by WEST by an additional 500 feet (ft; 152 meters [m]) to generate Survey Corridors used in the assessment of FYLF and CF habitat suitability and to guide field surveys efforts. The 500-ft buffer was used as van Hattem and Mantor (2018) recommend that surveys associated with disturbance projects be conducted within the project area (assumed to be the area of disturbance) and at least 500 ft upstream and downstream.

Foothill Yellow-legged Frog Survey Area

Foothill yellow-legged frog occur in the coast ranges of Oregon and California, as well as the more interior Sierra Nevada and Cascades ranges, where the species occupies riparian habitats immediately adjacent to perennial, flowing water with rocky substrates. The species has been documented at elevations up to approximately 6,300 feet (ft; 1,920 meters [m]; Hayes et al.

2016). According to the California Natural Diversity Database (CNDDB), there are no known occurrences of FYLF within or immediately adjacent to the Project; the closest known occurrences of FYLF are approximately 4.0 mi (6.4 km) to the north and south of the Project (CDFW 2018a; Figure 1). The CWHR includes information on both habitat suitability (i.e., predicted habitat; Figure 1) and habitat modeled as potentially important for connectivity (i.e., connectivity habitat; Figure 2) for FYLF (CDFW 2018b). Although the large majority of FYLF habitat within the Project area is classified as low likelihood of occurrence using the CWHR predicted habitat model, some locations are classified as medium to higher suitability for potential habitat connectivity (Figure 2). The predicted habitat and habitat connectivity models overlap with the Survey Corridors in some locations. Because the FYLF is most commonly associated with moving waters, stream corridors within areas of higher rated habitat connectivity that overlapped with Survey Corridors were the focus of FYLF habitat assessments and field surveys in 2018 (Figure 2).

Cascades Frog Survey Area

Cascades frog occupies mountain lakes, ponds, and adjacent wet meadows at elevations up to 8,200 ft (2,500 m) in the mountains of northern California and southern Oregon. Reproduction by CF occurs in shallow, still-water habitats that become exposed by snowmelt early in the spring and retain water long enough for egg and tadpole development (about three to four months; Pope et al. 2014). These habitats include shallow alcoves of lakes, ponds, potholes, flooded areas in meadows, and occasionally slow-moving streams or stream backwaters (Pope et al. 2014). Cascades frog has disappeared from much of its historical range due to predation from non-native and/or introduced fish species, and other threats (Pope et al. 2014).

Based on CWHR data, the southern Project area boundary is at the edge of the current range of CF, with all Survey Corridors located more than two mi from the known range (CDFW 2018b). The closest known occurrence of CF is approximately 1.2 mi (1.9 km) southeast of the Project area boundary; an additional known occurrence is approximately 6.3 mi (10.1 km) north of the Project (Figure 3, CDFW 2018a). No known occurrences of CF have been documented within the Project area (CDFW 2018a). The CWHR model of habitat suitability for CF indicates that only a small portion of low quality CF habitat is predicted to occur in the southernmost portion of the Project area (CDFW 2018b), well south of the construction corridors provided by Pacific Wind. This area of overlap was the focus of desktop and field evaluations of CF habitat in 2018.

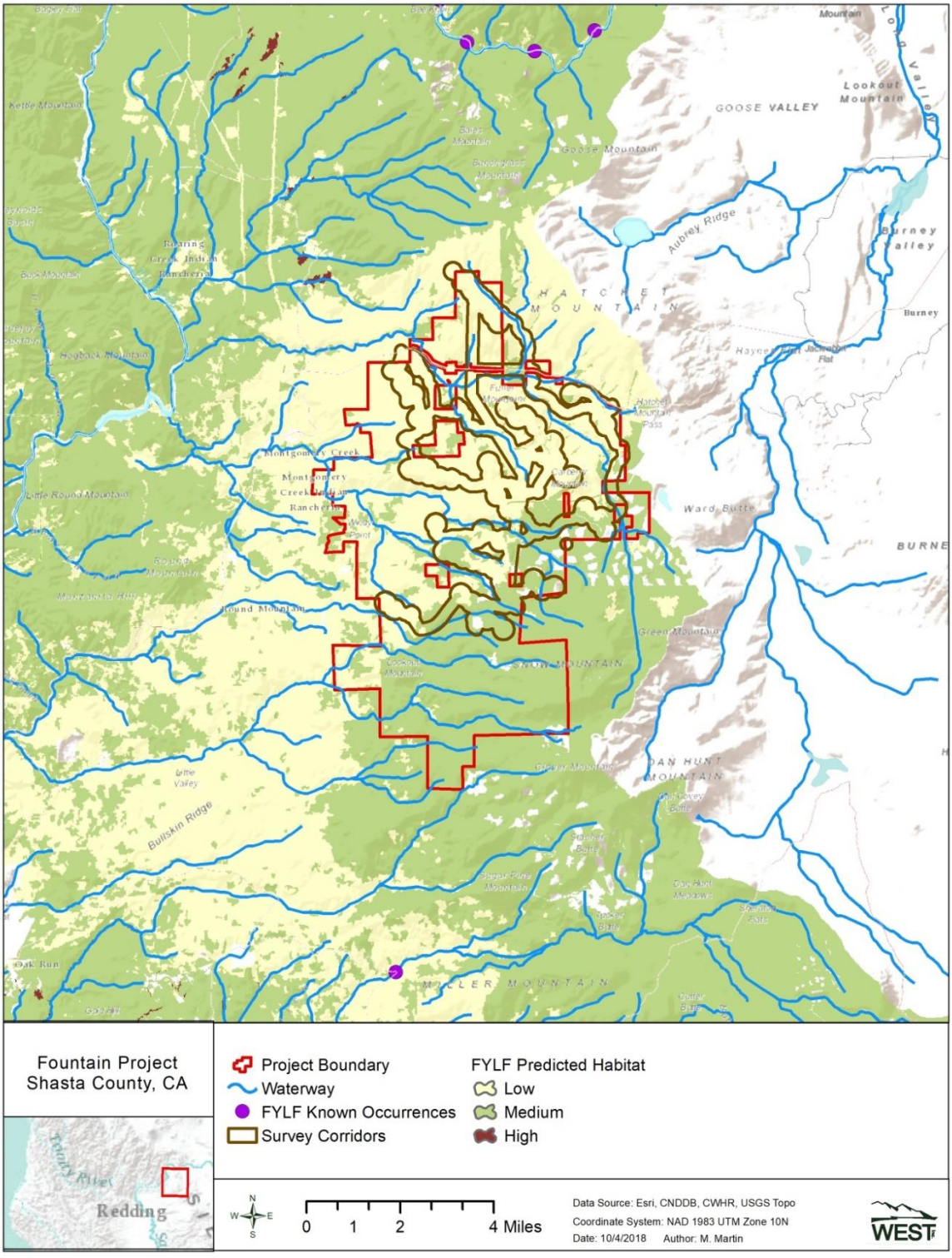

Figure 1. Foothill yellow-legged frog known occurrences and areas of predicted habitat as provided by the California Natural Diversity Database (CNDDB) and California Wildlife Habitat Relationships (CWHR) within the Fountain Wind Project area, Shasta County, California.

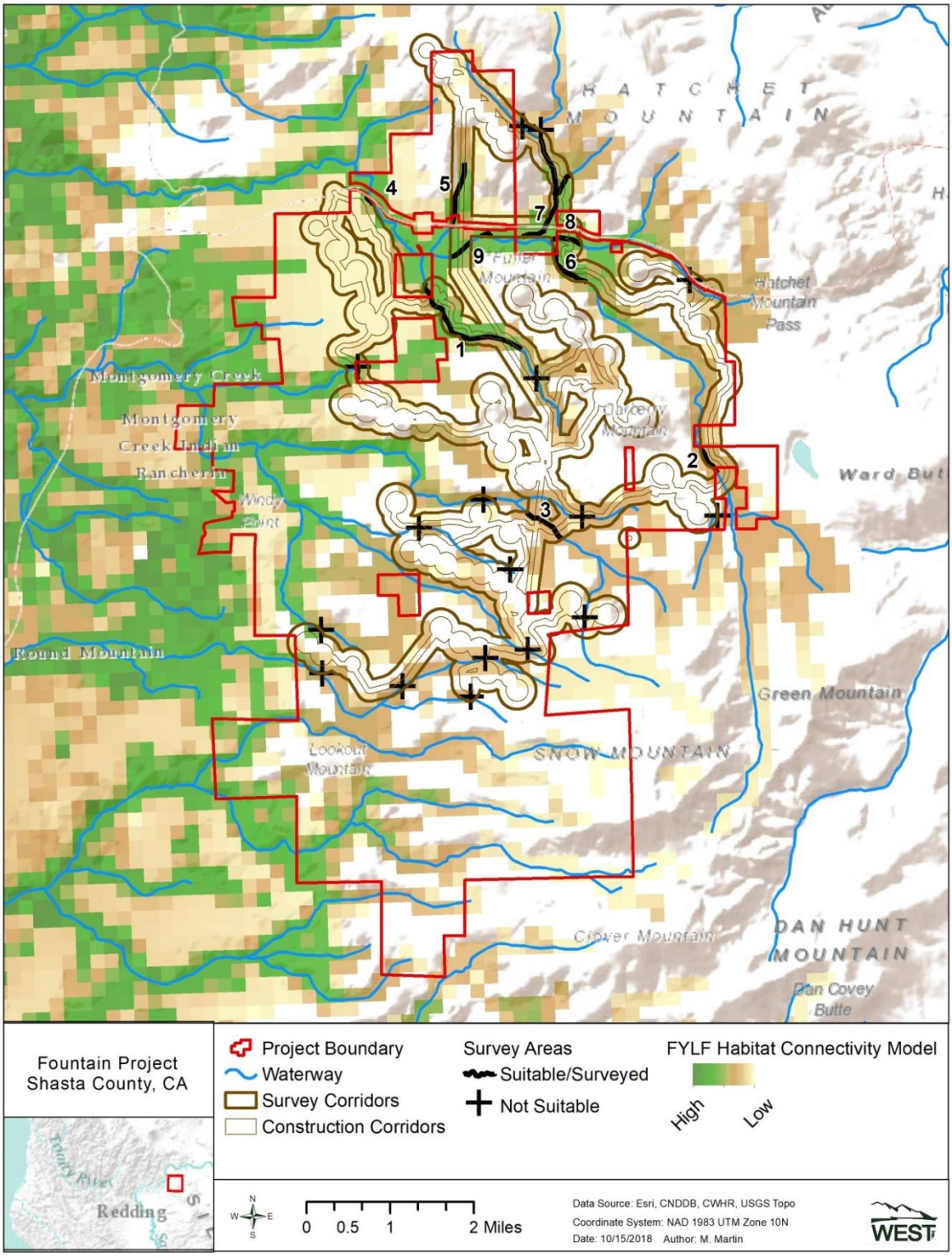

Figure 2. Foothill yellow-legged frog habitat assessment and survey areas within the Fountain Wind Project, Shasta County, California, based on modelled connectivity habitat obtained from the California Natural Diversity Database (CNDDB) and California Wildlife Habitat Relationships (CWHR).

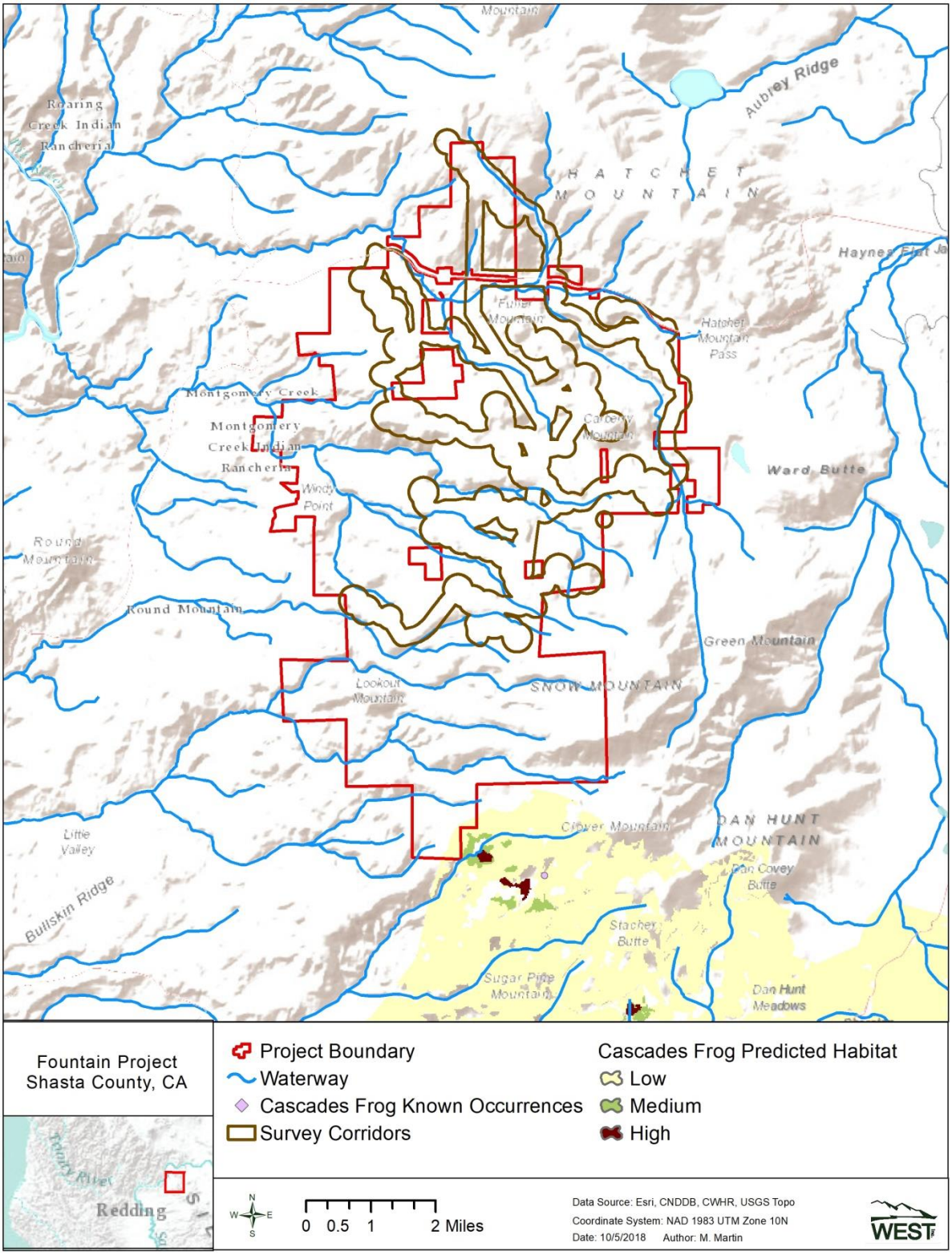

Figure 3. Cascades frog known occurrences and areas of predicted habitat as provided by the California Natural Diversity Database (CNDDB) and California Wildlife Habitat Relationships (CWHR) within the Fountain Wind Project, Shasta County, California.

METHODS

Foothill Yellow-legged Frog

Geographic information system (GIS) data from the CWHR and examination of aerial imagery were used to conduct a desktop review of potential FYLF habitat overlap with the Survey Corridors. The CWHR's GIS-based habitat model analyzes and compiles several remotely sensed GIS coverages to predict habitat suitability. A WEST biologist with training in FYLF survey methods conducted a field assessment of modeled FYLF habitat at the Project to verify habitat suitability and identify potential FYLF habitat not predicted by CWHR models. During the field assessment, the biologist visited areas of modelled habitat that overlapped with the Survey Corridors. Criteria considered during the field assessment for consideration as potential habitat, as defined by the CWHR models, included cover component (i.e., vegetation canopy closure from 20 - 90%), proximity to water (i.e., FYLF typically occur within 40 ft [12 m] of flowing, low-gradient perennial streams), elevation (below 6,562 ft [2,000 m]) and species range (i.e., known species occurrences; Hayes et al. 2016).

VES for FYLF were conducted in areas identified as suitable FYLF habitat in early September 2018. VES conducted in late summer have a high probability of detecting FYLF and are often the easiest method for determining FYLF presence, as subadult (and sometimes adults) FYLF are often observed along stream margins (van Hattem and Mantor 2018). VES were completed by walking all stretches of suitable habitat identified during the field assessment. The field surveyor walked up one side of the stream in stretches of suitable habitat visually searching for subadult and adult frogs, then returned on the opposite bank while continuing to visually search for FYLF. Each stretch of suitable habitat was given a survey area identifier and the date, survey time, air and water temperature, and vegetative cover were recorded for each survey. Survey routes were mapped with a handheld geographic positioning system unit and transferred to a GIS for later reference.

Cascades Frog

A desktop review for CF habitat suitability and occurrences within the Survey Corridors was conducted using a combination of range maps, CNDDB known occurrence data, CWHR predicted suitable habitat, and aerial imagery. These data were used in combination with site-specific field data collected during rare plant surveys (Flaig et al. 2019), to determine the likelihood of occurrence of suitable CF habitat within the Survey Corridors.

RESULTS AND DISCUSSION

Foothill Yellow-legged Frog

Results from a desktop analysis of potential habitat within the Survey Corridors yielded 15 areas where FYLF had potential to occur. Field assessments of habitat suitability within the 15 areas resulted in nine stream reaches that appeared to be suitable for FYLF. Habitat characteristics were identified as unsuitable for FYLF at 16 other stream crossings (see Figure 2). VES for

subadult and adult FYLF were conducted from September 1-4 in the nine areas identified as potentially suitable habitat.

No FYLF were detected during 2018 subadult VES (Table 1). In general, habitat for FYLF within the Survey Corridors was marginal due to limited or nonexistent surface water and/or excessive vegetative cover that greatly limited sun exposure.

Table 1. Results of visual encounter surveys conducted for Foothill yellow-legged frogs from September 1 – 4, 2018 at the Fountain Wind Project, Shasta County, California.

Survey Area	Survey Date	Survey Time (minutes)	Air Temp (°F)	Water Temp (°F)	Vegetation Cover		Detections
					Right Bank (%)	Left Bank (%)	
1	9/1/18	246	52	58	98	100	0
2	9/1/18	65	70	54	90	90	0
3	9/1/18	56	67	48	90	95	0
4	9/1/18	34	86	58	97	95	0
5	9/1/18	154	94	54	98	98	0
6	9/2/18	131	91	56	100	99	0
7	9/3/18	285	79	49	95	100	0
8	9/3/18	97	95	59	95	95	0
9	9/4/18	124	82	60	95	95	0

Cascades Frog

Based on range maps, the current range of CF overlaps with only a small area at the southern extent of the Project area. A desktop analysis of CWHR's potentially suitable CF habitat indicated approximately 75 acres (30 hectares) of low quality habitat potentially exists in the southern portion of the Project area (see Figure 3; CDFW 2018b). Results from field-based habitat mapping of this area verified that this predicted low quality habitat does not currently include the habitat components necessary to support CF (e.g., ponds or wet meadows; Flaig et al. 2018). Because the Survey Corridors are entirely outside the CF range and the modeled low-quality potential habitat that occurs within the larger Project area was confirmed as non-suitable, no formal surveys for CF were conducted.

CONCLUSION

VES for subadult FYLF conducted in late summer (i.e., late August to early October), immediately following the breeding season, yield the highest likelihood of detection for FYLF as both adults and subadults should be active during this period (van Hattem and Mantor 2018). However, no FYLF were detected during 2018 subadult VES conducted within the best habitats present within the Survey Corridors. The lack of FYLF detections during the 2018 VES surveys was consistent with results of past stream surveys conducted (primarily for fish) in support of timber management activities within the Project area by the landowners (R. Klug, Resource Planning Manager, LandVest Timberlands, personal communication).

Although some areas within the Survey Corridors were modeled as medium suitability for FYLF and some areas as having moderate to high connectivity, several of these areas were field-verified to be marginal or unsuitable habitat based on FLYF preferred habitat characteristics. Areas deemed marginal or unsuitable were either dry and/or the vegetative cover was inappropriate (i.e., too much canopy cover precluding sun exposure; Table 1). Based on the generally poor quality of FYLF habitat identified in the Survey Corridors, the lack of FLYF detections during VES conducted in 2018 in the highest quality habitats identified, and lack of historical FYLF detections documented by landowners during past stream surveys, it is unlikely that FYLF occur in the Project area. Additionally, according to the CWHR habitat connectivity model, connectivity between the closest known FYLF occurrence locations and the Project area are essentially non-existent (see Figure 2), suggesting that FYLF are not likely to immigrate into the Project area from other known occurrence areas. The data available from historical work in support of timber management activities within the Project area, and 2018 habitat assessments and surveys for FYLF, suggest that FYLF do not currently occur in, nor will they likely colonize the generally low-quality habitats present in the Project Survey Corridors; therefore, no impacts to FYLF are expected as a result of the Project.

Results from the desktop review of potential CF habitat at the Project indicated that the Project is largely outside the range of CF and only limited low quality habitat could potentially exist at the southern edge of the Project area. Habitat mapping conducted in this area during rare plant and natural community survey efforts (Flaig et al. 2018) indicated a lack of suitable habitat for CF (i.e., lack of WMM) in this area. Because this was the only area identified as potentially suitable habitat based on the CWHR model, but was identified as non-habitat during field surveys and did not overlap the Survey Corridors, no formal surveys were conducted for CF. Given the lack of habitat within the range of the CF and the lack of overlap among construction corridors and CF range, it is unlikely that CF occurs in areas that will be disturbed during Project construction; therefore no impacts to CF are expected as a result of the Project.

LITERATURE CITED

California Department of Fish and Wildlife (CDFW). 2018a. Special Animals List. Natural Diversity Database. April. *Available at*: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline. Periodic Publication. *Accessed* 15 July, 2018.

California Department of Fish and Wildlife (CDFW). 2018b. California Interagency Wildlife Task Group. CWHR version 9.0 personal computer program. Sacramento, CA. Available at: https://www.wildlife.ca.gov/Data/CWHR

Hayes, M.P. C.A. Wheeler, A.J. Lind, G.A. Green, and D.C. Macfarlane. 2016. 2016. Foothill Yellow-Legged Frog Conservation Assessment in California. Gen. Tech. Rep. PSW-GTR-248. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 193 p.

Flaig, K., Q. Hays, and J. Thompson. 2018. Rare Plant Surveys and Natural Vegetation Community Mapping, Fountain Wind Project, Shasta County, California. Prepared for Pacific Wind Development LLC; Portland, OR. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon.

Pope, K., C. Brown, M. Hayes, G. Green, and D. Macfarlane. 2014. Cascades Frog Conservation Assessment. Gen. Tech. Rep. PSW-GTR-244. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 116 p.

van Hattem, M, and M. Mantor. 2018. Considerations for Conserving the Foothill Yellow-Legged Frog. California Department of Fish and Wildlife. May 2018. *Available at:* https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=157562 &inline. Accessed 31 May, 2018.

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TECHNICAL MEMORANDUM

DATE: December 20, 2019

TO: John Kuba, ConnectGen Operating LLC

FROM: Andrea Chatfield and Kori Hutchison, WEST, Inc.

RE: 2018/2019 Foothill Yellow-legged Frog Assessment for the Fountain Wind Project, Shasta County, California

INTRODUCTION

In September 2018, at the request of the California Department of Fish and Wildlife (CDFW), Western EcoSystems Technology, Inc. (WEST) performed an assessment of potential foothill yellow-legged frog (FYLF; *Rana boylii*) habitat, and conducted visual encounter surveys (VES) in the most suitable habitats located on lands leased for the development of the proposed Fountain Wind Project (Project). The 2018 habitat assessment and subsequent surveys were conducted within development corridors[1] provided by the Project proponent in May 2018 (Figure 1). In May 2019, the Project layout was amended, adding areas of proposed development that were not covered by the 2018 FYLF habitat assessment and VES (Figure 1). As a result, in June 2019, WEST performed a supplemental desktop review and field verification of potential FYLF habitat. VES were conducted in potentially suitable habitats within these newly added development corridors, as well as within suitable breeding habitats previously surveyed in 2018. The following memorandum summarizes WEST's efforts to assess the potential for FYLF to occur within the development corridors, based on desktop assessments and field verification of potentially suitable habitat, VES conducted in 2018 and 2019, and consultation with CDFW biologists and herpetologists.

SPECIES BACKGROUND

Foothill yellow-legged frog (FYLF; *Rana boylii*) was designated as a candidate for listing as threatened at the species level under the California Endangered Species Act (CESA) on July 7,

[1] The development corridors represent all project facilities included in the site plan and an appropriate buffer to capture any areas where potential disturbance could occur. As the Project progressed, the development corridors were iteratively refined to form the most current iteration of the project referred to as the Project Site.

2017, and is currently under review for possible listing as threatened or endangered under the federal Endangered Species Act (ESA). In a status review submitted to the California Fish and Game Commission on September 20, 2019, CDFW recommended listing 5 of 6 genetically distinct clades as threatened or endangered: East/Southern Sierra, West/Central Coast, and Southwest/South Coast clades as endangered; Northeast/Northern Sierra and Feather River clades as threatened (CDFW 2019c). The CDFW recommended that a listing for the Northwest/North Coast clade, which is the only clade to occur within or adjacent to the Project, was not warranted at this time, as this clade has the most robust populations and greatest genetic diversity (CDFW 2019c). In December 2019, the California Fish and Game Commission adopted CDFW's listing recommendation as proposed. .

According to the California Natural Diversity Database (CNDDB), several known occurrences of FYLF have been documented in the vicinity of the Project. These include a single specimen collected in 1953 with an approximate location of between 0.5 and 1.5 miles (mi; 0.8 to 2.4 kilometers [km]) northwest of the Project, likely on Hatchet Creek; several detections of all life stages documented as recently as 2018, approximately 4.0 mi (6.4 km) north of the Project along the Pit River; and a single observation of two adult FYLF documented in 2001 approximately 4.0 mi (6.4 km) south of the May 2019 development corridors (CDFW 2019b). Although the species has not been documented within the development corridors, and the Project is on the edge of the species range (Figure 1), the California Wildlife Habitat Relationships (CWHR) database, maintained by CDFW (2019a), indicates that potential habitat for FYLF may be present within the Project development corridors.

PROJECT AND SURVEY AREA

The Project is located on privately owned commercial timberlands in central Shasta County, California. The dominant vegetation type in and around the Project is mixed coniferous forest (both post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use in this area is commercial timber production, which has resulted in a highly fragmented landscape across much of the area. Dominant overstory species include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*).

For the purpose of assessing FYLF habitat and conducting field surveys, development corridors were provided in a Geographic Information System (GIS) format by the Project proponents in May 2018 and May 2019 (Figure 1). The development corridors include all project facilities and adjacent areas where potential permanent and temporary disturbance could occur. The development corridors varied in size and included buffers of all areas of proposed infrastructure that may be subject to ground disturbance (e.g., newly proposed roads, roads that may be expanded, turbine pads, and underground collection lines) to provide for some flexibility in final project design. For the purpose of assessing FYLF habitat for the May 2019 Project layout, the 2019 development corridors were overlain onto the development corridors used in the 2018 habitat assessment to identify new areas of proposed development requiring additional evaluation

(Figure 1). The May 2019 Project layout includes approximately 1,746 acres (707 hectares) which fall outside of the 2018 development corridors and were, therefore, not evaluated during the 2018 assessment (see Figure 1). WEST buffered the 2018 and 2019 development corridors by an additional 500 feet (ft; 152 meters [m]) to delineate survey areas used in the assessment of FYLF habitat suitability and to guide field surveys efforts. The 500-ft buffer was used as van Hattem and Mantor (2018) recommend that surveys are conducted 500 ft upstream and downstream of disturbance projects.

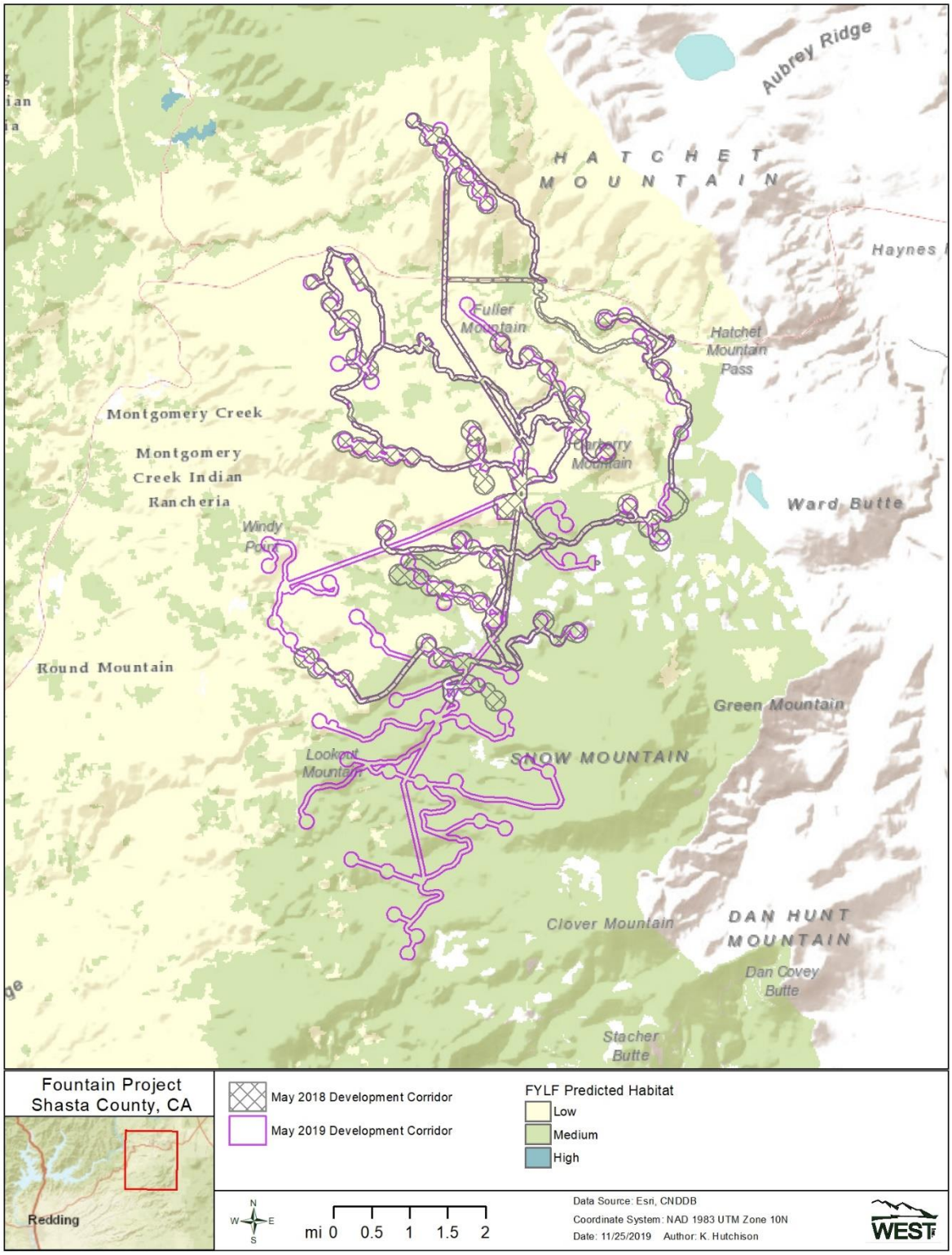

Figure 1. Proposed development corridors for the Fountain Wind Project as provided by the Project proponent in May 2018 and May 2019 and foothill yellow-legged frog areas of predicted habitat as provided by the California Wildlife Habitat Relationships (CWHR).

METHODS

Habitat Assessment

Geographic information system (GIS) data from the CWHR, United States Geological Survey (USGS) National Hydrography Dataset (NHD; USGS 2019), and examination of aerial imagery were used to conduct a desktop review of potential FYLF habitat overlap with development corridors. The CWHR's GIS-based habitat model analyzes and compiles several remotely sensed GIS coverages to predict habitat suitability. The CWHR includes information on both habitat suitability (i.e., predicted habitat; Figure 1) and habitat modeled as potentially important for connectivity (i.e., connectivity habitat; Figure 2) for FYLF (CDFW 2019a). An initial desktop assessment was completed in 2018 and, following revision to the Project layout in May 2019, a supplemental assessment was completed for newly added development corridors. Following both the 2018 and 2019 desktop habitat assessments, a WEST biologist with training in FYLF survey methods conducted a field assessment to determine suitability of 1) CWHR modeled FYLF habitat near stream crossings of the Project Layout, and 2) potential FYLF habitat at crossings not predicted by CWHR models. During the field assessment, the biologist visited areas of modeled habitat that overlapped with the development corridors. Criteria considered during the field assessment for consideration as potential habitat, as defined by the CWHR models, included cover component (i.e., vegetation canopy closure from 20 - 90%), proximity to water (i.e., FYLF typically occur within 40 ft [12 m] of flowing, low-gradient perennial streams), elevation (below 6,562 ft [2,000 m]) and species range (i.e., known species occurrences; Hayes et al. 2016).

Visual Encounter Surveys

VES for FYLF were conducted in areas identified as potentially suitable FYLF habitat in early September 2018. VES conducted in late summer have a high probability of detecting FYLF and are often the easiest method for determining FYLF presence, as subadult (and sometimes adult) FYLF are often observed along stream margins (van Hattem and Mantor 2018). VES were completed by walking all stretches of potentially suitable habitat identified during the habitat assessment. The field surveyor walked up one side of the stream in stretches of suitable habitat visually searching for subadult and adult frogs, then returned on the opposite bank while continuing to visually search for FYLF. Each stretch of suitable habitat was given a survey area identifier and the date, survey time, air and water temperature, and vegetative cover were recorded for each survey. Survey routes were mapped with a handheld geographic positioning system unit and transferred to a GIS for later reference.

In June of 2019, after consultation with CDFW, additional VES were conducted for egg masses and adult FYLF within stream sections that qualified as suitable breeding habitat. Survey methodology was consistent between the two years, with a focus on protected stream edges with low flow velocity, as these sites are more suitable for egg mass attachment (van Hattem and Mantor 2018).

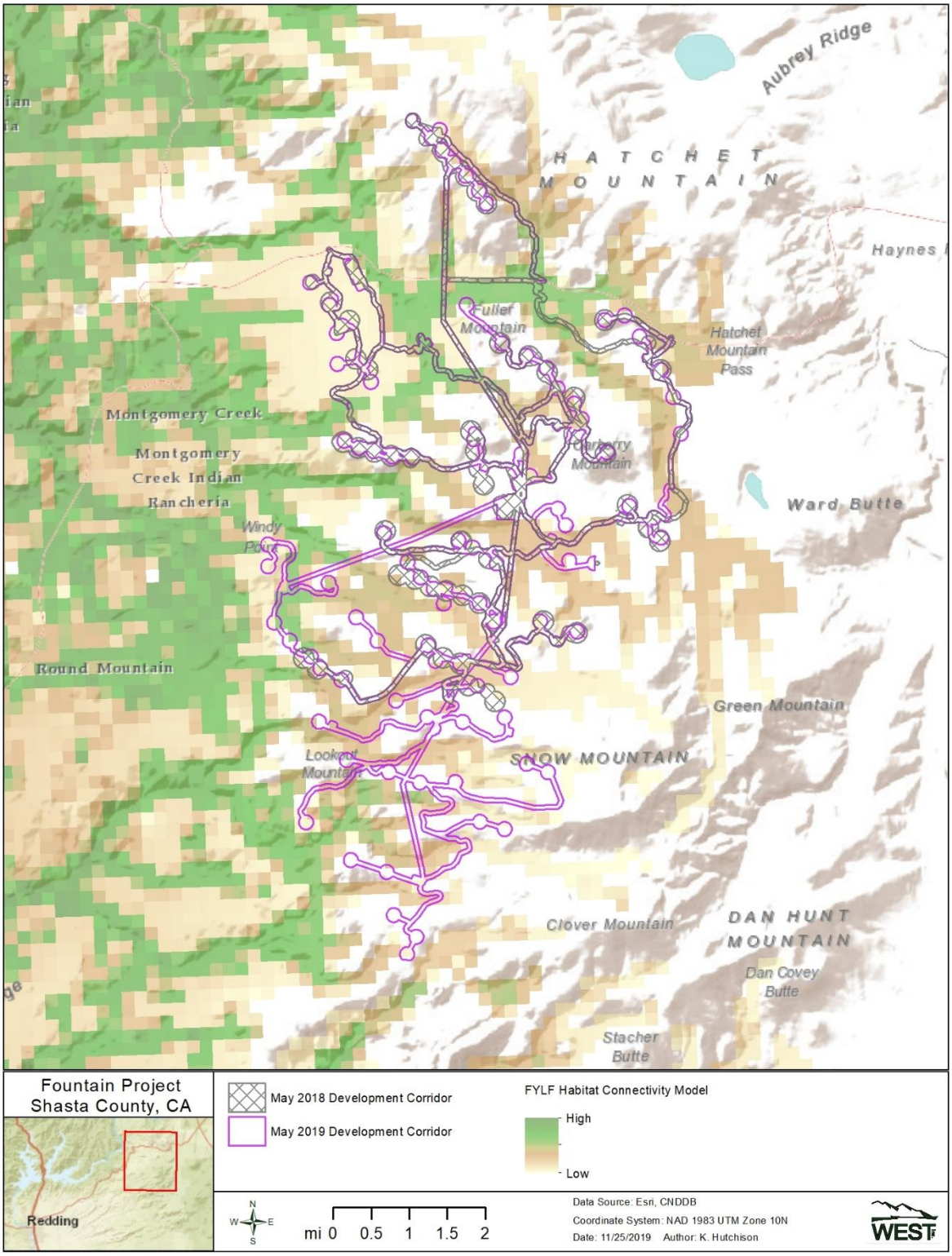

Figure 2. Modelled connectivity habitat for foothill yellow-legged frog within the Fountain Wind Project as obtained from the California Natural Diversity Database (CNDDB) and California Wildlife Habitat Relationships (CWHR).

RESULTS AND DISCUSSION

Habitat Assessement

Although the large majority of FYLF habitat within the development corridors is classified as low likelihood of occurrence using the CWHR predicted habitat model (Figure 1), some locations are classified as medium to higher suitability for potential habitat connectivity (Figure 2). The predicted habitat and habitat connectivity models overlap with the development corridors in some locations. Because the FYLF is most commonly associated with moving waters, stream corridors within areas of higher rated habitat connectivity that overlapped with development corridors were the focus of FYLF habitat assessments and field surveys in 2018 and 2019 (Figure 3).

Results from a desktop analysis of potentially suitable habitat within the 2018 development corridors yielded 15 areas where FYLF had the highest potential to occur. These 15 areas were assessed in the field for FYLF habitat suitability in September 2018. During the field assessment, nine areas were identified as containing potentially suitable habitat for FYLF (see Figure 3). Based on the 2019 desktop assessment and field verification, five additional areas were identified as containing potentially suitable FYLF habitat within the newly added (i.e., 2019) development corridors (Figure 3).

Visual Encounter Surveys

VES for subadult and adult FYLF were conducted September 1-4, 2018 in the nine areas identified as potentially suitable habitat during the 2018 habitat assessment (Figure 3). VES for egg masses and adults were again conducted June 18-22 and 29-30, 2019 within areas identified as potential FLYF breeding habitat during both the 2018 and 2019 assessments (Figure 3). No life stages of FYLF or any sensitive amphibian species were detected during September 2018 subadult/adult VES or June 2019 egg mass/adult VES. In general, habitat for FYLF within the development corridors was marginal due to limited or nonexistent surface water and/or excessive vegetative cover that greatly limited sun exposure.

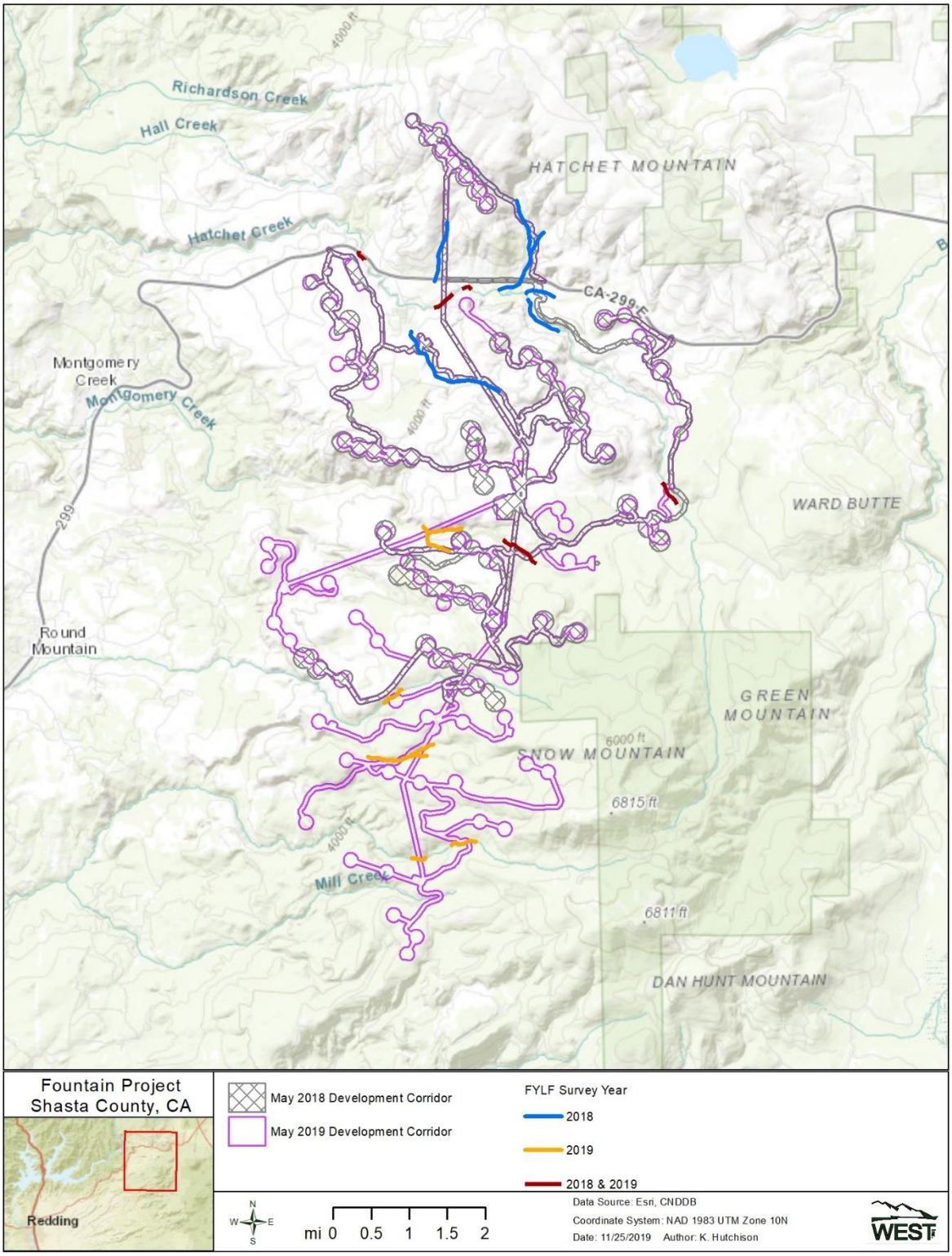

Figure 3. Foothill yellow-legged frog habitat assessment and survey areas within the Fountain Wind Project, Shasta County, California.

Agency Consultation and Site Visit

Consultation with CDFW and US Fish and Wildlife (USFWS) biologists was initiated early in the Project planning phase and has continued throughout the early development phase. In-person meetings with agency personnel included meetings with USFWS and CDFW on July 15, 2017 and February 12, 2019, and a site visit with CDFW on July 23, 2019. Additionally, WEST has had multiple phone conversations and email correspondence with CDFW biologists throughout the spring and summer of 2019, specifically with regard to FYLF. In particular, correspondence involved discussion of the best approach for continued FYLF surveys given the difficulty of surveying areas with excessive vegetative cover. Mike van Hattem, herpetologist with CDFW, expressed hesitation to skip surveys in these habitats altogether, as these streams could potentially be used for dispersal even though the streams are not able to support most life stages of FYLF (M. van Hatterm, CDFW, pers. comm.). Because dispersal is most likely to occur in the fall after the breeding season survey period, WEST coordinated with CDFW to focus surveys on suitable breeding habitat. Therefore those areas that met qualifications for suitable breeding habitat for FYLF would be surveyed for egg masses and adults during the 2019 breeding season.

During the July 2019 site visit, a WEST biologist showed CDFW examples of each category of FYLF habitat surveyed in 2018 (i.e., low-quality, medium-quality, high-quality), and the majority of the breeding habitats surveyed in 2019. The group conducted VES surveys out to 500 ft in two of the survey areas, and in areas immediately adjacent to crossings at the rest of the suitable breeding habitat visited that day. No life stages of FYLF or any sensitive amphibian species were detected during the site visit. During the July 2019 site visit, CDFW biologists agreed that it was less effective to conduct standard VES at the lower quality habitats, and that habitats identified as potentially suitable breeding habitat for FYLF were unlikely to be able to support egg mass attachment during the breeding period due to high flow velocities and low temps (≤10 degrees Celsius) into early July (M. van Hattem, CDFW, pers. comm.). CDFW biologists recommended environmental DNA (eDNA) as an alternative methodology and the group agreed that this would be a more effective option of determining presence/absence of FYLF at the Project.

CONCLUSION

Surveys for FYLF conducted during and immediately following the breeding season are considered most effective (van Hattem and Mantor 2018); however, no FYLF were detected during 2018 or 2019 VES conducted within the best habitats present within the development corridors. The lack of FYLF detections during the VES was consistent with results of past stream surveys conducted (primarily for fish) in support of timber management activities within the leasehold area by the landowners (R. Klug, Resource Planning Manager, LandVest Timberlands, pers. comm.).

Although some areas within the development corridors were modeled as medium suitability for FYLF and some areas as having moderate to high connectivity, several of these areas were field-verified by a WEST biologist to be marginal or unsuitable habitat based on FLYF preferred habitat characteristics. Areas deemed marginal or unsuitable were either dry and/or the vegetative cover

was inappropriate (i.e., too much canopy cover precluding sun exposure). Based on the generally poor quality of FYLF habitat identified at the Project's stream crossings, the lack of FLYF detections during VES conducted in 2018 and 2019 in the highest quality habitats identified, and lack of historical FYLF detections documented by landowners during past stream surveys, it is unlikely that FYLF occur at the Project. Additionally, according to the CWHR habitat connectivity model, connectivity between the closest known FYLF occurrence locations and the development corridors are essentially non-existent (see Figure 2), suggesting that FYLF are not likely to immigrate into the area from other known occurrence areas. The data available from historical work in support of timber management activities within the leasehold area, and 2018/2019 habitat assessments and surveys for FYLF, suggest that FYLF do not currently occur in, nor will they likely colonize the generally low-quality habitats present in the Project's development corridors; therefore, no impacts to FYLF are expected as a result of the Project.

This assessment is supported by early and ongoing communication with CDFW biologists and herpetologists concerning the potential for FYLF to occur in the development corridors and recommendations for surveys. Based on a site visit, CDFW confirmed that the likelihood of breeding habitat supporting egg masses is low, largely because of the late snow melt typical of the region. Additionally, dense vegetation along streams make VES more difficult and potentially less effective than surveys conducted along more open waterways. In consideration of these factors, CDFW biologists suggested presence/absence surveys using eDNA methodology to further supplement the VES surveys. WEST performed eDNA surveys on the Project Site in September 2019; no positive detections of FYLF were encountered. A detailed discussion of the methodology and survey results are included in a separate report titled, "2019 eDNA Surveys for Foothill Yellow-legged Frog at the Fountain Wind Project, Shasta County, California".

LITERATURE CITED

California Department of Fish and Wildlife (CDFW). 2019a. California Interagency Wildlife Task Group. CWHR version 9.0 personal computer program. Sacramento, CA. Available at: https://www.wildlife.ca.gov/Data/CWHR

California Department of Fish and Wildlife (CDFW). 2019b. California Natural Diversity Database (CNDDB). Available at: http://bios.dfg.ca.gov and https://map.dfg.ca.gov/rarefind/view/RareFind.aspx. Accessed 15 July, 2018, 1 June, 2019, and 1 October, 2019.

California Department of Fish and Wildlife (CDFW). 2019c. Report to the Fish and Game Commission: Status Review of the Foothill Yellow-Legged Frog in California. September 2019. 117p.

Hayes, M.P., C.A. Wheeler, A.J. Lind, G.A. Green, and D.C. Macfarlane. 2016. Foothill Yellow-Legged Frog Conservation Assessment in California. Gen. Tech. Rep. PSW-GTR-248. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 193 p.

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

U.S. Geological Survey (USGS). 2018. USGS Topographic maps.

U.S. Geological Survey (USGS). 2019. National Hydrography Dataset. Accessed 1 November 2019.

van Hattem, M, and M. Mantor. 2018. Considerations for Conserving the Foothill Yellow-Legged Frog. California Department of Fish and Wildlife. May 2018. Available at: https://nrm.dfg.ca.gov/File Handler.ashx?DocumentID=157562 &inline.

Appendix D
Communications Interference

ENGINEERING REPORT
CONCERNING THE EFFECTS UPON
FCC LICENSED RF FACILITIES
DUE TO CONSTRUCTION OF THE
FOUNTAIN WIND ENERGY PROJECT
In
SHASTA COUNTY, CALIFORNIA

Prepared for
Environmental Science Associates
San Francisco, CA

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I. INTRODUCTION

This engineering report describes the results of a study and analysis to determine the locations of federally-licensed (FCC) microwave and fixed station radio frequency (RF) facilities that may be adversely impacted as a result of the construction of the Fountain Wind Energy Project in Shasta County, California. This document describes impact zones and any necessary mitigation procedures, along with recommendations concerning individual wind turbine siting. All illustrations, calculations and conclusions contained in this document are based on FCC database records[1].

Frequently, wind turbines located on land parcels near RF facilities can cause more than one mode of RF impact, and may require an iterative procedure to minimize adverse effects. This procedure is necessary in order to ensure that disruption of RF facilities either does not occur or, in the alternative, that mitigation procedures will be effective. The purpose of this study is to facilitate the siting of turbines to avoid such unacceptable impact.

The Fountain wind project as currently planned involves the construction of up to 72 wind turbines and five MET towers just southwest of the town of Burney, in central Shasta County, California. The wind turbine model being considered has a hub height of 125 meter above ground and a rotor diameter of 162 meters. The maximum blade tip height would thus be 206 meters above ground.

Using industry standard procedures and FCC databases, a search was conducted to determine the presence of any existing microwave paths crossing the subject property, land mobile and other RF facilities within or adjacent to the identified area and TV and AM broadcast signals receivable in the area. A specific turbine layout has been submitted for analysis. Accordingly,

[1] The databases used in creating the attached tables and maps are generally accurate, but anomalies have been known to occur.

this report will address the potential conflicts that may be caused by the individually-sited proposed turbines.

The following report and analyses consist of six sections:

1. Microwave point-to-point path analysis
2. Land mobile, public safety and other communications tower sites
3. Earth Station Facilities analysis
4. Broadcast AM Radio and TV
5. NTIA Notification

The attached figures were generated based upon the operating parameters of the FCC-licensed stations as contained in the FCC station database. Often the technical data for stations in the FCC database, including their locations, are inaccurate; in such cases, follow-up due diligence should be done to assure no impact by the turbines to the stations based on the true technical data.

The following analysis examines the pertinent FCC licensed services in the area for impact. This analysis assumes that all licensed services have been designed and constructed according to FCC requirements and good engineering practice. If this is not the case, the impacted facility must share responsibility with the wind project developer for the costs of any mitigation measures[2].

Each of the RF analyses is described separately in the sections that follow.

II. ANALYSIS OF MICROWAVE LINKS

An extensive analysis was undertaken to determine the likely effect of the new wind turbine farm upon the existing microwave paths, consisting of a Fresnel x/y/z axis study. The microwave paths have been overlaid on Google Earth™ maps, and the images of the microwave paths and the proposed turbines are also available in a KMZ file.

Important Note: Microwave path studies are based upon third party and FCC databases that normally exhibit a high degree of accuracy and reliability. Although Evans performs due diligence to ensure that all existing microwave facilities are accurately represented, we cannot be responsible for errors in FCC databases that may lead to incomplete results. However, should such situations occur, Evans would perform additional engineering analyses to determine how the additional facilities can be accommodated or, if wind turbine structures are already built, determine a method to re-direct an impacted beam path.

[2] For instance, some microwave paths may have insufficient ground clearances as they are presently configured.

For this microwave study, the *First Fresnel Zone* (FFZ) ellipsoid, with K factor of 1.333, was calculated for each microwave path. The mid-point of a microwave path is the location where the widest (or worst case) Fresnel zone occurs. The radius *R* of the First Fresnel Zone, in meters, at the midpoint of the path is calculated for each microwave link using the following formula:

$$R \cong 8.65\sqrt{\frac{D}{F_{GHz}}}$$

where *D* is the microwave path length in kilometers and F_{GHz} is the frequency in gigahertz. This value is shown for each tabulated microwave path in Table 1 below. The FFZ ellipsoid is the zone where the siting of obstructions should be avoided.

Evans Engineering Solutions has identified 72 unique licensed microwave paths from the FCC database that are within 2 miles of the project area. These are listed in Appendix A.

In order to assess the blocking impact of the wind turbines proposed to be used, 3-D models of the wind turbines and the First Fresnel Zones of the microwave paths found in the area have been placed into the geographical depiction shown in the illustrations in this report. The results of that assessment are shown in the following Figures 3 through 13. As these figures show, none of the planned turbines are in conflict with the FFZs of the microwave links in the area as described by their FCC licenses.

The KMZ file containing the microwave paths and the proposed turbines are provided for further examination and closer inspection.

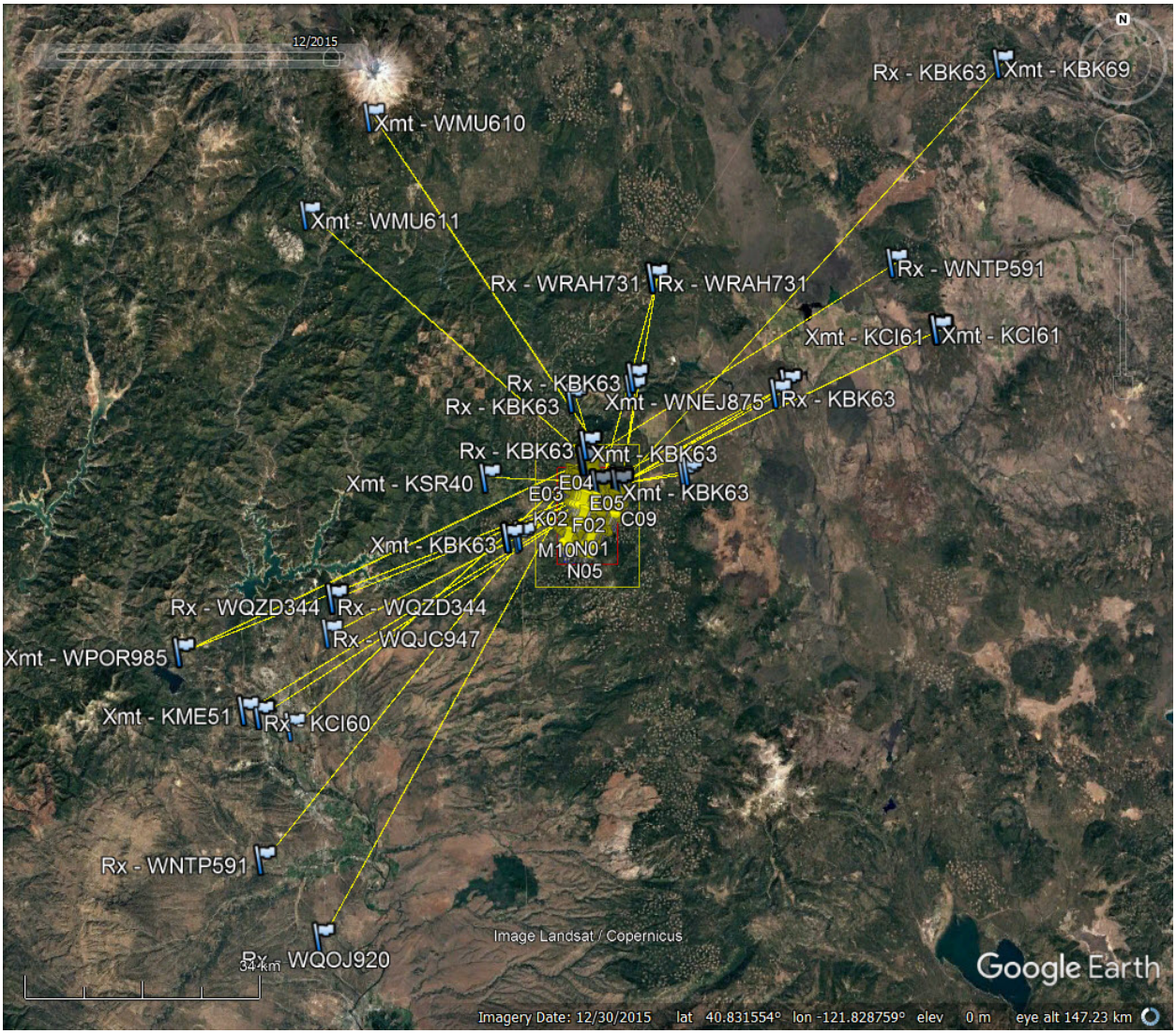


Figure 1 – Licensed Microwave Paths in or near Fountain Project Area

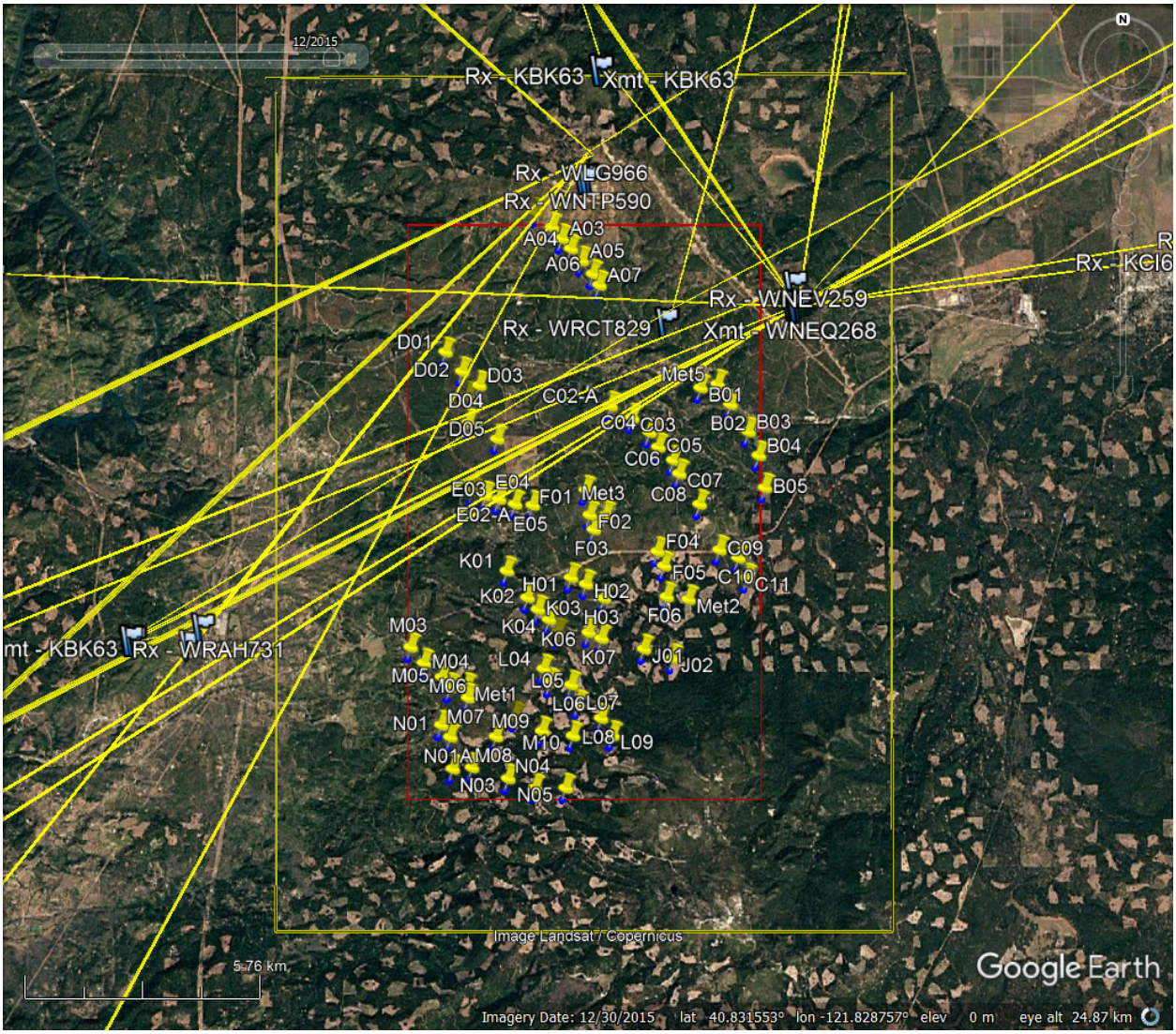


Figure 2 – Close-Up of Licensed Microwave Paths in or near Fountain Project Area

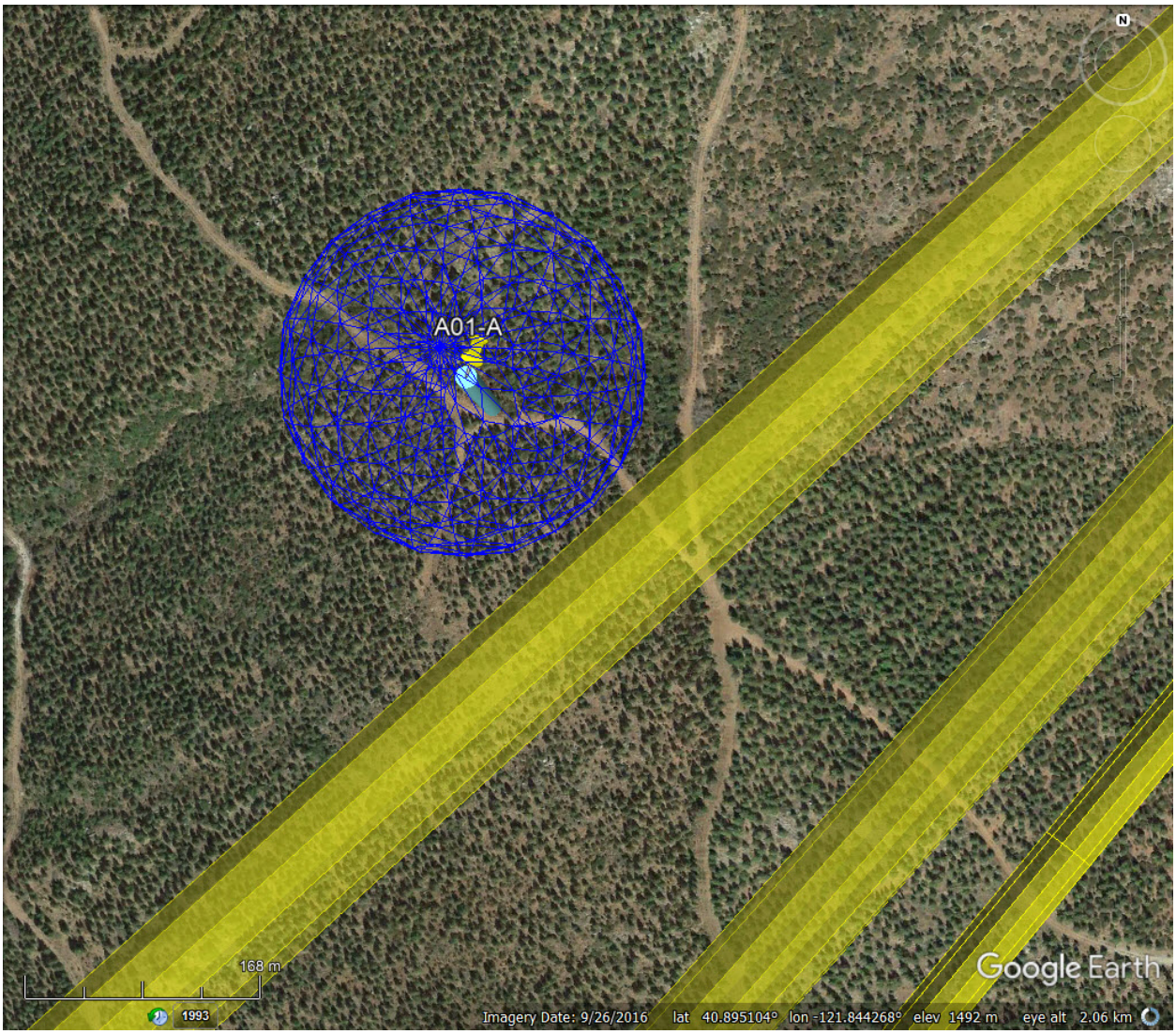


Figure 3 – Planned Turbine A01-A Close to Microwave Path

As can be seen in the image above, Turbine A01-A would not penetrate the FFZ of the FCC-licensed microwave link.

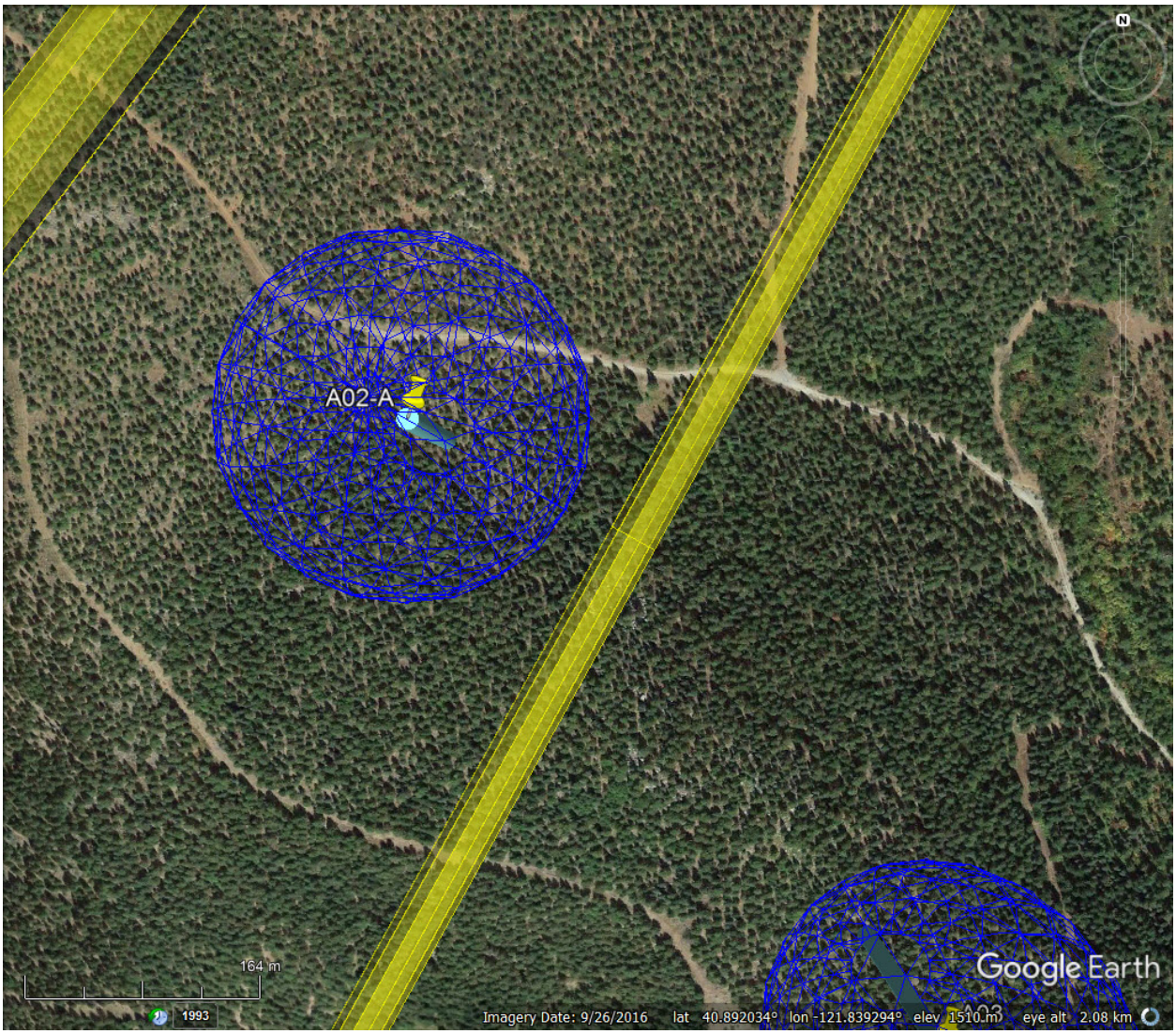


Figure 4 – Planned Turbine A02-A Close to Microwave Path

As can be seen in the image above, Turbine A02-A would not penetrate the FFZ of the FCC-licensed microwave link.

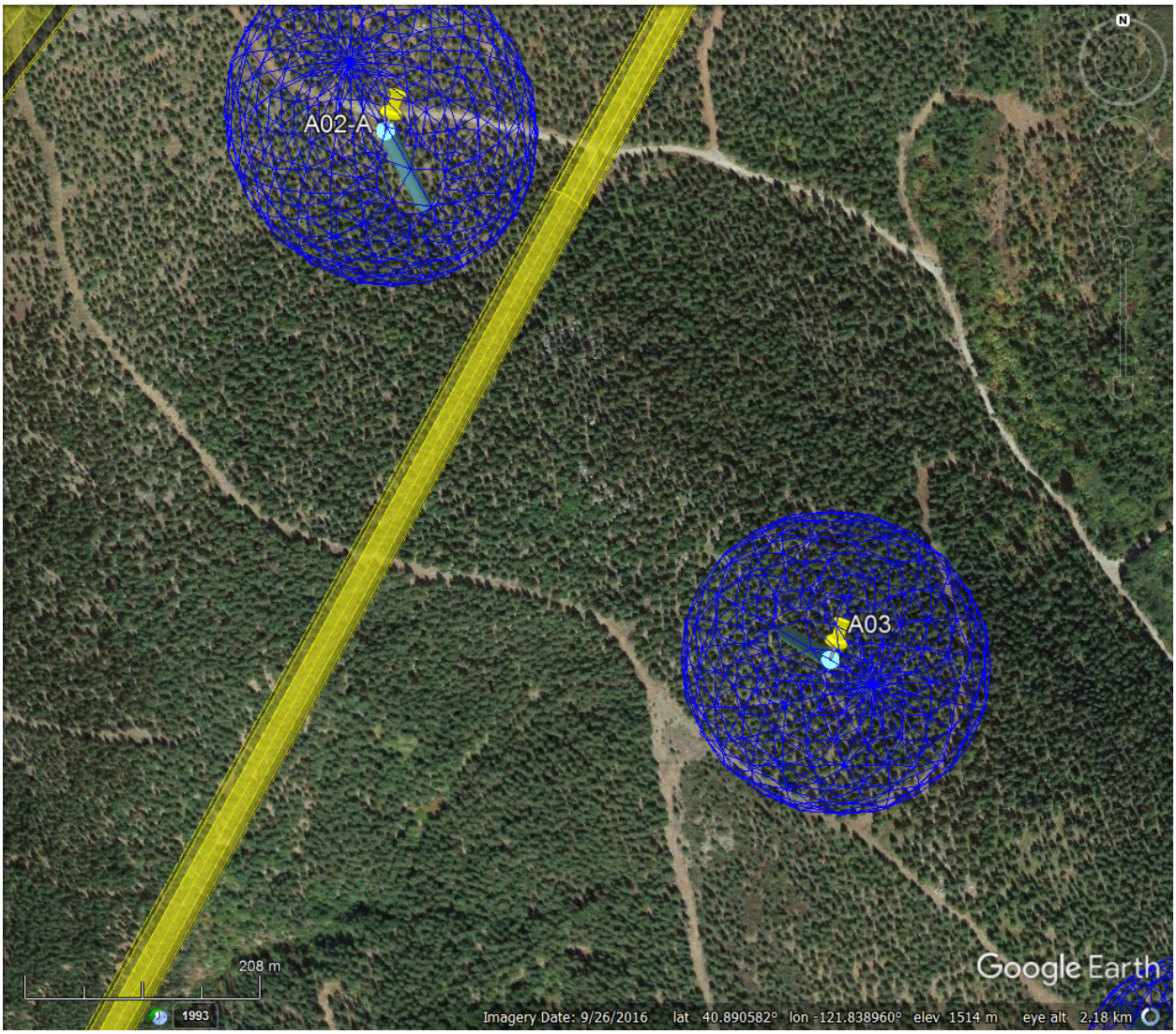


Figure 5 – Planned Turbine A03 Close to Microwave Path

As can be seen in the image above, Turbine A03 would not penetrate the FFZ of the FCC-licensed microwave link.

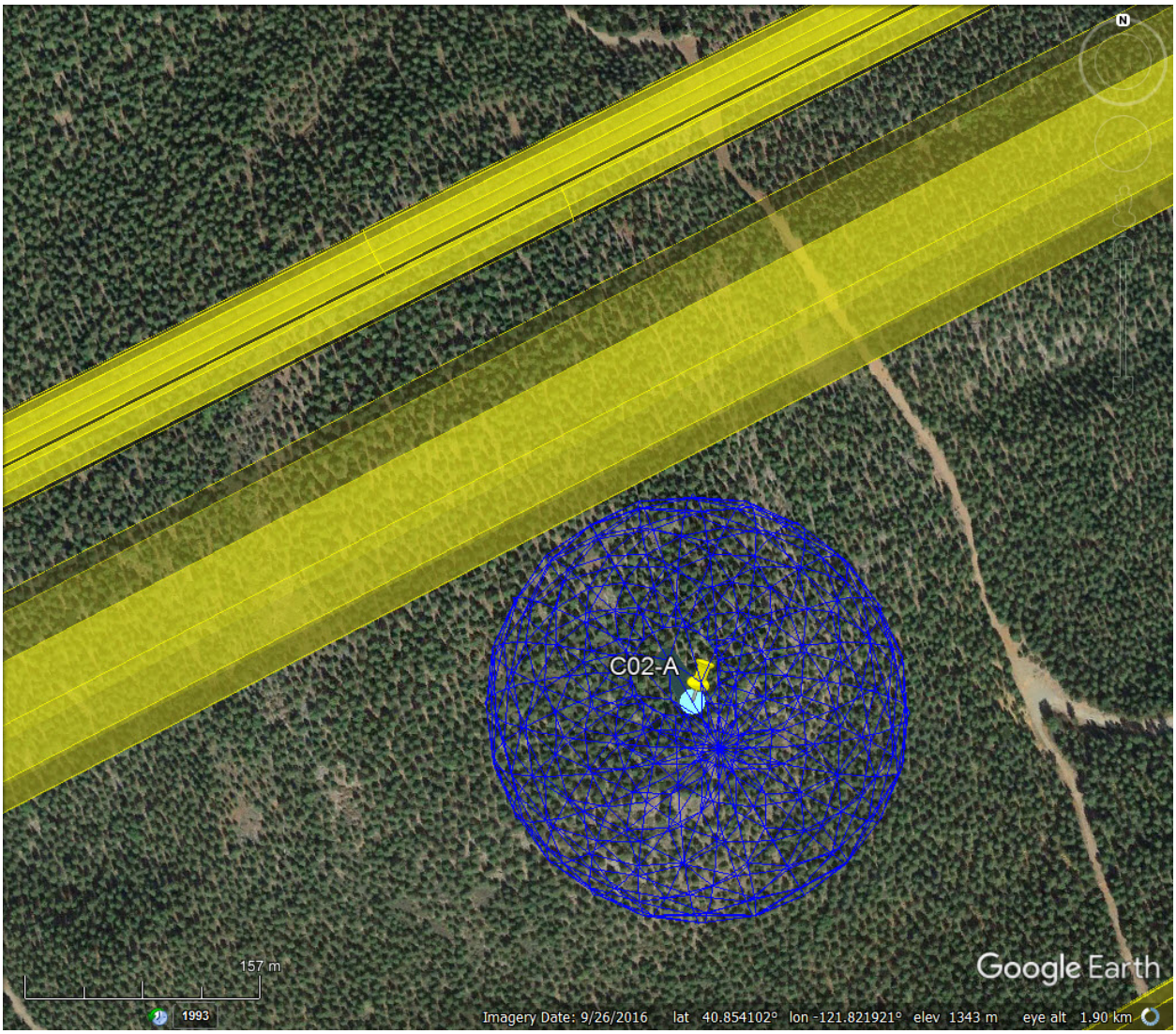


Figure 6 – Planned Turbine C02-A Close to Microwave Path

As can be seen in the image above, Turbine C02-1 would not penetrate the FFZ of the FCC-licensed microwave link.

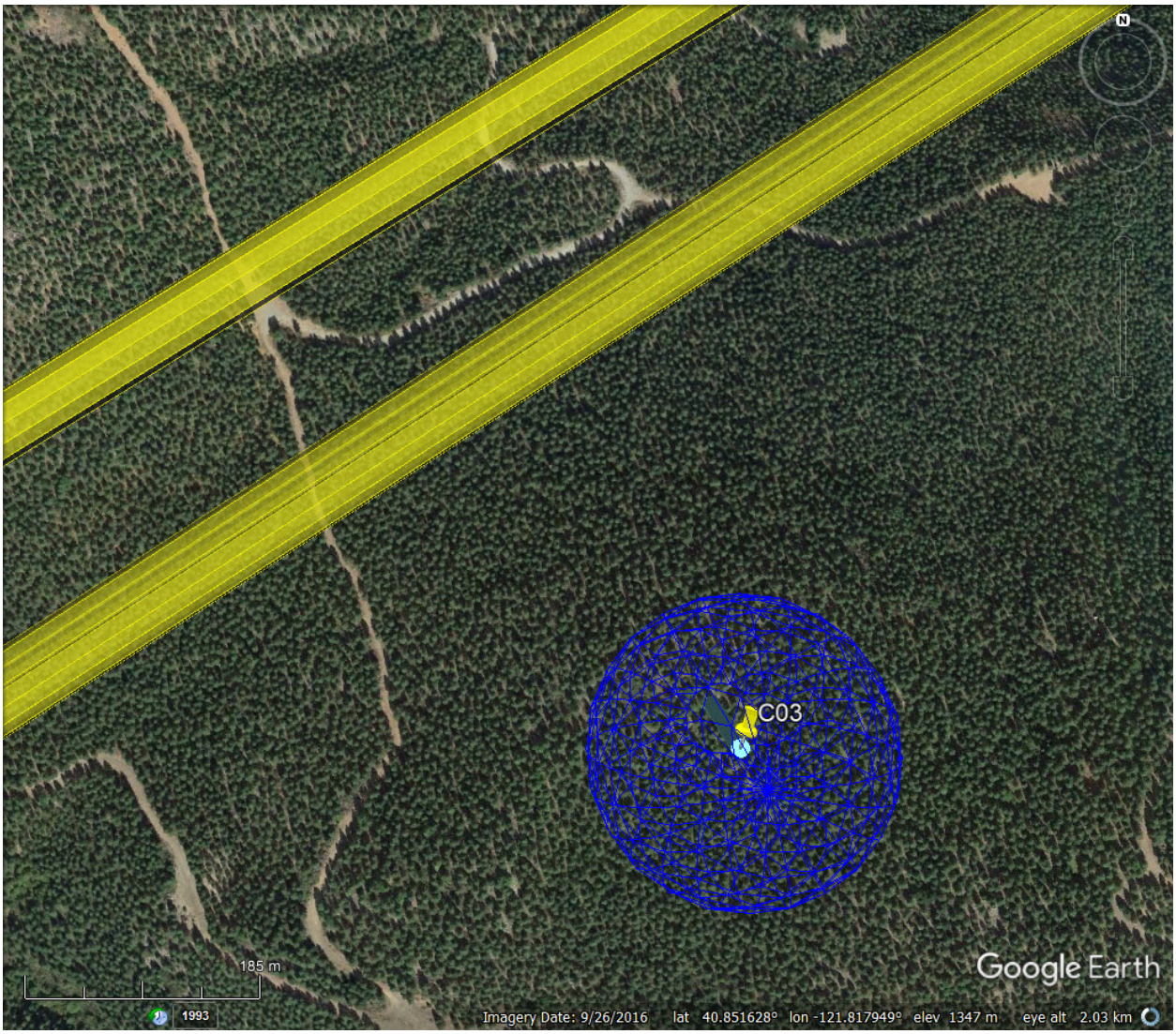


Figure 7 – Planned Turbine C03 Close to Microwave Path

As can be seen in the image above, Turbine C03 would not penetrate the FFZ of the FCC-licensed microwave link.

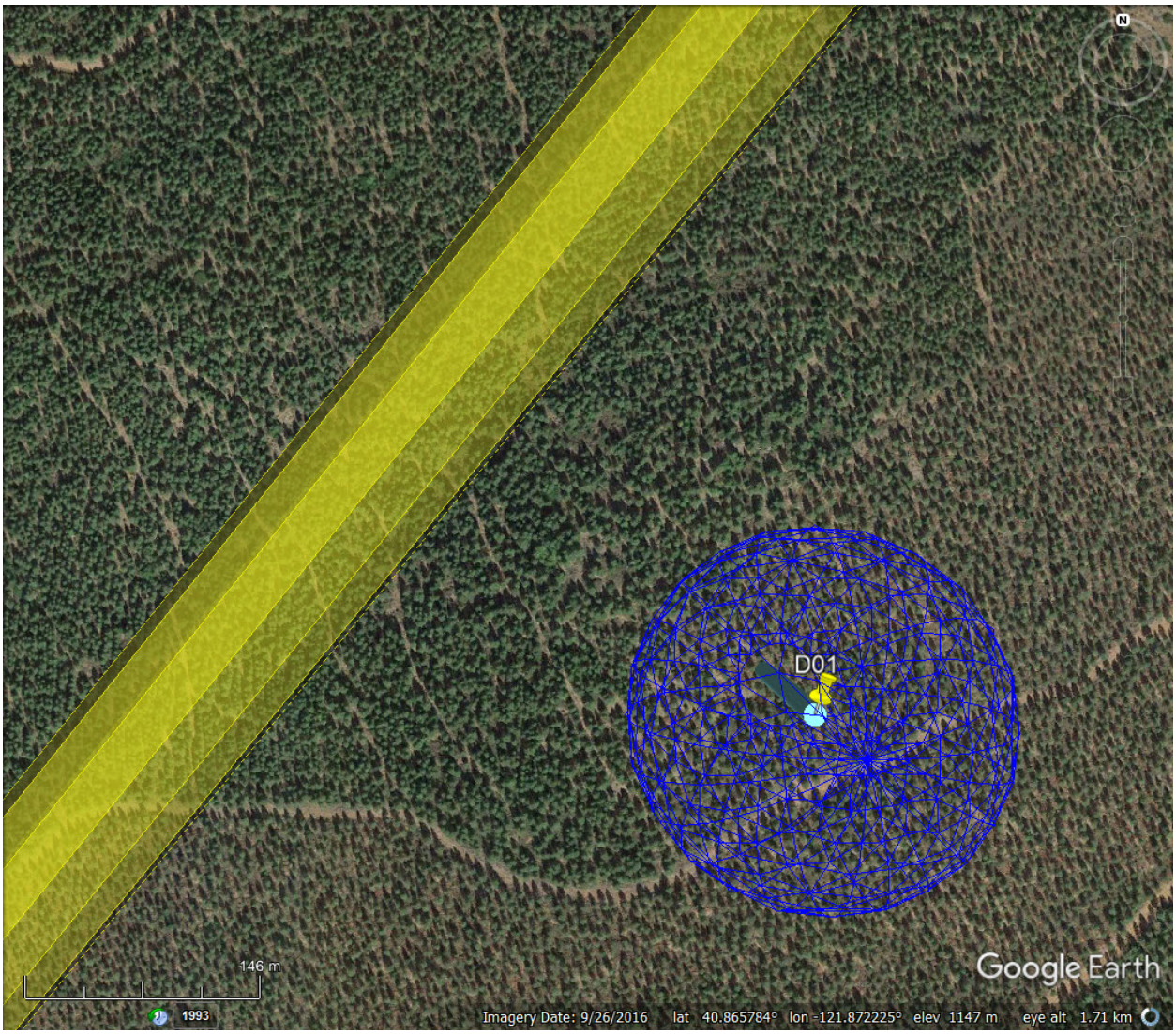


Figure 8 – Planned Turbine D01 Close to Microwave Path

As can be seen in the image above, Turbine D01 would not penetrate the FFZ of the FCC-licensed microwave link.

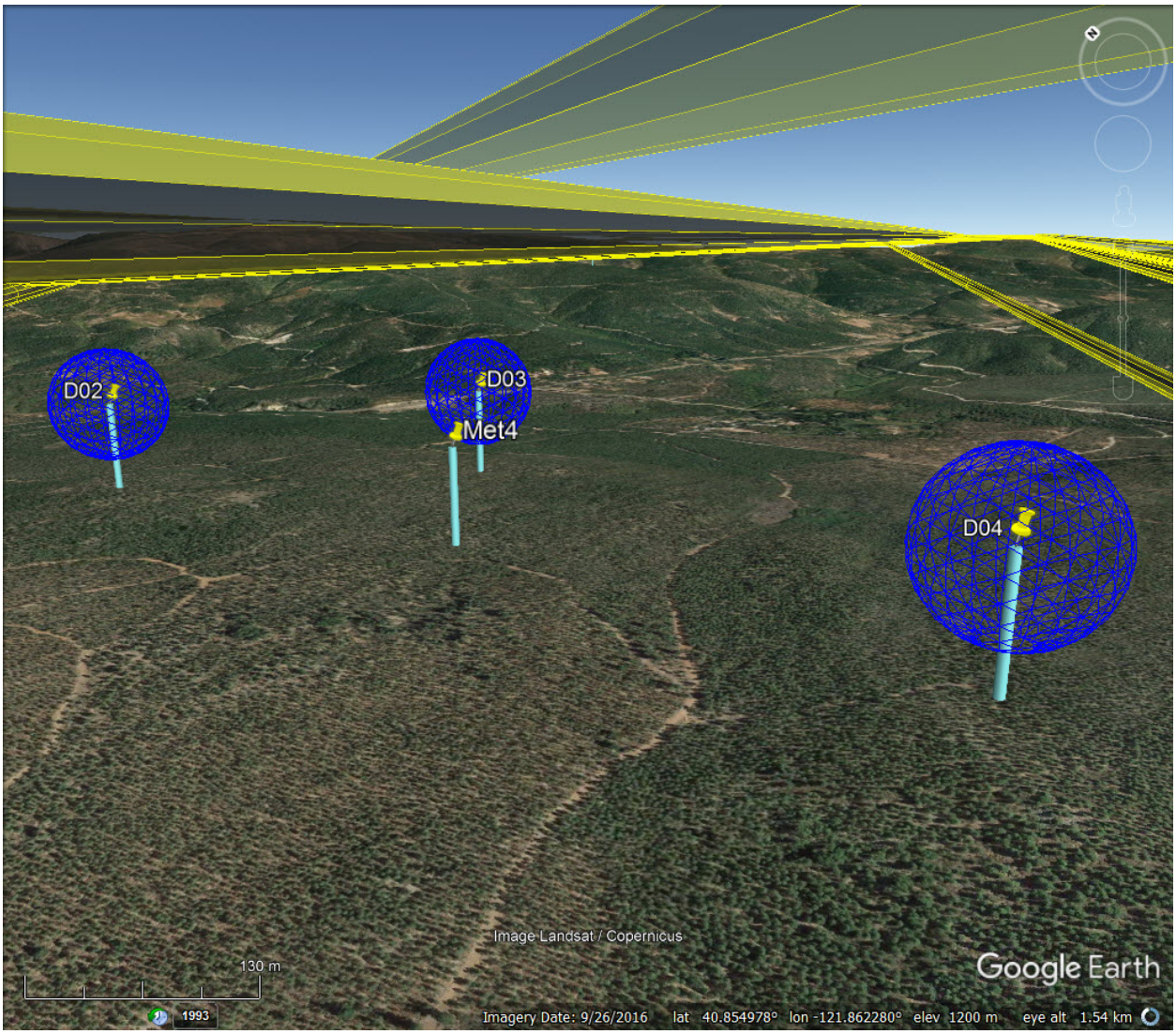


Figure 9 – Planned Turbines D02, D03 and D04 and MET 4 Close to Microwave Path

As can be seen in the image above, the turbines and MET tower would not penetrate the FFZ of the FCC-licensed microwave link.

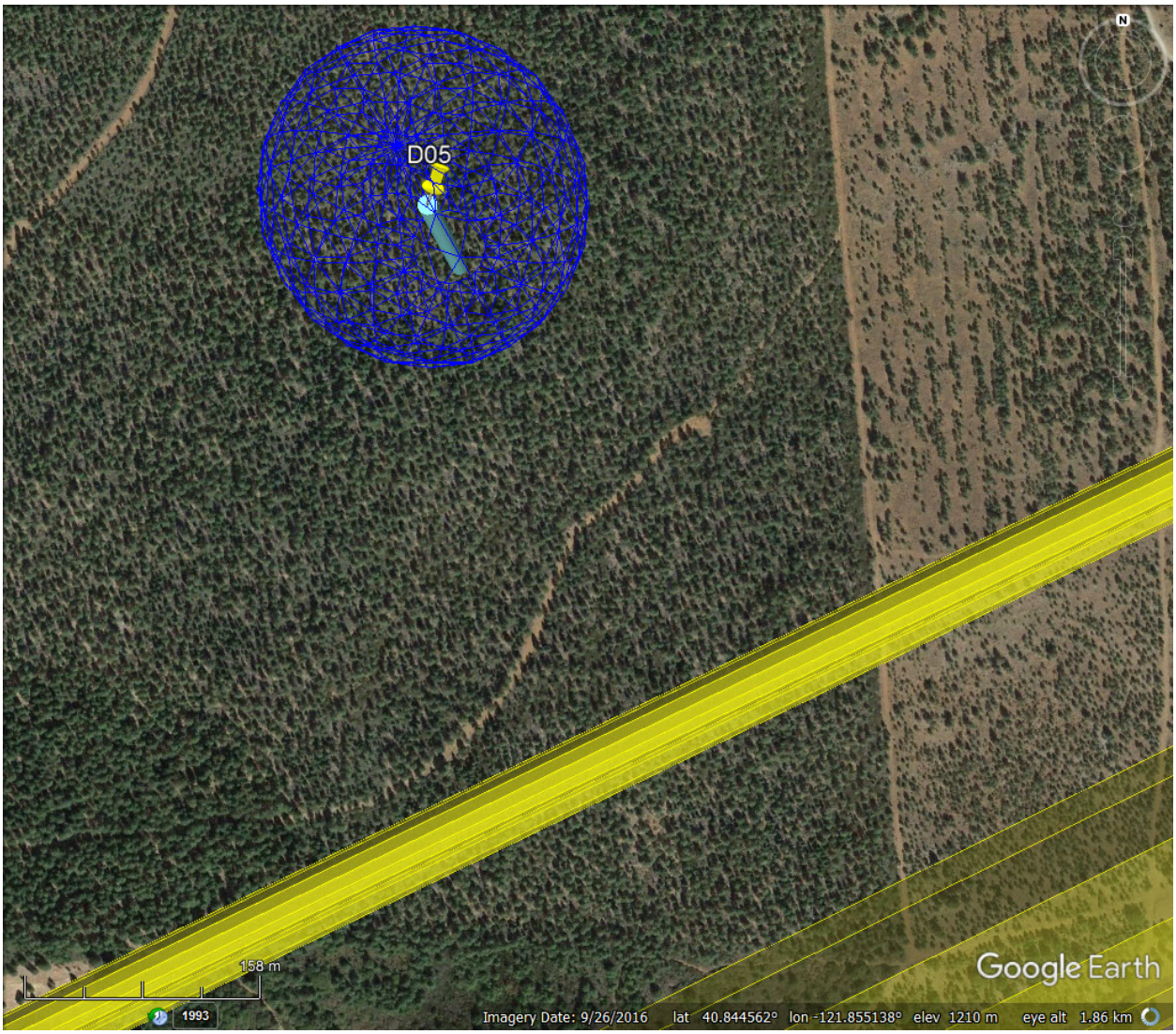


Figure 10 – Planned Turbine D05 Close to Microwave Path

As can be seen in the image above, Turbine D05 would not penetrate the FFZ of the FCC-licensed microwave link.

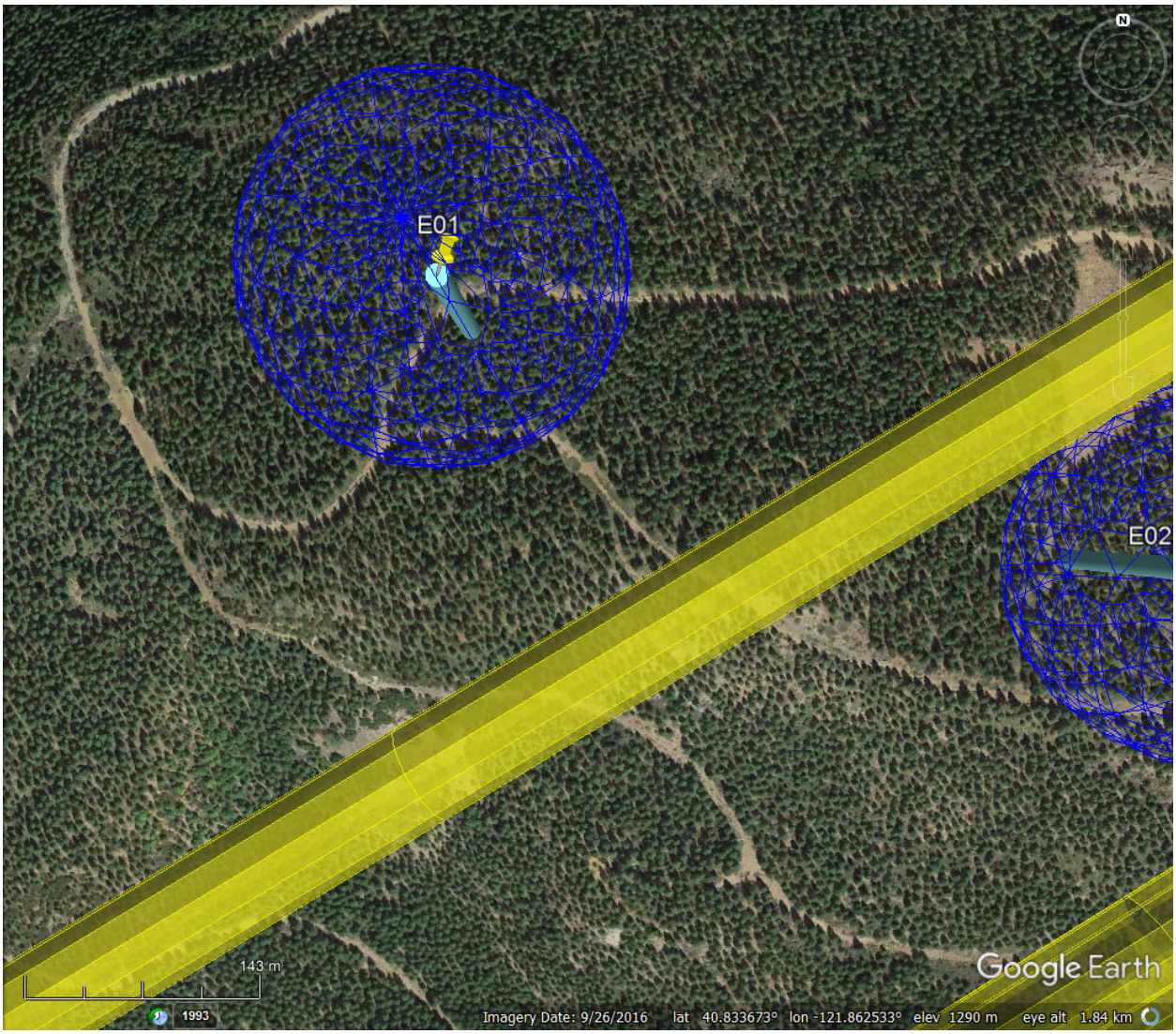


Figure 11 – Planned Turbine E01 Close to Microwave Path

As can be seen in the image above, Turbine E01 would not penetrate the FFZ of the FCC-licensed microwave link.

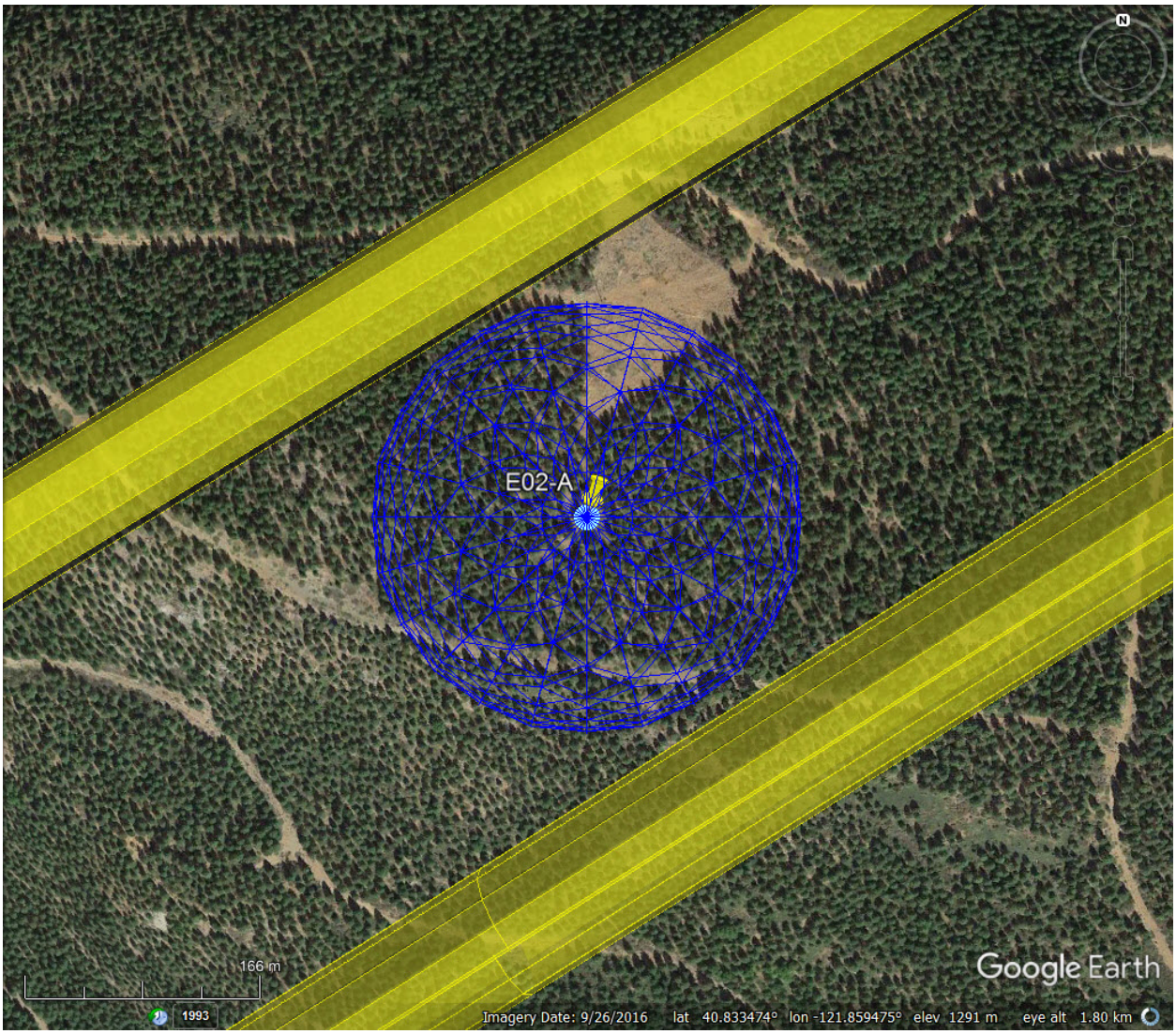


Figure 12 – Planned Turbine E02-A Close to Microwave Path

As can be seen in the image above, Turbine E02-A would not penetrate the FFZ of the FCC-licensed microwave link.

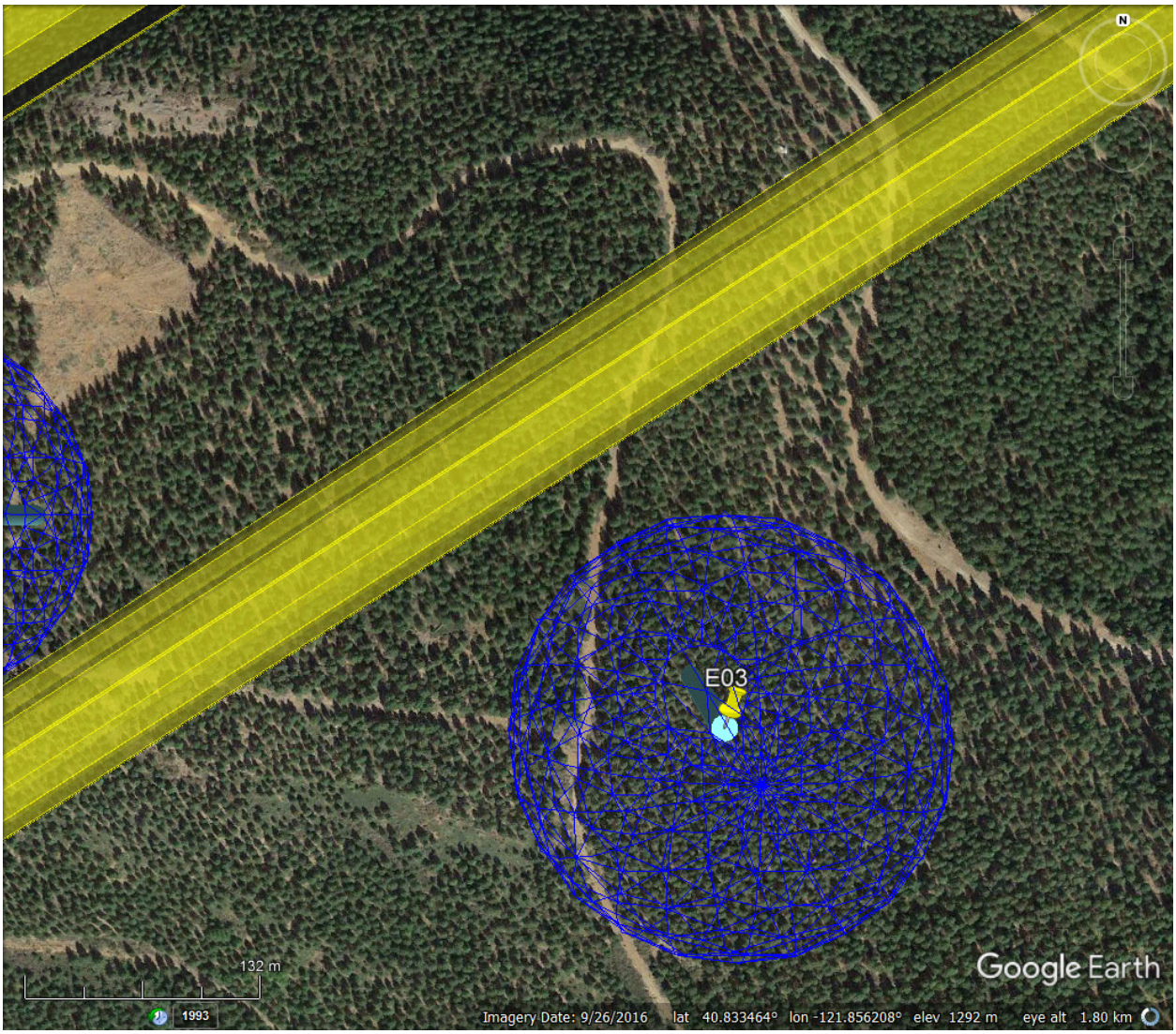


Figure 13 – Planned Turbine E03 Close to Microwave Path

As can be seen in the image above, Turbine E03 would not penetrate the FFZ of the FCC-licensed microwave link.

III. ANALYSIS OF FIXED RADIO FACILITIES

3.1 Land Mobile & Public Safety Facilities

A search of the FCC's land mobile/public safety radio database revealed 47 land mobile transmitter station that falls within the search area (about two miles beyond the project area). This land mobile station is listed in Table 2 and mapped in Figure 14. The specifications on the land mobile station can be found in the associated land mobile (LM) spreadsheet file.

In general, multi-directional transmitting facilities, including land mobile stations, that are within 425 meters of a turbine site customarily should be further evaluated for the possibility of transmitter interference caused by wind turbines. Station WRBP572 is the land mobile station nearest to turbine sites and is 592 meters from the nearest planned turbine, Turbine M08 (see Figure 15).

The reader is referred to the provided KMZ file for more magnification and closer inspection.

Based on the current project layout, and assuming that the land mobile stations in and near the project area are actually located at their licensed locations, or located farther away from turbines, no adverse impact is expected to be caused to the transmissions of land mobile stations that are licensed by the FCC.

Table 3 – Land Mobiles Stations within 2 Miles of Project Area

Call Sign	Location	Latitude (NAD-83)	Longitude (NAD-83)	Ant. Ht. (m AGL)	Highest Freq. (MHz)	Licensee
KCO756	1	40.874889	-121.771389	19	158.25	Pacific Gas & Electric Co., d/i/p
KCO756	1	40.874889	-121.771389	20	158.46	Pacific Gas & Electric Co., d/i/p
KDE673	1	40.874889	-121.771944	41.1	42.34	California, State of
KDE673	1	40.874889	-121.771944	41.1	45.14	California, State of
KDU429	1	40.875444	-121.771111	40	158.895	Shasta County Sheriff-Coroner
KER951	1	40.875444	-121.771111	12	452.8	Roseburg Forest Products Co.
KER951	1	40.875444	-121.771111	40	153.35	Roseburg Forest Products Co.
KIN68	1	40.868222	-121.884528	11	159.33	California, State of
KJM345	1	40.875444	-121.771111	39	158.985	Shasta, County of
KLR825	1	40.874611	-121.770556	11.3	151.985	Citizens Telecom. Co. of Calif. Inc.
KMA582	1	40.875444	-121.771111	23	158.73	Shasta, County of
KMH435	2	40.874889	-121.771111	19	48.86	Fruit Growers Supply Company

Call Sign	Location	Latitude (NAD-83)	Longitude (NAD-83)	Ant. Ht. (m AGL)	Highest Freq. (MHz)	Licensee
KNFD862	1	40.874889	-121.771944	40	856.9875	California, State of
KNHU243	3	40.875444	-121.771111	26	155.1	Shasta, County of
KVA377	1	40.874889	-121.771944	41	47.1	California, State of
KYQ496	2	40.875167	-121.771944	5	452.875	Shasta, County of
KYQ496	2	40.875167	-121.771944	20	463.175	Shasta, County of
WGC352	1	40.874889	-121.771944	43	151.415	California, State of
WNKI574	1	40.875	-121.771944	42.7	151.355	California, State of
WNKI574	1	40.875	-121.771944	42.7	151.175	California, State of
WNQQ340	1	40.874889	-121.771389	17	451.025	Pacific Gas & Electric Co., d/i/p
WNSU750	3	40.905306	-121.828917	7.6	46.08	Shasta, County of
WNZM801	2	40.895722	-121.792778	15	463.95	Pit River Indian Health Service Inc
WPIJ785	1	40.895722	-121.792778	8	461.775	Valley Industrial Communications
WPIN850	1	40.874889	-121.771944	43	151.235	California, State of
WPLW718	1	40.905722	-121.828333	60	455.99	SMG-Redding, LLC
WPNT829	3	40.905722	-121.827222	9	463.825	Plass, Stephen M
WPOX435	1	40.875444	-121.771111	15	150.905	Headrick II, James
WPPV640	1	40.895722	-121.792778	15	452.2	Valley Industrial Communications
WPRJ732	1	40.895722	-121.792778	15	464.925	Valley Industrial Communications
WPUN733	2	40.895722	-121.792778	15	461.225	Valley Industrial Communications
WPYA277	4	40.895722	-121.792778	15.9	49.08	Sierra Pacific Industries
WQBX262	1	40.875444	-121.771111	27	451.425	Burney Transportation, Inc.
WQCK764	1	40.875444	-121.771111	21	451.425	Burney Transportation, Inc.
WQEQ313	5	40.895722	-121.792778	6	463.4	Mckeown, James R
WQFD407	5	40.895722	-121.792778	6	152.4575	Mckeown, James R
WQNQ845	1	40.874861	-121.771917	19	452.7	Pacific Gas & Electric Co., d/i/p
WQRM807	2	40.906	-121.812	23	469.9375	Roseburg Forest Products
WQRX845	3	40.895722	-121.792778	12	152.87	Goose Valley Farming LLC
WQTG775	1	40.905806	-121.82875	8.5	463.825	Plass, Stephen M
WQW851	1	40.874889	-121.771944	43	153.755	California, State of
WQX903	2	40.895722	-121.792778	11	48.76	Sierra Pacific Industries
WQXH846	1	40.902333	-121.826111	91.4	463.55	Siemens Gamesa Renewables
WQXM677	1	40.905806	-121.82875	11.2	464.9125	Silke Communications, Inc.
WQYP430	4	40.874889	-121.771389	29	153.56	Pacific Gas & Electric Co., d/i/p
WRAT551	1	40.875	-121.770278	20	154.43	Shasta, County of
WRBP572	1	40.7785	-121.850056	47.5	462.0625	LandVest

Table 3 – Land Mobiles Stations within 2 Miles of Project Area

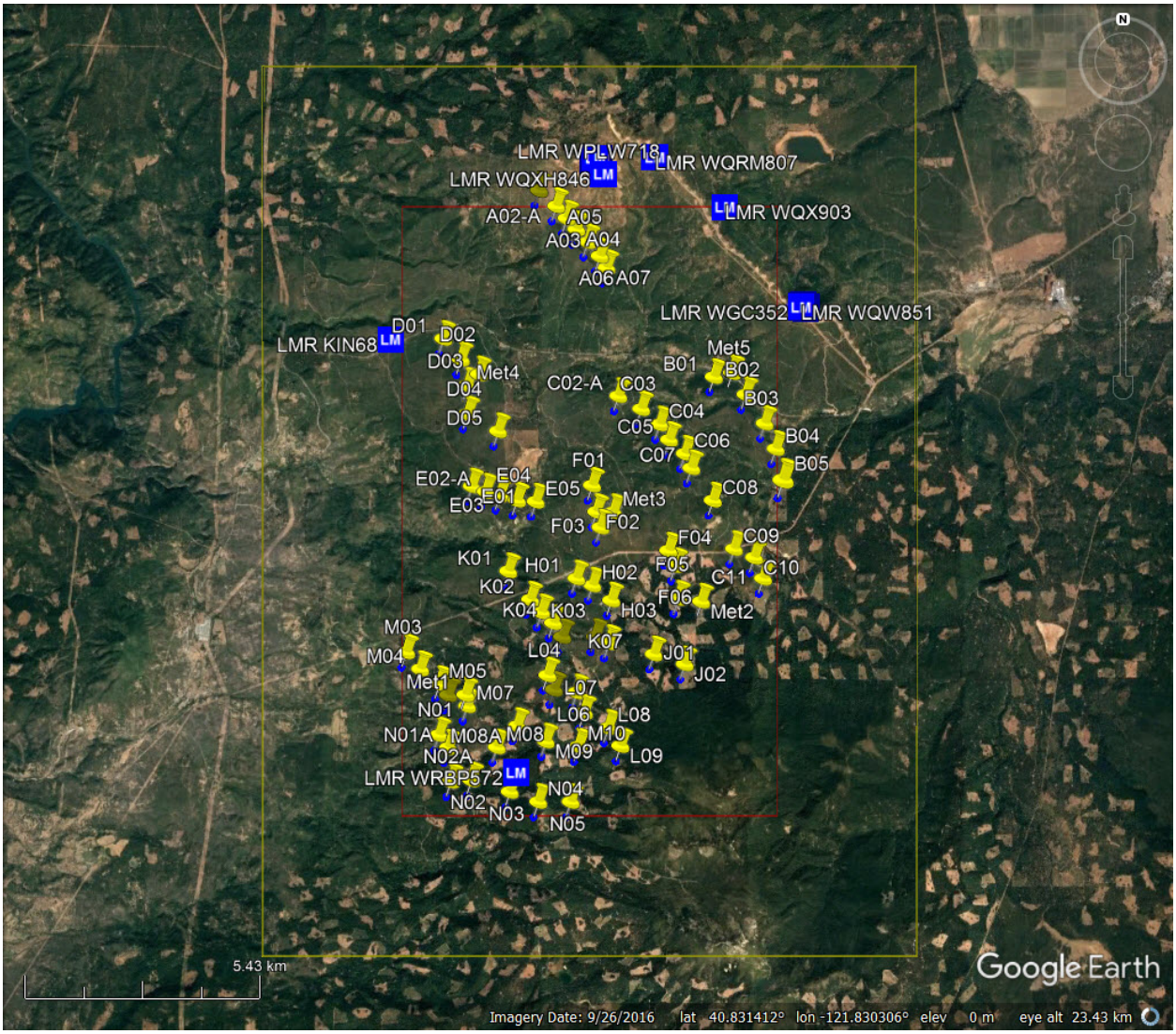


Figure 14 – Land Mobile Stations in or near Fountain Project Area

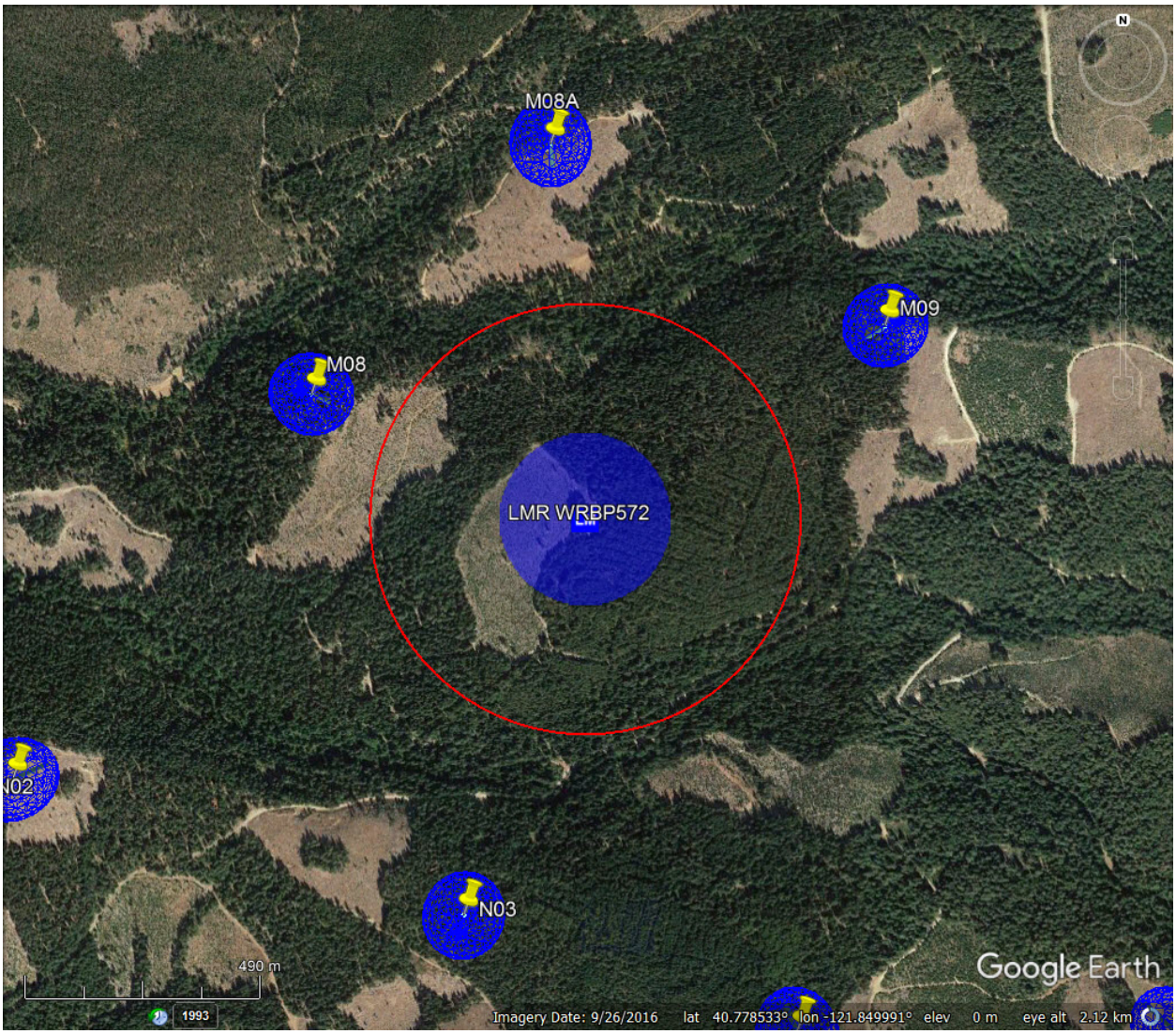


Figure 15 - Planned Turbines near Land Mobile Station WRBP572

(Red Circle represents a worst-case setback of 425 meters.)

As can be see, the planned turbines in the image above are no closer than the worst-case recommended setback of 425 meters to the land mobile site(s).

IV. EARTH STATION ANALYSIS

A search of the FCC's IBFS (International Bureau Filing System) database reveals many FCC-licensed satellite earth stations within 65 miles of the Fountain wind project area, which are shown in Appendix B. The only earth station from the list whose azimuthal range over its assigned satellite arc sweeps across the wind project (in whole or in part) is FCC Call Sign E200635, Location 44 (43710 State Highway 299 East, Fall River Mills, CA), located 41 kilometers northeast of the center of the wind project area. The proposed turbine site closest to this earth station is B03 which is 36.79 kilometers away. The highest elevation within the turbine area is 1980 meters AMSL. Based on these assumptions and assuming a flat earth (K-factor = infinity), any turbine of 206 meters blade tip height anywhere in the turbine area would be clear of the satellite arc by at least 2042 meters in vertical distance.

Thus, it is determined that no FCC-authorized satellite earth station would be adversely affected by the Fountain Wind project.

V. ANALYSIS OF BROADCAST FACILITIES

5.1 TV Broadcast Facilities

The rotating blades of a wind turbine have the potential to disrupt over-the-air broadcast TV reception within a few miles of the turbine, especially when the direct path from the viewer's residence is obstructed by terrain. Interference is caused when signals reflected by the blades arrive at the viewer's TV antenna along with the direct signal. This is known as "multipath interference." However, as turbine manufacturers have replaced all-metal blades with blades constructed of mostly nonmetallic materials[3], this effect has been reduced. Also, the new generation of HDTV receivers is better equipped to deal with minor multipath interference (which is manifested by "pixilating" or "freezing" of the digital picture) than analog TV sets, as special circuitry is employed to suppress the reflected signal. Occasionally, however, multipath interference from one or more turbines can cause video failure in HDTV receivers, especially if the receiver location is in a valley or other place of low elevation.

There is some possibility of signal disruption for residences that have to point their outdoor antennas through the turbine area, or that utilize "rabbit ear" antennas and/or older HDTV receivers. Most of this effect should be dissipated for locations three or more miles from a turbine, but some residual problems could be noted for HDTV receivers that are located below

[3] Modern turbine blades are usually constructed from glass-reinforced plastic (GRP), although they usually contain some metal for strengthening, balance and grounding.

the grade level at the turbine base. Usually, a rule of thumb is that approximately 10% of the receiver locations are affected to some extent within three miles of a large turbine when the turbine is between the TV station and the receiver. The usual effect is intermittent "pixilation" or freezing of the digital TV picture. This estimate is based upon Evans Engineering's experience with similar wind energy projects.

Shasta County is in the Chico-Redding, California Designated Market Area (DMA) as defined by Nielsen Media Research. The TV stations listed in Table 4 have been determined to place a predicted FCC primary off-the-air service signal over at least a portion of the project area or its immediate environs.

Call Sign	Type of Station	Virtual Channel	Actual Channel	City of License	Power (KW)	Ant. Height (m HAAT)	Dist. (km)	Direction
K02RK(CP)	Low Power	--	2	Redding, CA	3.0	402	61.7	WSW
K03FU(CP)	Translator	--	3	Mountain Gate, CA	0.3	325	40.9	WSW
K04EZ(CP)	Translator	--	4	Big Bend, CA	0.275	48	24.1	NNW
K05DQ	Translator	7	5	Burney, CA	0.045	309	34.9	ENE
KNNN(CP)	Low Power	--	6	Redding, CA	3.0	422	61.7	WSW
KRCR-TV	Conventional	7	7	Redding, CA	84	1095	73.9	WSW
KVFR(CP)	Low Power	8	8	Redding, CA	1.5	389	62.2	WSW
KIXE-TV	Conventional	9	9	Redding, CA	15	1090	74.0	WSW
KTVL(CP)	Conventional	10	10	Medford, OR	25	1001	157.4	NNW
K15KO	Low Power	46	15	Redding, CA	5.0	393	61.7	WSW
K16IW	Low Power	16	16	Redding, CA	5.0	394	61.7	WSW
KCVU(CP)	Conventional	20	17	Paradise, CA	500	431	97.2	S
K18LJ	Translator	10	18	Dunsmur, CA	0.015	231	58.9	NW
KNVN(CP)	Conventional	24	20	Chico, CA	300	567	67.5	SSW
KRDT	Class A	23	23	Redding, CA	3.0	402	61.7	WSW
K24MI(CP)	Low Power	--	24	Redding, CA	0.5	388	62.2	WSW
KRHT(CP)	Low Power	41	25	Redding, CA	15	457	61.9	WSW
K27MZ(CP)	Low Power	--	27	Redding, CA	5.0	388	62.2	WSW
K31PS	Low Power	12	31	Lakeshore, CA	1.32	386	52.7	W
KQSX(CP)	Low Power	--	33	Cal-Oregon, CA	1.0	259	55.8	NW
K35PG(CP)	Low Power	--	35	Redding, CA	15	392	61.7	WSW
KHSL-TV	Conventional	12	36	Chico, CA	170	462	97.6	S

"CP" = FCC Construction Permit

Table 4 - TV Stations Serving Fountain Wind Project Area

It should be noted that many of the translator and low power stations holding an FCC construction permit are currently off the air and their target dates for returning to operation are unknown.

If the Fountain wind project should cause disruptions to over-the-air TV viewing, methods to resolve them are available, and are as follows:

1. Relocation of the household antenna to receive a better signal
2. Installation of a better outside antenna, or one with a higher gain
3. Installation of satellite or cable TV

According to this engineer's calculations, there are approximately 600 households within an area likely to be affected (215 square miles). It is conservatively estimated that 55%, or 330, of the households receive TV programming primarily by satellite dish or cable. This leaves an estimated 270 households relying on transmitted off-the-air TV signals. Based on the 10% criteria described previously, up to 27 TV receiving locations may be affected to some degree in the worst-case. Mitigation costs would be approximately $200 per location for an upgraded outdoor antenna, or $400 per year per location for a satellite or cable subscription.

It is the opinion of this consultant that any disruptions to over-the-air TV broadcast signals, if they occur, can be resolved satisfactorily.

5.2 AM Facilities

Large metallic structures such as wind turbines can adversely affect the transmitted signals of AM broadcast stations up to three kilometers away. A search of the FCC's database revealed no AM facilities within the required notification distance of three kilometers from any planned turbine. There should therefore be no reasonable expectations of disruptions in transmitted radiations on the AM band due to the presence of the turbines. Occasionally, depending upon ground conditions, local AM receivers may experience slight signal changes due to local effects, but such anomalies are not recognized by the FCC or the standards of good engineering practice as having an unduly adverse effect.

VI. NTIA NOTIFICATION

Operation of RF frequencies for federal government use is managed by the National Telecommunication Information Agency (NTIA), which is part of the U.S. Department of Commerce. The technical specifications for most government facilities are unavailable to the public. In order to avoid the derailment of the wind energy project due to late objections from a government agency, the NTIA should be notified of the proposed project during pre-construction planning. The NTIA has set in place a review process, wherein the Interdepartmental Radio Advisory Committee (IRAC), consisting of representatives from various government agencies, reviews new proposals for wind turbine projects for impact on government frequencies. In

almost all cases, no adverse impact is found, and IRAC usually issues a determination in about 60 days.

On May 6, 2020, this office sent a notification of the Fountain wind project to the NTIA, and a determination is expected about the first week of July 2020.

VII. CONCLUSIONS AND RECOMMENDATIONS

1. Many FCC-licensed microwave paths crosses the project area, however, based on the FCC licenses, no turbines in the current project layout are in conflict with the path.

2. Additional due diligence with regard to the microwave antennas on Hatch Mountain are warranted. Many of the underlying licenses are in error with respect to the location coordinates. It is recommended that the microwave path licenses be contacted to ascertain their correct locations so as to determine definitively whether or not any conflicts with turbines occur.

3. If an excessive amount of time goes by before the turbines are to be constructed (six months or more), it is recommended that the microwave study be updated in case new paths have been added to the FCC's database.

4. No land mobile transmitting stations are expected to be adversely affected, assuming that their transmitters are located exactly as per their FCC licenses.

5. Over-the-air TV interference due to operating wind turbines is not expected to be an intractable problem. Effective mitigation methods to resolve any interference that may occur are available, with satellite or cable service installation providing the worst-case solution. No radio broadcast facilities are likely to be affected.

Respectfully Submitted,

B. Benjamin Evans
RF Impact Consultant

May 15, 2020

APPENDIX A

FCC-LICENSED MICROWAVE PATHS IN AND NEAR FOUNTAIN WIND PROJECT AREA

Call Sign	Site 1	Site 2	Path	FFZ Radius(m)	Freq. (MHz)	Licensee
KBK63	HATCHET MT	PR7	7	8.8	6860	Pacific Gas & Electric Co.
KBK63	PR Path 7	PIT 4 PH	7	8.8	6860	Pacific Gas & Electric Co.
KBK63	HATCHET MT	HAPPY CAMP	9	32	5974.85	Pacific Gas & Electric Co.
KBK63	HATCHET MT	BURNEY SC	10	10.6	6855	Pacific Gas & Electric Co.
KBK63	HATCHET MT	PIT 1 PH	11	17.9	6165.722	Pacific Gas & Electric Co.
KBK63	HATCHET MT	PR12	12	13.9	6004.5	Pacific Gas & Electric Co.
KBK63	PR Path 12	PIT 3 PH	12	4.6	6004.5	Pacific Gas & Electric Co.
KBK63	HATCHET MT	PR13	13	8.9	6780.625	Pacific Gas & Electric Co.
KBK63	PR Path 13	PIT 4 PH	13	8.8	6780.625	Pacific Gas & Electric Co.
KBK63	HATCHET MT	PR14	14	14.8	6004.5	Pacific Gas & Electric Co.
KBK63	PR14	Round Mtn Sub	14	4.6	6004.5	Pacific Gas & Electric Co.
KBK63	HATCHET MT	HANEY MTN	15	18.6	6093.45	Pacific Gas & Electric Co.
KBK69	HAPPY CAMP	HATCHET MT	4	31.4	6226.89	Pacific Gas & Electric Co.
KBY24	BURNEY SVC CTR	HATCHET MT	3	10.7	6695	Pacific Gas & Electric Co.
KCI60	HATCHETMTN	REDDING MW	1	26.1	6735	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	BIGVALLEYCDFLO	2	23.8	6725	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	BURNEYDOTMSTWR	4	10.4	6750.625	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	BIGVALLEYCDFLO	5	23.7	6795	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	REDDING MW	6	25.9	6845	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	BIGVALLEYCDFLO	7	23.7	6815	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	BIGVALLEYCDFLO	8	23.7	6815	CALIFORNIA, STATE OF
KCI61	BIGVALLEYCDFLO	HATCHETMTN	2	23.7	6825	CALIFORNIA, STATE OF
KCI61	BIGVALLEYCDFLO	HATCHETMTN	3	24	6635	CALIFORNIA, STATE OF
KCI61	BIGVALLEYCDFLO	HATCHETMTN	5	24	6655	CALIFORNIA, STATE OF
KEU38	Pit #3 Powerhouse	PR2	2	4.5	6256.54	Pacific Gas & Electric Co.
KEU38	PR	Hatchet Mtn	2	13.6	6256.54	Pacific Gas & Electric Co.
KJI72	Round Mt Substn	PR6	6	4.5	6256.54	Pacific Gas & Electric Co.
KJI72	PR	Hatchet Mtn	6	14.5	6256.54	Pacific Gas & Electric Co.
KME51	REDDING	HATCHETT MT	1	27.5	6226.89	Citizens Telecom. Co of Calif
KMH74	HATCHETT MT	BIG VALL MT	1	25.3	5945.2	Citizens Telecom. Co of Calif
KMH74	HATCHETT MT	REDDING HUT	2	28.1	5974.85	Citizens Telecom. Co of Calif
KNI78	REDDING MW	HATCHET MTN	2	26.5	6555	CALIFORNIA, STATE OF
KNI78	REDDING MW	HATCHET MTN	7	26.2	6685	CALIFORNIA, STATE OF
KSR40	Hogback Mountain	Hatchet Mt	7	14.7	6565	Pacific Gas & Electric Co.
WAH462	BIG VALL MT	HATCHETT MT	1	24.8	6197.24	Citizens Telecom. Co of Calif
WLE341	Hatchet Mtn	Az:249,Dist:0	1	--	951.5	Southern Oregon University
WLG966	Studio	KRRX Xmtr	1	67.3	947	SMG-Redding, LLC
WLP267	Hatchet Mtn	Az:326,Dist:0	1	--	951	Southern Oregon University
WMS863	ROUND MTN	BURNEY	7	10.8	11245	New Cingular Wireless PCS

WMS863	ROUND MTN	BURNEY	8	10.8	11285	New Cingular Wireless PCS
WMS864	BURNEY	ROUND MTN	4	11	10755	New Cingular Wireless PCS
WMS864	BURNEY	ROUND MTN	5	11	10795	New Cingular Wireless PCS
WMU584	BEAR SPRINGS	S Fork Mtn	1	71.7	944.5	Southern Oregon University
WMU610	Gray Butte	Hatchet Mtn	1	70.8	945	Southern Oregon University
WMU611	MT BRADLEY	BEAR SPRINGS	1	65	948	Southern Oregon University
WNEJ875	Pit #1 Powerhouse	Hatchet Mtn	2	17.5	6417.762	Pacific Gas & Electric Co.
WNEQ268	STATION	Az:360,Dist:0	1	--	952.4625	Pacific Gas & Electric Co.
WNEQ268	STATION	Az:360,Dist:0	2	--	928.4625	Pacific Gas & Electric Co.
WNEV258	Hatchet Mountain	Hogback Mtn	1	14.5	6765	Pacific Gas & Electric Co.
WNEV258	Hatchet Mountain	Harlow Mtn	2	18.1	6865	Pacific Gas & Electric Co.
WNEV259	HARLOW MT	HATCHET MT	2	18.6	6545	Pacific Gas & Electric Co.
WNTC676	Haney Mountain	HATCHET MT	3	18.2	6345.49	Pacific Gas & Electric Co.
WNTP590	STATION	Bear Springs	2	24.5	6565	Xmssn Agency of Northern CA
WNTP591	STATION	Window Mtn	1	24.2	6735	Xmssn Agency of Northern CA
WNTP591	STATION	Olinda	2	28.6	6795	Xmssn Agency of Northern CA
WNTP592	STATION	Bear Springs	1	28.9	6635	Xmssn Agency of Northern CA
WPOR985	South Fork Mtn	Hatchet Mt n	1	26.7	7100	Paradise (KCVU-TV) Lic. Inc.
WPOR986	South Fork Mtn	Hatchet Mt n	1	27.1	6900	Sinclair-Calif Licensee, LLC
WQEN887	Pit #4 Powerhouse	PR1	1	9	6620.625	Pacific Gas & Electric Co.
WQEN887	PR	Hatchet Mtn	1	9	6620.625	Pacific Gas & Electric Co.
WQJC947	Hatchett Mountain	KJPR	1	61	946.5	Southern Oregon University
WQOF288	KKRN STUDIO	Bear Springs Pk	1	34.2	948.5	Acorn Community Enterp.
WQOJ920	BEAR SPRINGS	COTTONWOOD	1	31.4	5974.85	AC BidCo LLC
WQOJ921	COTTONWOOD	BEAR SPRINGS	1	30.8	6226.89	AC BidCo LLC
WQOX547	BURNEYDOTMSTWR	HATCHETMTN	1	10.5	6590.625	CALIFORNIA, STATE OF
WQSU930	Bear Mtn	Hatchet Mtn	4	17.4	10915	Ricketts, Curtis W
WQSU930	Bear Mtn	Hatchet Mtn	5	17.4	10915	Ricketts, Curtis W
WQZD344	Hatchet Mtn	Bear Mtn	1	17	11405	Ricketts, Curtis $
WQZD344	Hatchet Mtn	Bear Mtn	2	17	11405	Ricketts, Curtis $
WQZD344	Hatchet Mtn	HANEY MTN	3	13.9	10995	Ricketts, Curtis $
WRAG236	SC55538A	SC55540A	2	10.2	10855	T-MOBILE LICENSE LLC
WRAH727	SC55541A	SC55540A	1	14.6	10855	T-MOBILE LICENSE LLC
WRAH731	SC55540A	SC55538A	1	9.9	11345	T-MOBILE LICENSE LLC
WRAH731	SC55540A	SC55541A	2	14.2	11345	T-MOBILE LICENSE LLC
WRAH731	SC55540A	SC75001A	3	19.3	6152.75	T-MOBILE LICENSE LLC
WRAH731	SC55540A	SC75001A	4	19.5	6034.15	T-MOBILE LICENSE LLC
WRAU957	HANEY MTN	HATCHET MTN	1	13.6	11485	Com-Pair Services
WRCT829	SC75001A	SC55540A	1	19	6404.79	T-MOBILE LICENSE LLC
WRCT829	SC75001A	SC55540A	2	19.1	6286.19	T-MOBILE LICENSE LLC

APPENDIX B

FCC-LICENSED SATELLITE EARTH STATIONS WITHIN 65 MILES OF FOUNTAIN WIND PROJECT AREA

Earth Station Location Search Results

New Search Refine Search

Parameters: Latitude=40° 49' 57.2", Longitude=121° 49' 47.4", Radius=65 , Frequency Lower=0 GHz , Frequency Upper=100 GHz

Call Sign: E890126 **File Number:** SES-RWL-20090309-00270
Licensee: WINDJAMMER COMMUNICATIONS LLC
ATTN: STEPHEN FLESSNER
Phone: 561-775-1208 Fax: E-Mail: sflessner@wjcable.net
Counsel: WINDJAMMER COMMUNICATIONS LLC
ATTN:
Phone: 561-775-1208 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
9.25	40° 52' 56.6" N 121° 39' 57.0" W	NAD27	37100 MAIN STREET BURNEY, CA JALYN D. TEZIK	952.5	00003700.00000000 00004200.00000000	R

Call Sign: E200635 **File Number:** SES-REG-20181010-05943
Licensee: Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day
ATTN: Bart Eichelberger
Phone: 510-531-3200 Fax: E-Mail:
Counsel: Wiley Rein LLP
ATTN:
Phone: 202-719-4975 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
25.46	41° 1' 52.27" N 121° 25' 10.7" W	NAD27	43710 State Highway 299 East FALL RIVER MILLS, CA Bart Eichelberger 801-240-1000		00003700.00000000 00004200.00000000	R

Call Sign: E859880 **File Number:** SES-RWL-20050823-01146
Licensee: Associated Press
ATTN: OLETA J. BROWN
Phone: 816-654-1000 Fax: 816-654-1035 E-Mail: ojbrown@ap.org
Counsel: WILEY, REIN & FIELDING
ATTN:
Phone: (202) 429-7245 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
27.73	40° 42' 30.0" N 122° 19' 59.0" W	NAD83	REDDING, CA	262.0	00003700.00000000 00004200.00000000	R

Call Sign: E190802 **File Number:** SES-REG-20180919-04461
Licensee: Results Radio of Chico Licensee, LLC
ATTN: Jack W Fritz II
Phone: 707-546-9185 Fax: 707-546-9188 E-Mail: jfritz@fritzcommunications.com
Counsel: SAME AS APPLICANT
ATTN:
Phone: 707-546-9185 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
31.75	40° 38' 0.5" N 122° 22' 32.3" W	NAD83	1588 Charles Dr. Redding, CA Ronald E. Castro 530-244-9700	214.9	00003700.00000000 00004200.00000000	R

Call Sign: E190617 **File Number:** SES-REG-20180911-04284
Licensee: SMG-Redding, LLC
ATTN: Mr David P Stephens
Phone: 918-492-2660 Fax: E-Mail: david.stephens@smgok.com
Counsel: Cooley LLP
ATTN:
Phone: 202-776-2687 Fax: E-Mail:

Distance	Latitude	Site Address/	Elevation	Frequency Lo/

Distance	Latitude / Longitude		Site Address / Contact Information	Elevation AMSL	Frequency Lo / Frequency Hi	
32.39	40° 33' 30.2" N 122° 19' 50.1" W	NAD83	3360 Alta Mesa Drive Redding, CA Duane Davis 530-226-9500	163.68	00003700.00000000 00004200.00000000	R

Call Sign: E100107 **File Number:** SES-LIC-20100928-01201
Licensee: Pacific Cascade Communications Corporation
ATTN: PAUL BROWN
Phone: 530-222-4455 x Fax: 530-222-4484 E-Mail: pbrown@kvip.org
Counsel: PACIFIC CASCADE COMMUNICATIONS CORPORATION
ATTN:
Phone: 530-222-4455 x Fax: E-Mail:

Distance	Latitude / Longitude		Site Address / Contact Information	Elevation AMSL	Frequency Lo / Frequency Hi	
33.05	40° 33' 46.5" N 122° 21' 0.0" W	NAD83	1139 HARTNELL AVENUE REDDING, CA PAUL E. BROWN 530-222-4455	164.0	00000011700.00000 00000012200.00000	R
					00000014000.00000 00000014500.00000	T

Call Sign: E190701 **File Number:** SES-REG-20180910-04372
Licensee: Pacific Cascade Communications Corporation
ATTN: Paul E Brown
Phone: 530-222-4455 Fax: 530-222-4484 E-Mail: pbrown@kvip.org
Counsel: SAME AS APPLICANT
ATTN:
Phone: 530-222-4455 Fax: E-Mail:

Distance	Latitude / Longitude		Site Address / Contact Information	Elevation AMSL	Frequency Lo / Frequency Hi	
33.05	40° 33' 46.5" N 122° 21' 0.0" W	NAD83	1139 Hartnell Avenue Redding, CA Paul E. Brown 530-222-4455	165.4	00003700.00000000 00004200.00000000	R

Call Sign: E040432 **File Number:** SES-RWL-20190904-01142
Licensee: Sinclair Media Licensee, LLC
ATTN: Mr Harvey Arnold
Phone: 410-568-1500 Fax: E-Mail: FCCContacts@sbgtv.com
Counsel: Lerman Senter PLLC
ATTN:
Phone: 202-416-6756 Fax: E-Mail:

Distance	Latitude / Longitude		Site Address / Contact Information	Elevation AMSL	Frequency Lo / Frequency Hi	
33.46	40° 35' 14.0" N 122° 22' 47.0" W	NAD83	755 AUDITORIUM DRIVE REDDING, CA JEFF KNOTT 530-243-7777	149.41	00003700.00000000 00004200.00000000	R

Call Sign: E180819 **File Number:** SES-REG-20180613-01434
Licensee: Sinclair Media Licensee, LLC
ATTN: Mr. Harvey Arnold
Phone: 410-568-1500 Fax: E-Mail: harnold@sbgtv.com
Counsel: SAME AS APPLICANT
ATTN:
Phone: 410-568-1500 Fax: E-Mail:

Distance	Latitude / Longitude		Site Address / Contact Information	Elevation AMSL	Frequency Lo / Frequency Hi	
33.51	40° 35' 14.0" N 122° 22' 51.0" W	NAD83	755 Auditorium Drive Redding, CA Bob Ashurst 530-243-7777	150.16	00003700.00000000 00004200.00000000	R

Call Sign: E180286 **File Number:** SES-REG-20180511-00653
Licensee: Fox Broadcasting Company
ATTN: Alastair Hamilton
Phone: 310-369-6644 Fax: E-Mail:
Counsel: SAME AS APPLICANT
ATTN:
Phone: 310-369-6644 Fax: E-Mail:

Distance	Latitude / Longitude		Site Address / Contact Information	Elevation AMSL	Frequency Lo / Frequency Hi	
33.52	40° 35' 14.0" N 122° 22' 51.9" W	NAD83	755 Auditorium Drive Redding, CA Bob Ashurt 530-722-6401	160.16	00003700.00000000 00004200.00000000	R

Call Sign: E030157 **File Number:** SES-RWL-20180606-00992
Licensee: Spectrum Pacific West, LLC
ATTN: Alexis Anderten

Phone: (303) 323-1423 Fax: E-Mail: CharterFCC@charter.com

Counsel: CHARTER COMMUNICATIONS
ATTN:
Phone: 3033231423 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
36.86	40° 29' 44.0" N 122° 22' 26.0" W	NAD83	7203 Sands Ln Anderson, CA Jim Schneringer 530-241-1591	151.18	00003700.00000000 00004200.00000000	R

Call Sign: E200880 **File Number:** SES-REG-20181016-06191

Licensee: Velocity Communications, Inc.
ATTN: Travis Finch
Phone: 530-623-3550 x3005 Fax: E-Mail: tf@velotech.net

Counsel: SAME AS APPLICANT
ATTN:
Phone: 530-623-3550 x3005 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
58.03	40° 44' 8.26" N 122° 55' 49.7" W	NAD83	121 Horseshoe Lane Weaverville, CA Travis Finch 530-623-3550	647.0	00003700.00000000 00004200.00000000	R

Call Sign: E000463 **File Number:** SES-RWL-20100620-00735

Licensee: Fox Broadcasting Company
ATTN: Paul F Beeman
Phone: 631-951-4923 Fax: 631-951-4925 E-Mail:

Counsel: SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP
ATTN:
Phone: 202-371-7574 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
60.5	39° 57' 44.6" N 121° 42' 47.9" W	NAD83	300 MAIN STREET CHICO, CA ALAN TOMPKINS 530-893-1234	1082.04	00003700.00000000 00004200.00000000	R

Appendix E
Energy: Fuel Use Calculations

Fountain Wind Project Fuel Use

6/26/2020

CO_2 emissions from AQ Calculations:

Conversion	1 MT =	1000	kg

Diesel Sources during Construction		
	CO_2 Emissions	
Off road equipment (year 1)	3301.9331	MT
Off road equipment (year 2)	1447.4337	MT
Haul trucks (year 1)	1610.14	MT
Haul trucks (year 2)	2593.98	MT
TOTAL Diesel Sources =	**8953.48**	**MT**
Convert to kilograms	8.95E+06	kg

Diesel fuel combustion[a] = 10.21 kg CO2/gallon

Diesel Combustion Rate = 876,932.81 gallons (over construction period)

Gasoline Sources during Construction		
	CO_2 Emissions	
Construction workers (year 1)	387.46	MT
Construction workers (year 2)	378.62	MT
TOTAL Gasoline Sources =	766.08	MT
Convert to kilograms	7.66E+05	kg

Gasoline fuel combustion[a] = 8.78 kg CO2/gallon

Gasoline combustion rate = 87,252.97 gallons (over construction period)

Aviation Gasoline Sources during Construction		
	CO_2 Emissions	
Transmission Line Connection Stringing	21.30	MT
Overhead Collection System Stringing	106.51	MT
TOTAL Aviation Gasoline Sources =	127.81	MT
Convert to kilograms	1.28E+05	kg

Aviation gasoline fuel combustion[a] = 8.31 kg CO2/gallon

Aviation gasoline combustion rate = 15,380.05 gallons (over construction period)

Diesel Sources during Operation		
	CO_2 Emissions	
Emergency Generator	10.21	MT
Cranes and other equipment	96.00	MT
TOTAL Diesel Sources =	106.21	
Convert to kilograms	1.06E+05	kg

Diesel fuel combustion[a] = 10.21 kg CO2/gallon

Diesel Combustion Rate = 10402.10 gallons (annually during operation)

Gasoline Sources during Operation		
	CO_2 Emissions	
Employees	136.46	MT
Convert to kilograms	1.36E+05	kg

Gasoline fuel combustion[a] = 8.78 kg CO2/gallon

Gasoline combustion rate = 15541.60 gallons (annually during operation)

Notes: [a] Emissions factors per The Climate Registry 2019 Default Emission Factors (Table 2.1 - US Default CO2 Emission Factors for Transport Fuels)

Appendix F
Hazards and Hazardous Materials

F1. Site Characterization Study Report
F2. Aquatic Resources Survey Report

F1. Environmental Records Review

Stantec

Memo

To:	Kristen Goland Pacific Wind Development, LLC	From:	Steve Little San Luis Obispo, CA
File:	Fountain Wind Project	Date:	February 20, 2019

Reference: Environmental Records Review

As part of the Phase I Environmental Site Assessment for the referenced project, Stantec Consulting Services has reviewed a database search report prepared by Environmental Data Resources (EDR) consistent with ASTM Standard Practice E1527-13. The findings of the environmental agency database search are summarized as follows:

- As listed in the California Integrated Water Quality System, two permits regulating timber harvesting activities on the Property were issued by the Central Valley Regional Water Quality Control Board (RWQCB) as Waste Discharge Requirements Order No. R5-2017-0061. WDR R5-2017-0061 was issued to Sierra Pacific Industries on February 14, 2018 and to Oxbow Timber 1 LLC on October 24, 2017 (see EDR Report Page 68). These currently active Waste Discharge Requirements regulate the non-point discharge of pollutants to water associated with logging and timber harvesting. A copy of WDR R5-2017-0061 is attached.

- As listed in the California Emergency Response System database, a pre-harvest inspection of Oxbow Timber 1 LLC operations at the Property was conducted by RWQCB staff on June 6, 2017 under the Timber Harvesting program (see EDR Report Page 69). No violations were found.

- Under the California DTSC ENVIROSTOR database, an off-site location identified as Whitmore Gap Filler Annex was listed as a Military Evaluation site with the RWQCB as the lead agency. Located on the peak of Clover Mountain approximately 0.84 miles southeast of the Property, the site is a former Air Defense Command Installation radar site ((see EDR Report Pages 69-71). The radar installation has been decommissioned and the site is currently owned by the U.S. Bureau of Land Management. Based on their evaluation, the RWQCB and DTSC determined in January 2014 that no further action was required for the site.

An annotated radius search map showing the listed sites is attached. The complete EDR report and a copy of WDR R5-2017-0061 are also attached.

Sincerely,

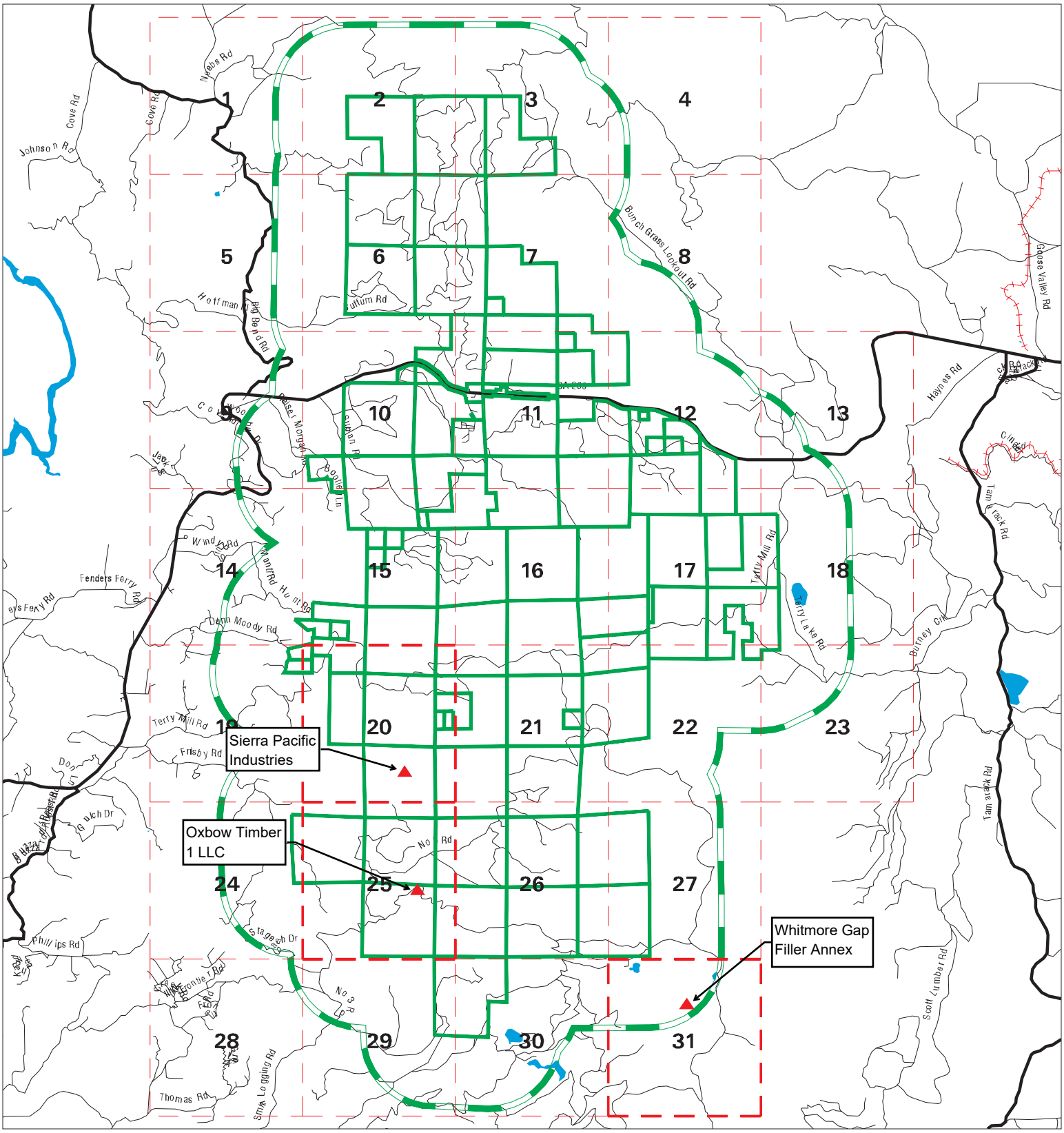
Stantec Consulting Services Inc.

Steve Little, PG, CHG
Principal Geologist
Phone: (805) 250-2857
Steve.little@stantec.com

Reference: **Environmental Records Review**

Attachments: Radius Search Map
EDR Area/Corridor Report
RWQCB Waste Discharge Requirements Order No. R5-2017-0061

Key Map - 5564109.2s



SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19 12:48 PM

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Fountain Wind Project
Shasta County
Montgomery Creek, CA 96065

Inquiry Number: 5564109.2s
February 15, 2019

EDR Area / Corridor Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

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Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13), the ASTM Standard Practice for Environmental Site Assessments for Forestland or Rural Property (E 2247-16), the ASTM Standard Practice for Limited Environmental Due Diligence: Transaction Screen Process (E 1528-14) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

SUBJECT PROPERTY INFORMATION

ADDRESS

SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

TARGET PROPERTY SEARCH RESULTS

The Target Property was identified in the following databases.

Page Numbers and Map Identifcations refer to the EDR Area/Corridor Report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

ADDITIONAL ENVIRONMENTAL RECORDS

Other Ascertainable Records

CIWQS: California Integrated Water Quality System

A review of the CIWQS list, as provided by EDR, and dated 12/03/2018 has revealed that there are 2 CIWQS sites within the requested target property.

Site	Address	Map ID / Focus Map(s)	Page
THP 2-16-063-SHA GOO		1 / 20	68
THP 2-16-077-SHA CED		A2 / 25	68

CERS: CERS

A review of the CERS list, as provided by EDR, and dated 10/22/2018 has revealed that there is 1 CERS site within the requested target property.

Site	Address	Map ID / Focus Map(s)	Page
THP 2-16-077-SHA CED		A3 / 25	69

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

EXECUTIVE SUMMARY

Page Numbers and Map Identifcations refer to the EDR Area/Corridor Report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

State- and tribal - equivalent CERCLIS

ENVIROSTOR: EnviroStor Database

A review of the ENVIROSTOR list, as provided by EDR, and dated 10/29/2018 has revealed that there is 1 ENVIROSTOR site within approximately1 mile of the requested target property.

Site	Address	Direction / Distance	Map ID / Focus Map(s)	Page
WHITMORE GAP FILLER Facility Id: 71000058 Status: No Further Action	LOCATED IN SHAST COU	SE 1/2 - 1 (0.838 mi.)	B4 / 31	69

ADDITIONAL ENVIRONMENTAL RECORDS

Other Ascertainable Records

FUDS: Formerly Used Defense Sites

A review of the FUDS list, as provided by EDR, and dated 01/31/2015 has revealed that there is 1 FUDS site within approximately1 mile of the requested target property.

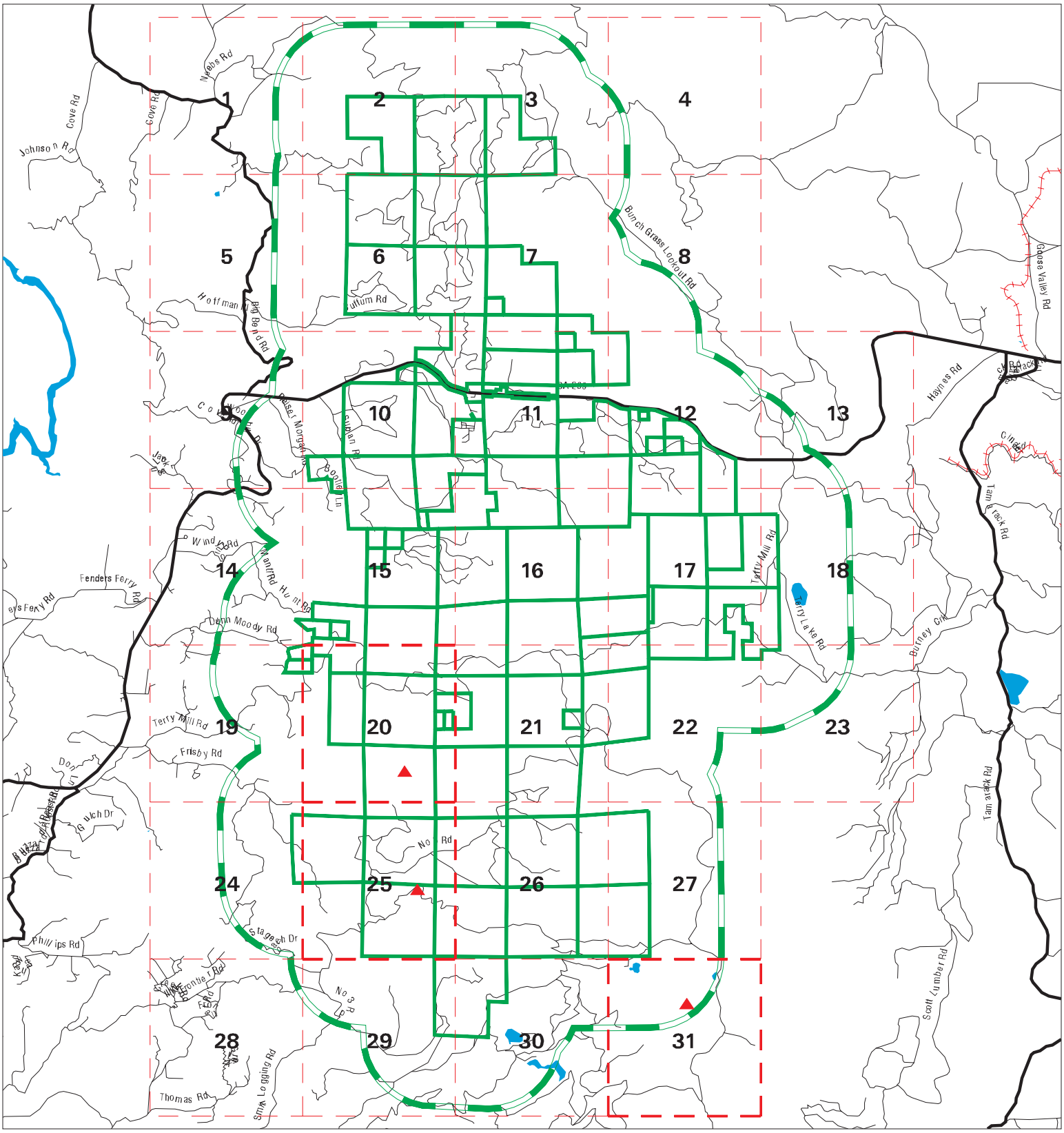
Site	Address	Direction / Distance	Map ID / Focus Map(s)	Page
WHITMORE GAP FILLER Federal Facility ID:: CA9799F5242 INST ID:: 57766		SE 1/2 - 1 (0.855 mi.)	B5 / 31	71

MAPPED SITES SUMMARY

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION
1 / 20	THP 2-16-063-SHA GOO		CIWQS	TP
A2 / 25	THP 2-16-077-SHA CED		CIWQS	TP
A3 / 25	THP 2-16-077-SHA CED		CERS	TP
B4 / 31	WHITMORE GAP FILLER	LOCATED IN SHAST COU	ENVIROSTOR	4425 0.838 SE
B5 / 31	WHITMORE GAP FILLER		FUDS	4516 0.855 SE

Key Map - 5564109.2s



SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19 12:48 PM

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MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	1.000		0	0	0	0	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site list								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
RESPONSE	1.000		0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
ENVIROSTOR	1.000		0	0	0	1	NR	1
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
INDIAN LUST	0.500		0	0	0	NR	NR	0
CPS-SLIC	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
FEMA UST	0.250		0	0	NR	NR	NR	0
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
State and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
WMUDS/SWAT	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
HAULERS	TP		NR	NR	NR	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
IHS OPEN DUMPS	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	TP		NR	NR	NR	NR	NR	0
HIST Cal-Sites	1.000		0	0	0	0	NR	0
SCH	0.250		0	0	NR	NR	NR	0
CDL	TP		NR	NR	NR	NR	NR	0
Toxic Pits	1.000		0	0	0	0	NR	0
CERS HAZ WASTE	0.250		0	0	NR	NR	NR	0
US CDL	TP		NR	NR	NR	NR	NR	0
Local Lists of Registered Storage Tanks								
SWEEPS UST	0.250		0	0	NR	NR	NR	0
HIST UST	0.250		0	0	NR	NR	NR	0
CERS TANKS	0.250		0	0	NR	NR	NR	0
CA FID UST	0.250		0	0	NR	NR	NR	0
Local Land Records								
LIENS	TP		NR	NR	NR	NR	NR	0
LIENS 2	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
DEED	0.500		0	0	0	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
CHMIRS	TP		NR	NR	NR	NR	NR	0
LDS	TP		NR	NR	NR	NR	NR	0
MCS	TP		NR	NR	NR	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
FUDS	1.000		0	0	0	1	NR	1
DOD	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
ABANDONED MINES	0.250		0	0	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
ECHO	TP		NR	NR	NR	NR	NR	0
DOCKET HWC	TP		NR	NR	NR	NR	NR	0
UXO	1.000		0	0	0	0	NR	0
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
CA BOND EXP. PLAN	1.000		0	0	0	0	NR	0
Cortese	0.500		0	0	0	NR	NR	0
CUPA Listings	0.250		0	0	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
EMI	TP		NR	NR	NR	NR	NR	0
ENF	TP		NR	NR	NR	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
HAZNET	TP		NR	NR	NR	NR	NR	0
ICE	TP		NR	NR	NR	NR	NR	0
HIST CORTESE	0.500		0	0	0	NR	NR	0
HWP	1.000		0	0	0	0	NR	0
HWT	0.250		0	0	NR	NR	NR	0
MINES	0.250		0	0	NR	NR	NR	0
MWMP	0.250		0	0	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
PEST LIC	TP		NR	NR	NR	NR	NR	0
PROC	0.500		0	0	0	NR	NR	0
Notify 65	1.000		0	0	0	0	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
UIC GEO	TP		NR	NR	NR	NR	NR	0
WASTEWATER PITS	0.500		0	0	0	NR	NR	0
WDS	TP		NR	NR	NR	NR	NR	0
MILITARY PRIV SITES	TP		NR	NR	NR	NR	NR	0
PROJECT	TP		NR	NR	NR	NR	NR	0
WDR	TP		NR	NR	NR	NR	NR	0
CIWQS	TP	2	NR	NR	NR	NR	NR	2
CERS	TP	1	NR	NR	NR	NR	NR	1
WIP	0.250		0	0	NR	NR	NR	0
NON-CASE INFO	TP		NR	NR	NR	NR	NR	0
OTHER OIL GAS	TP		NR	NR	NR	NR	NR	0
PROD WATER PONDS	TP		NR	NR	NR	NR	NR	0
SAMPLING POINT	TP		NR	NR	NR	NR	NR	0
WELL STIM PROJ	TP		NR	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		0	NR	NR	NR	NR	0
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA LF	TP		NR	NR	NR	NR	NR	0
RGA LUST	TP		NR	NR	NR	NR	NR	0
- Totals --		3	0	0	0	2	0	5

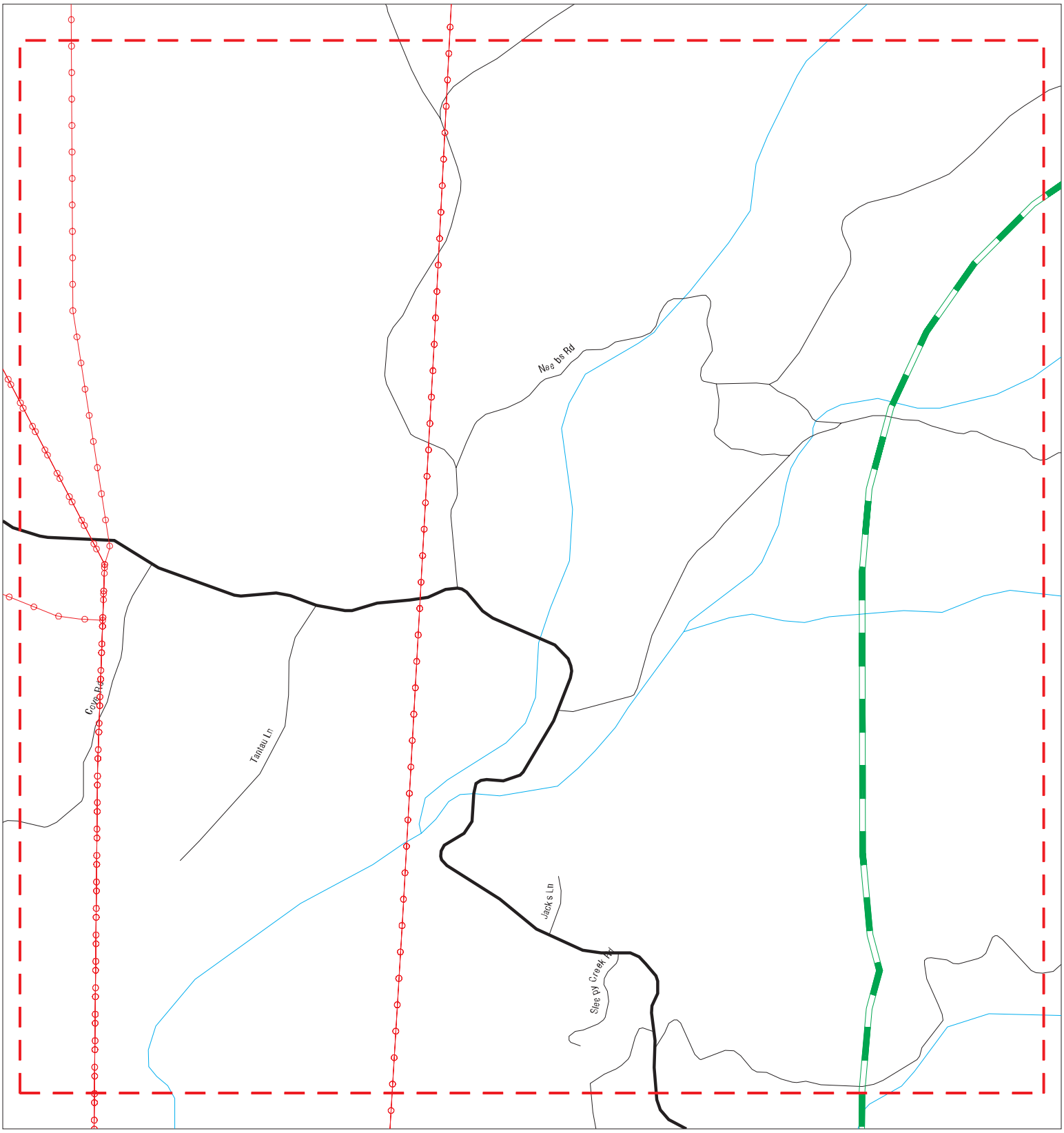
NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

Focus Map - 1 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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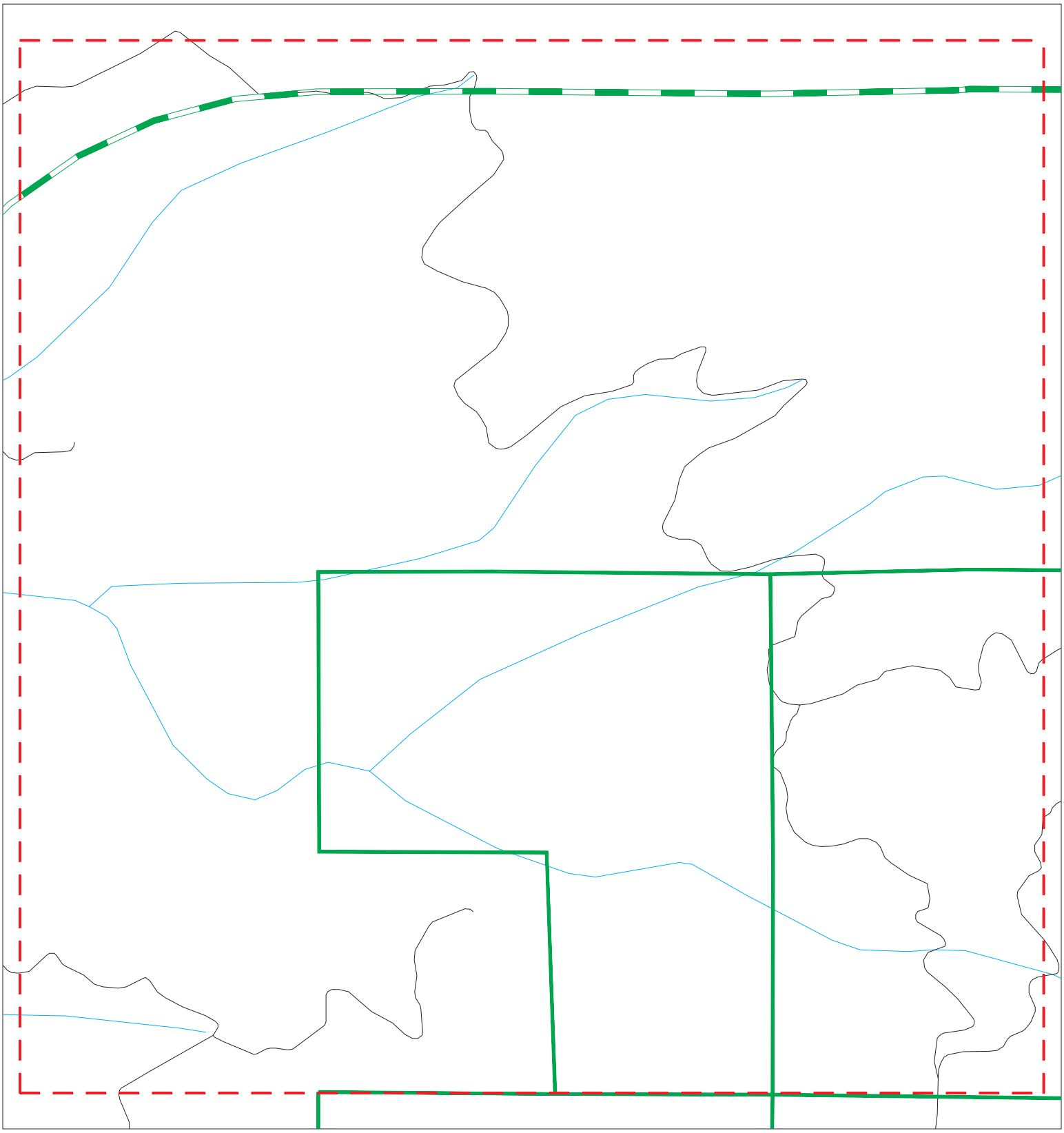
MAPPED SITES SUMMARY - FOCUS MAP 1

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 2 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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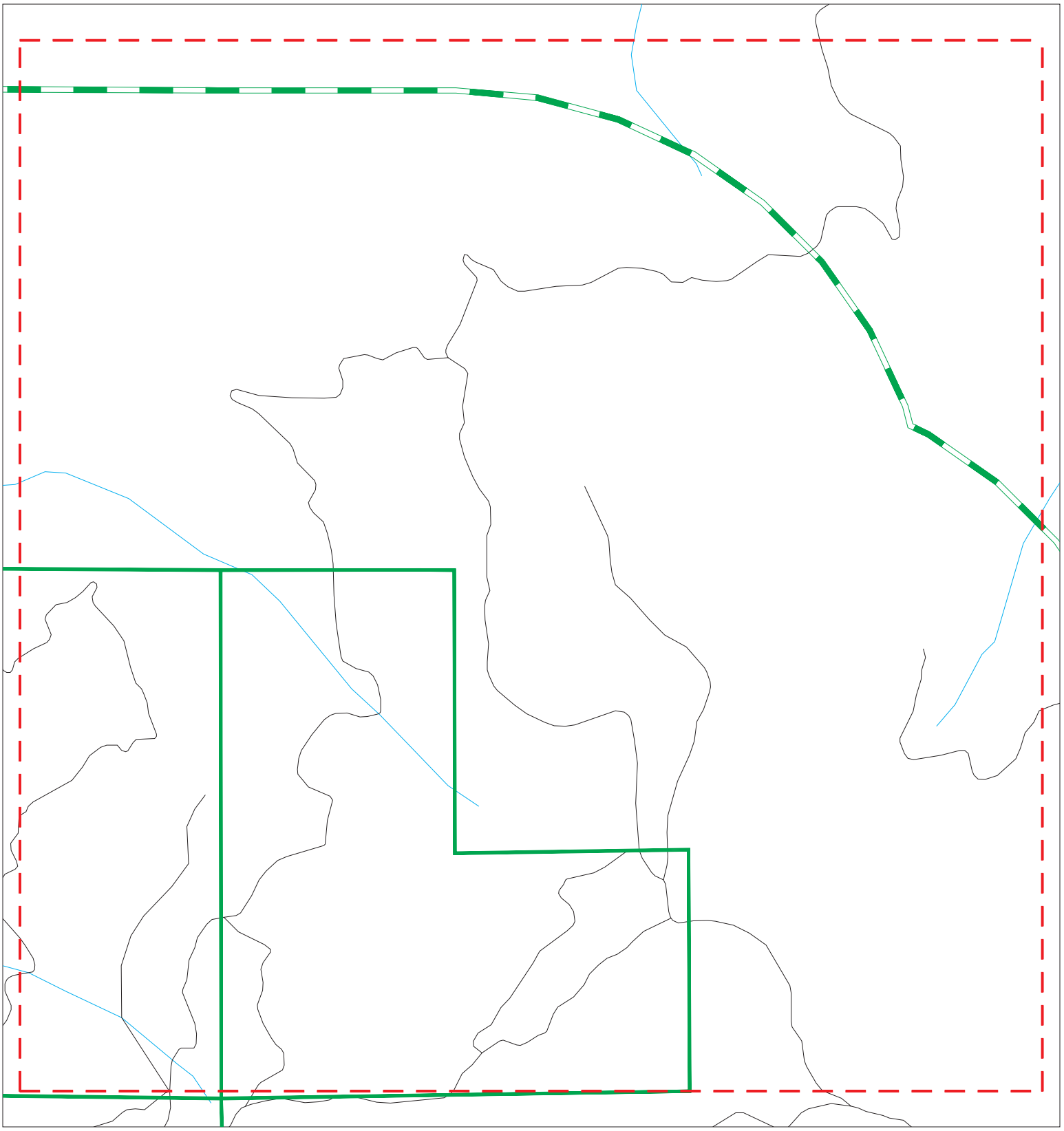
MAPPED SITES SUMMARY - FOCUS MAP 2

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 3 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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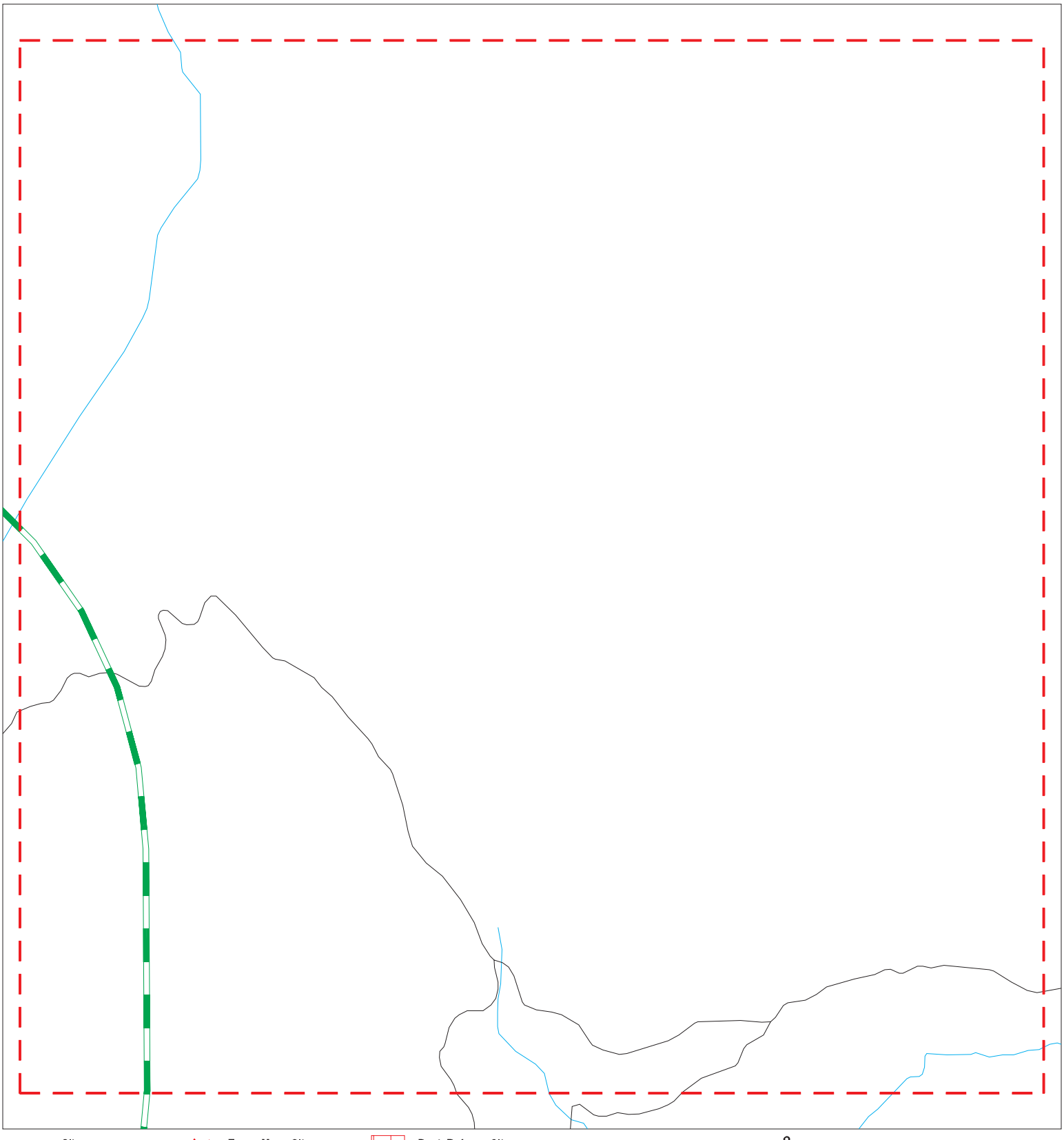
MAPPED SITES SUMMARY - FOCUS MAP 3

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 4 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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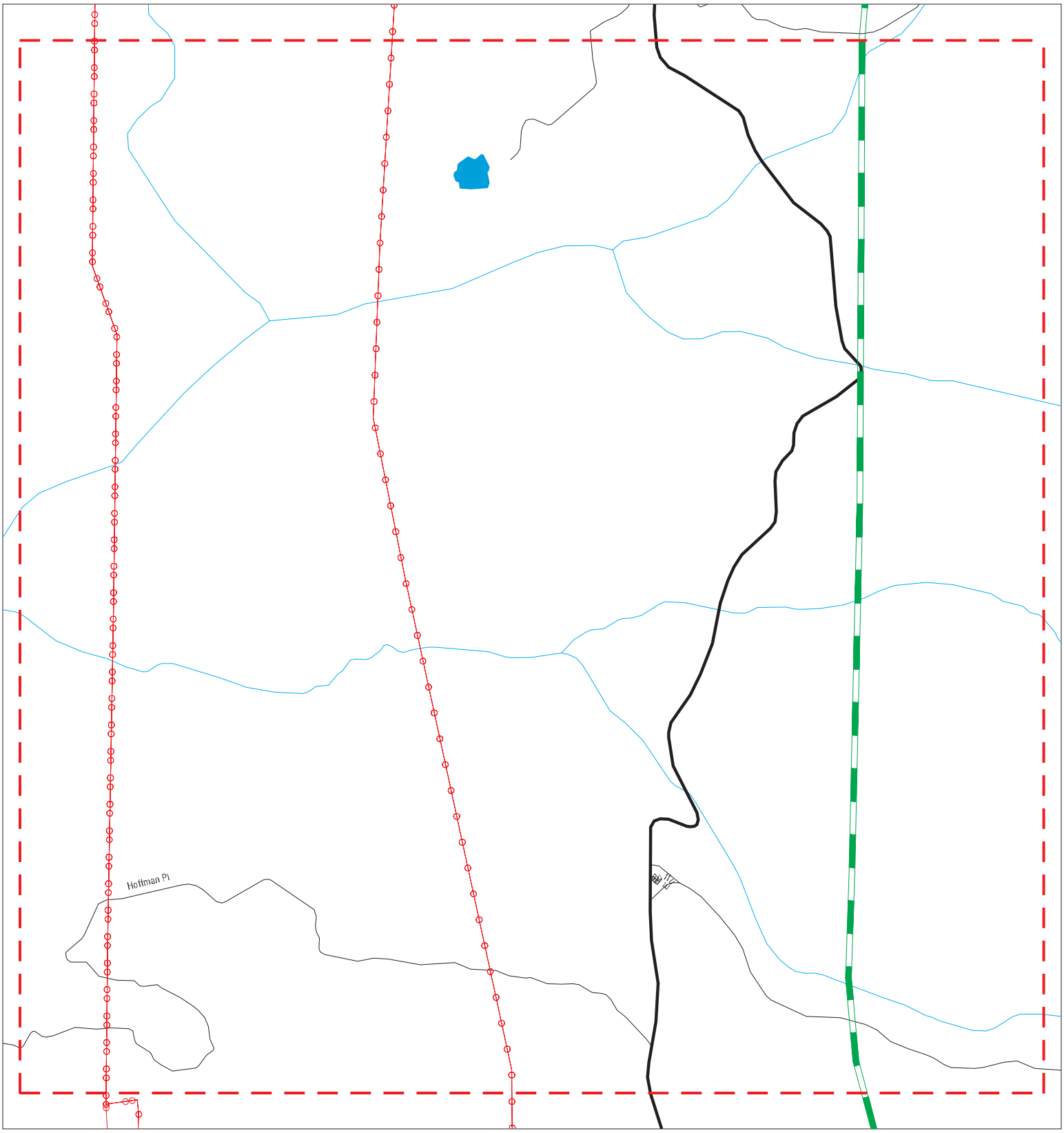
MAPPED SITES SUMMARY - FOCUS MAP 4

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 5 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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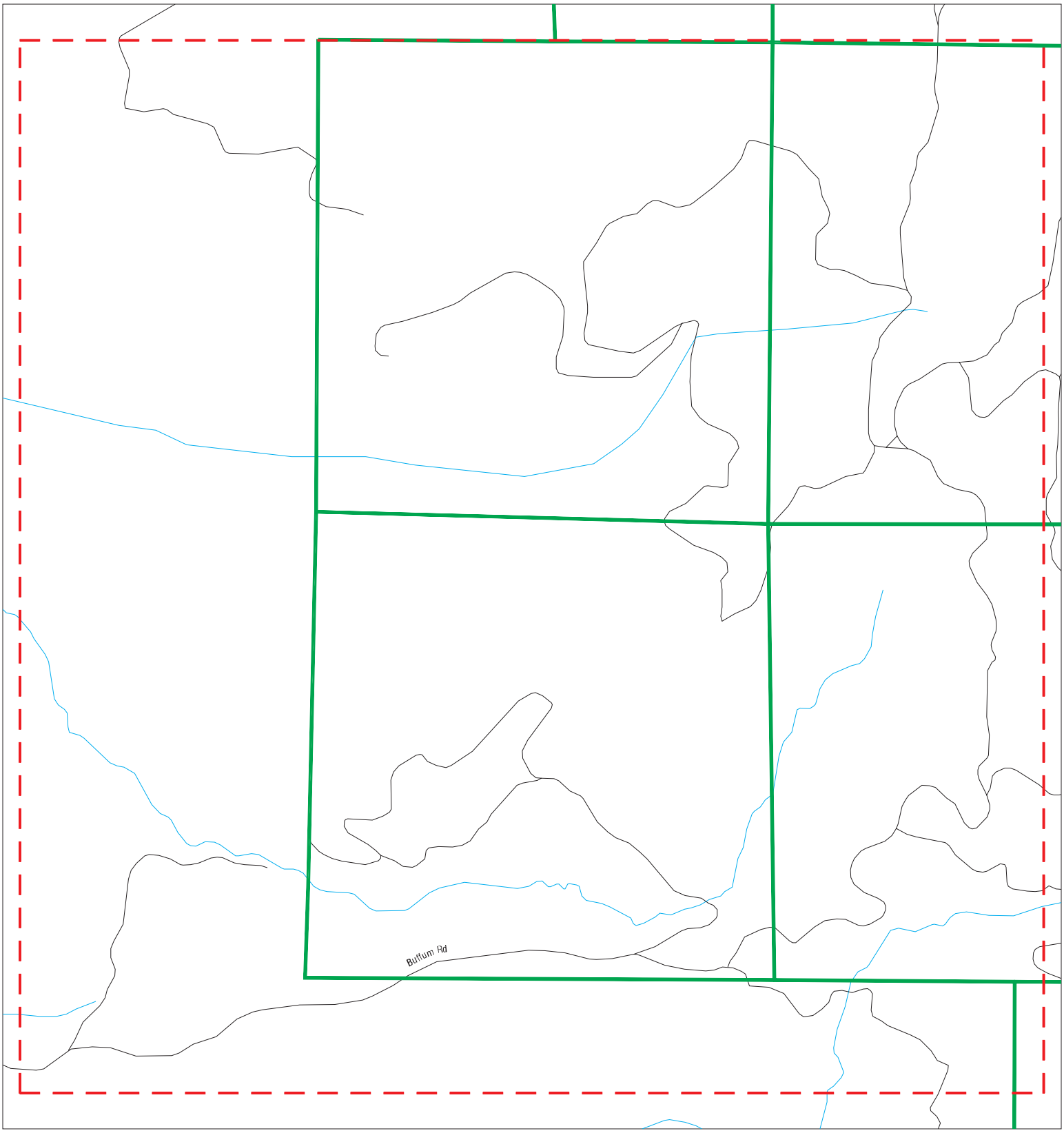
MAPPED SITES SUMMARY - FOCUS MAP 5

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 6 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME:	Fountain Wind Project	CLIENT:	Stantec
ADDRESS:	Shasta County	CONTACT:	Steve Little
CITY/STATE:	Montgomery Creek CA	INQUIRY #:	5564109.2s
ZIP:	96065	DATE:	02/15/19

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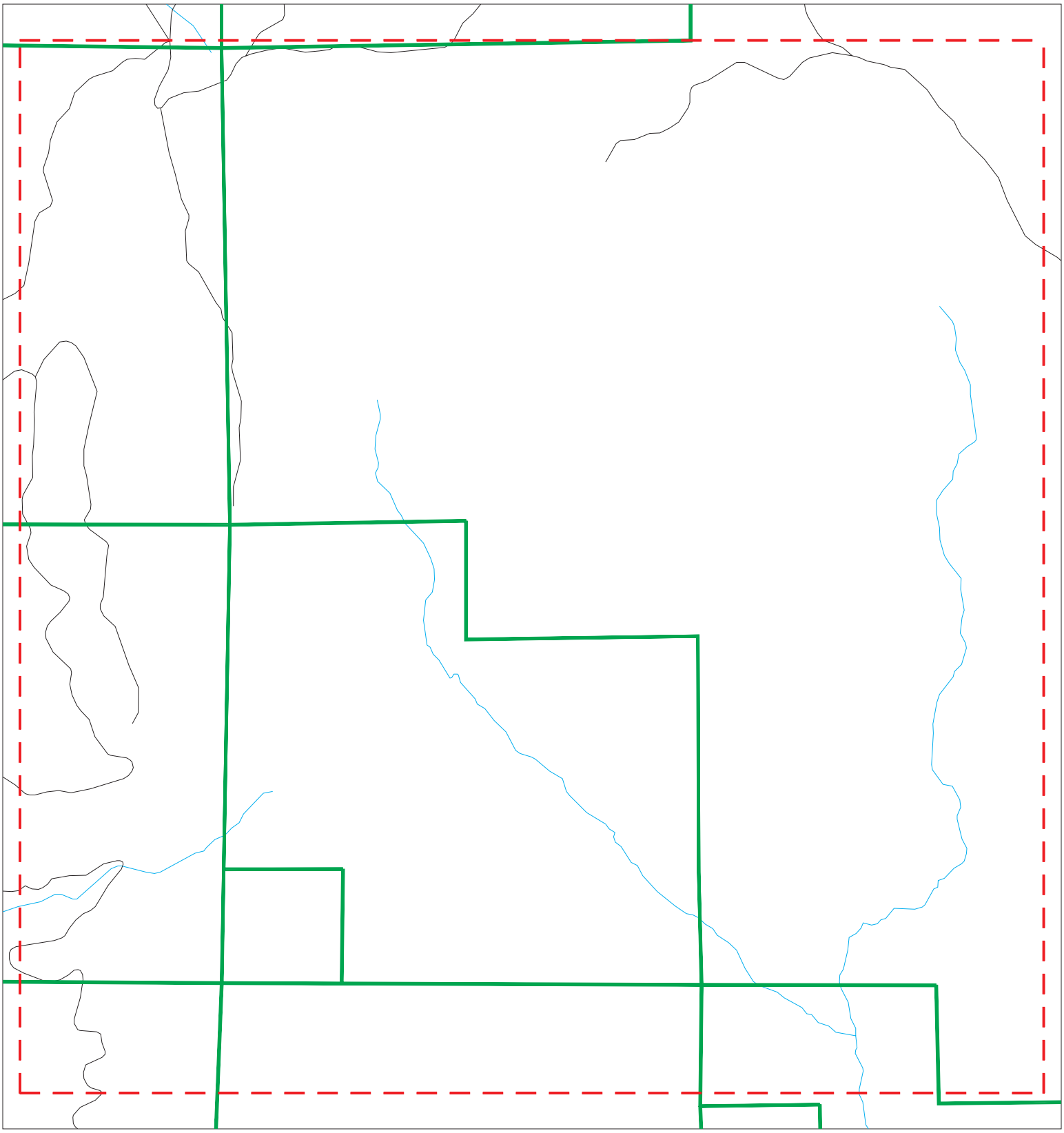
MAPPED SITES SUMMARY - FOCUS MAP 6

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 7 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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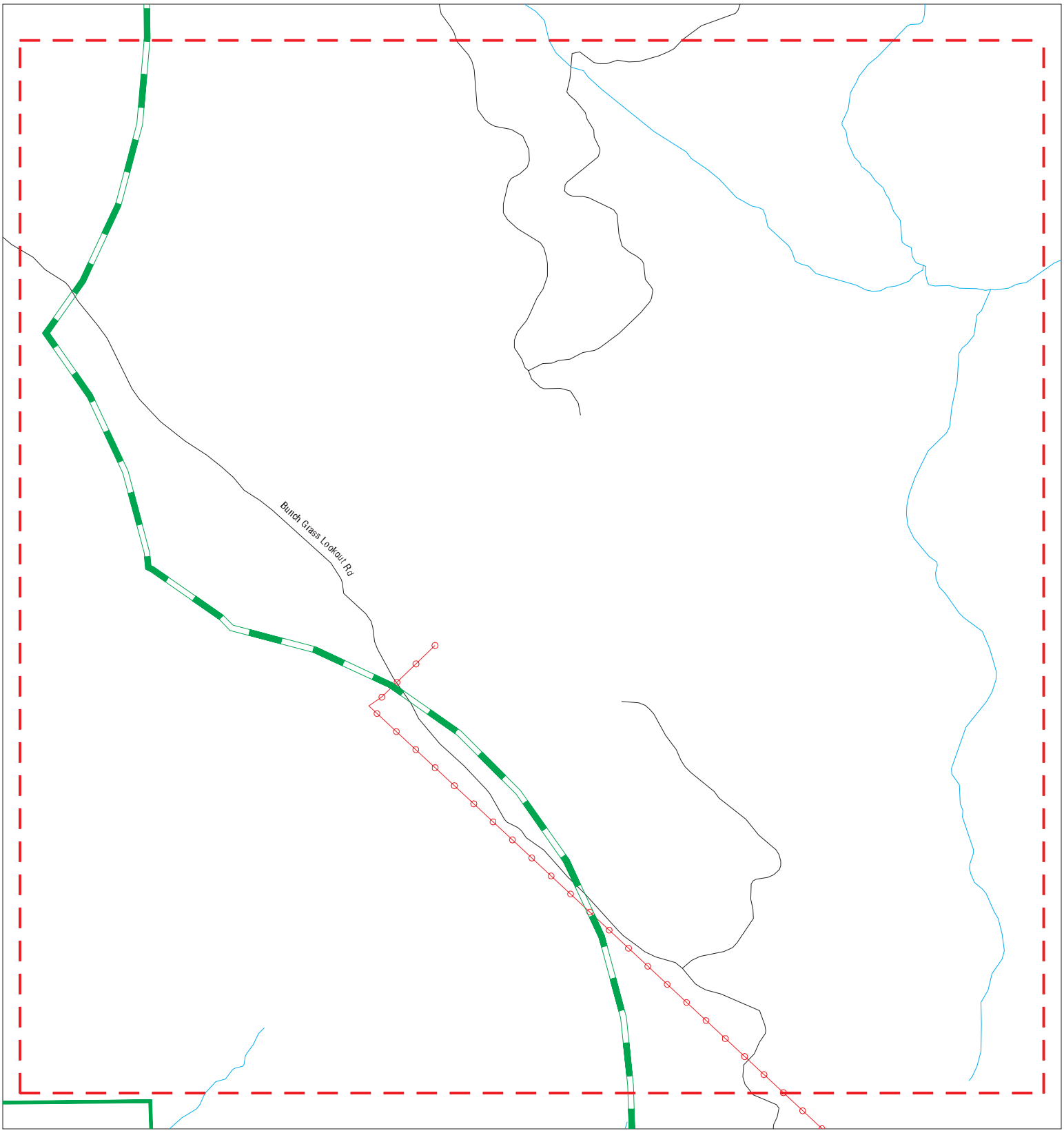
MAPPED SITES SUMMARY - FOCUS MAP 7

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 8 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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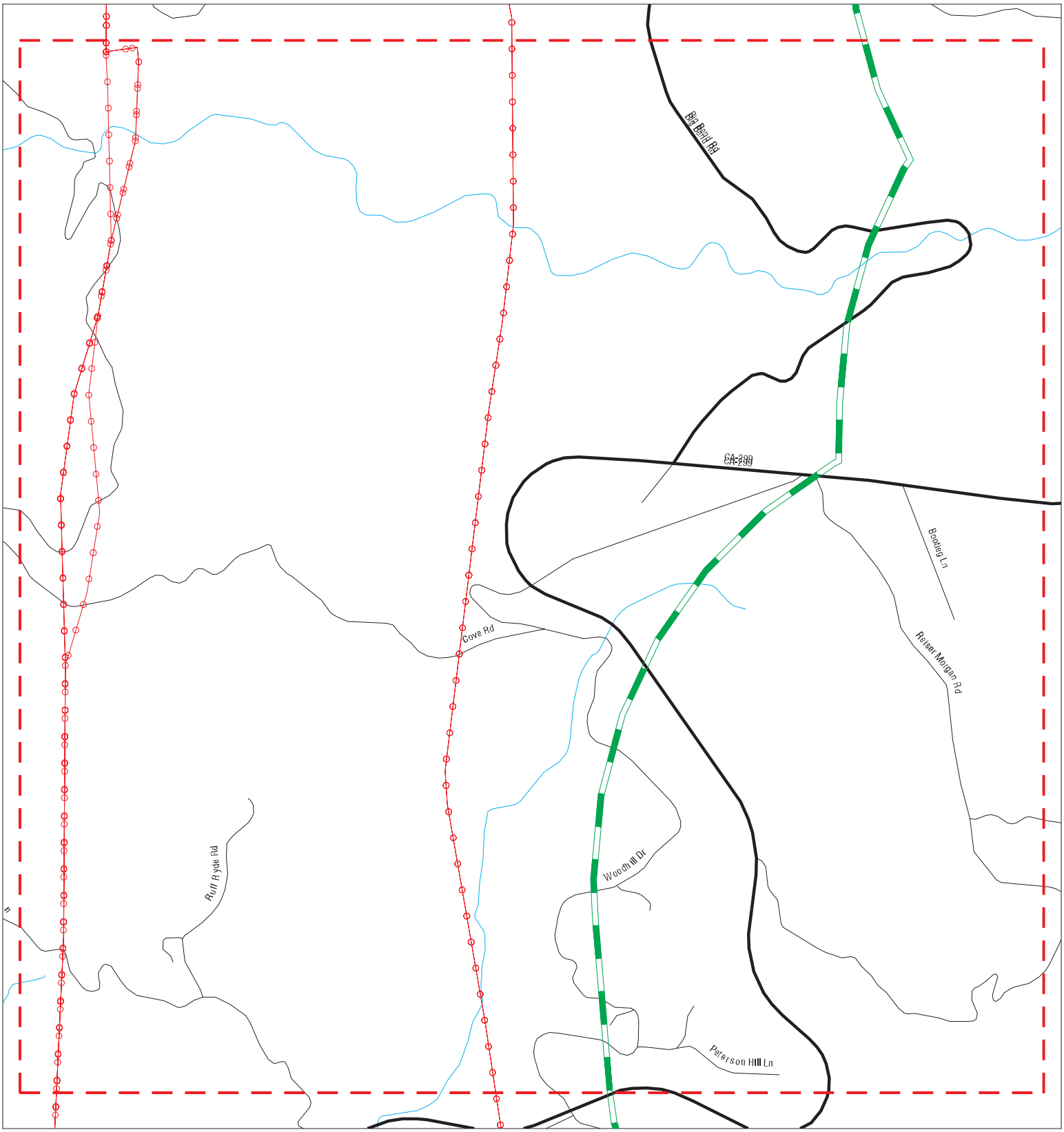
MAPPED SITES SUMMARY - FOCUS MAP 8

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 9 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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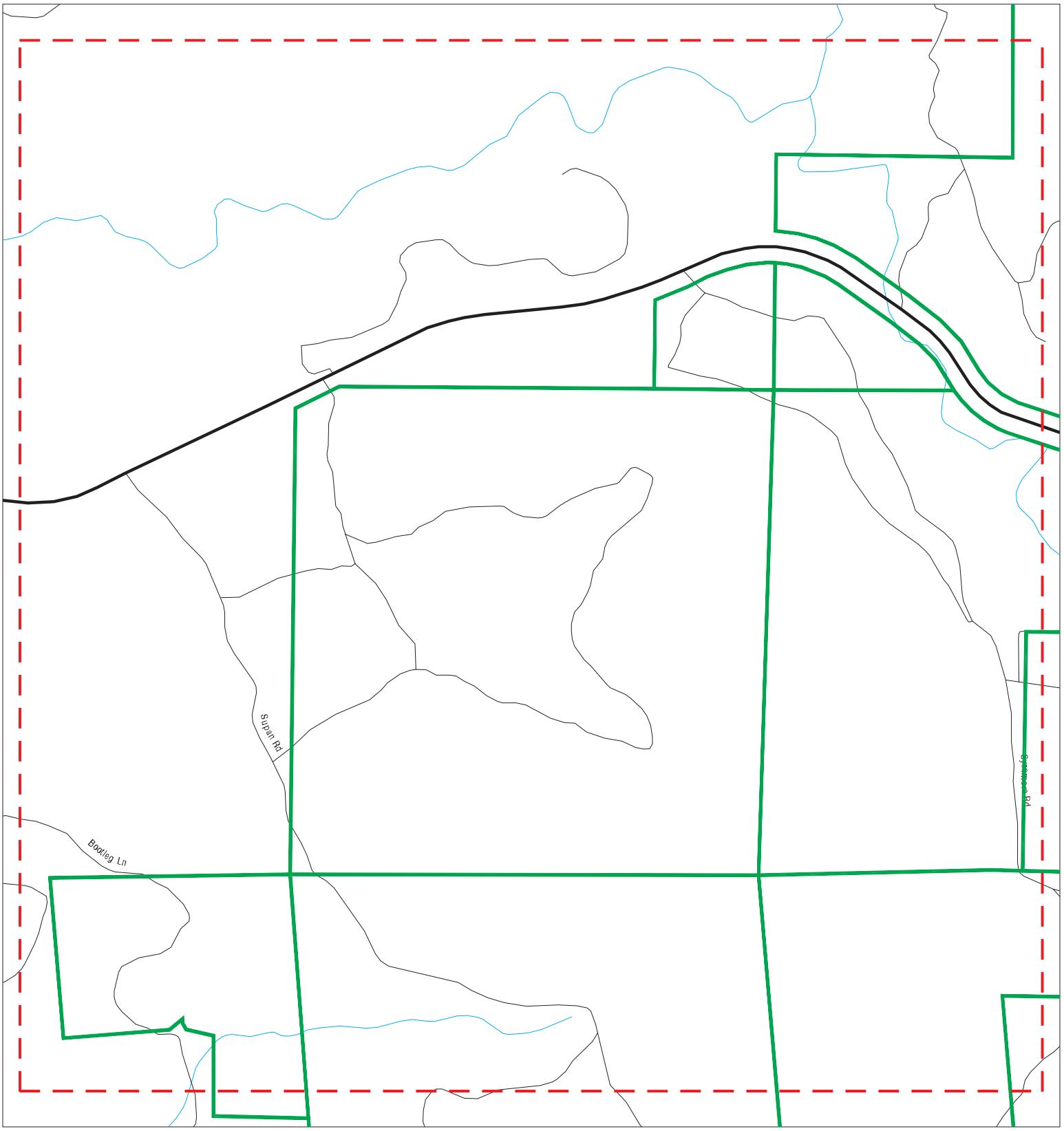
MAPPED SITES SUMMARY - FOCUS MAP 9

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 10 - 5564109.2s



SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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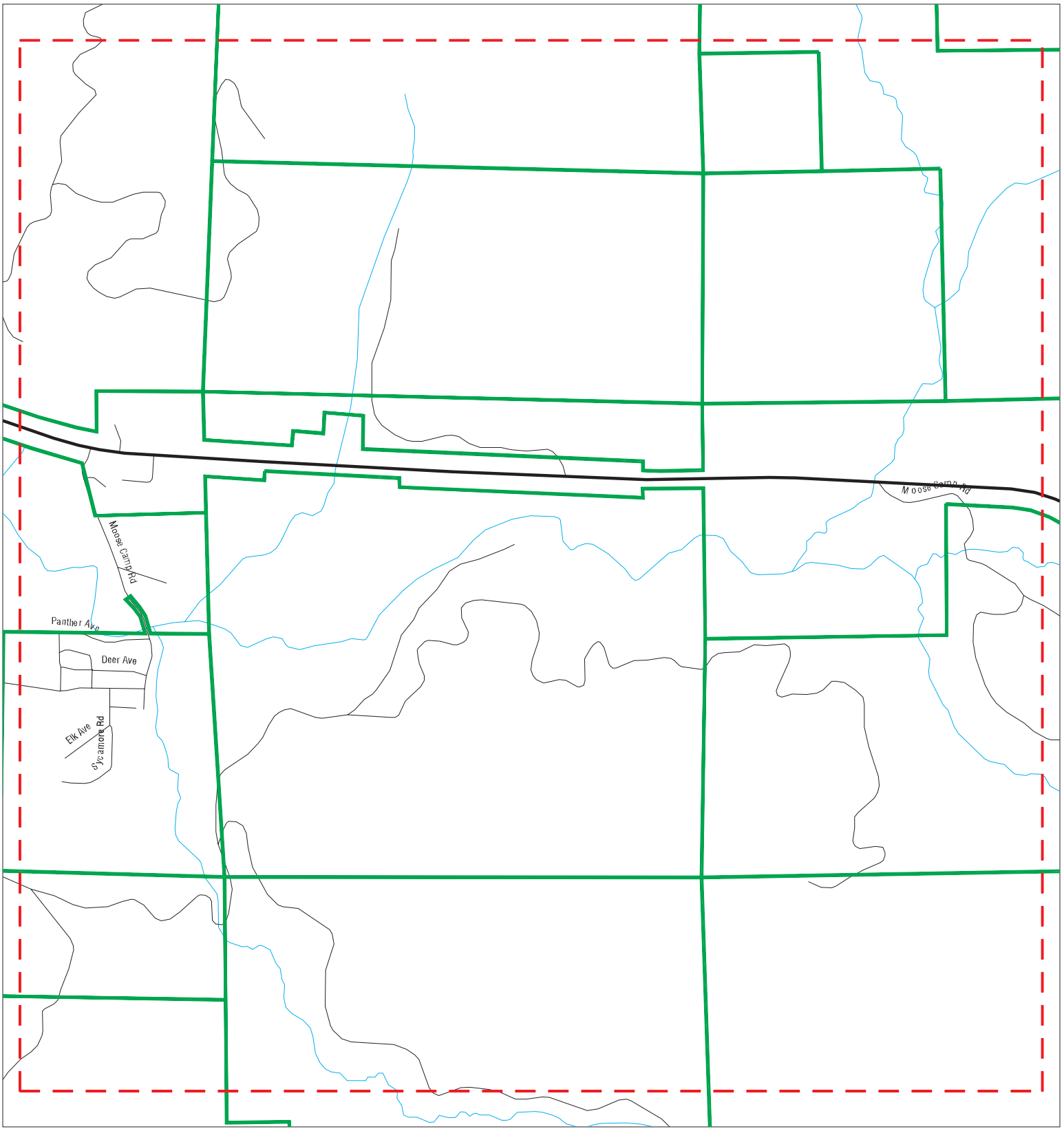
MAPPED SITES SUMMARY - FOCUS MAP 10

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 11 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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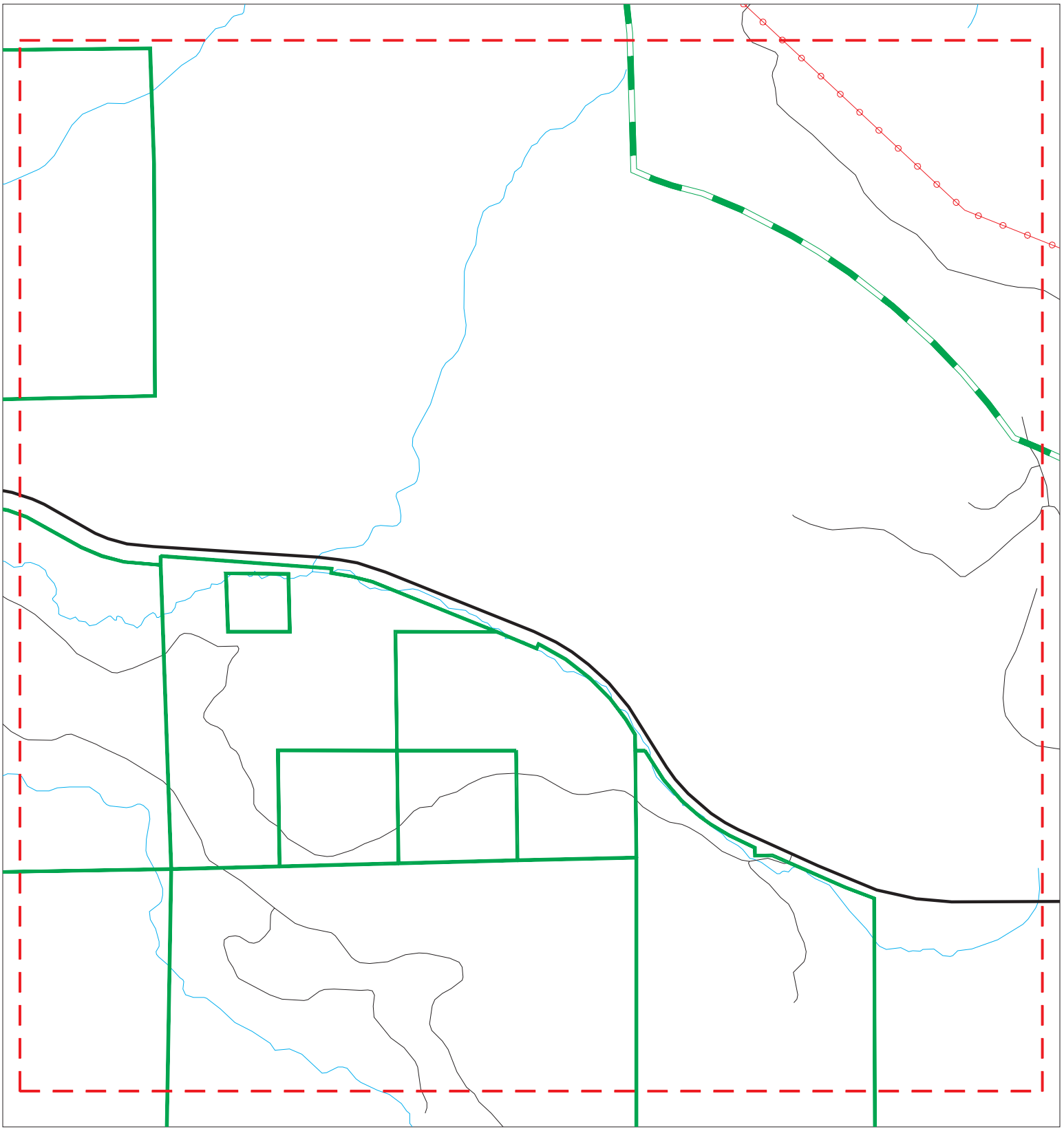
MAPPED SITES SUMMARY - FOCUS MAP 11

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 12 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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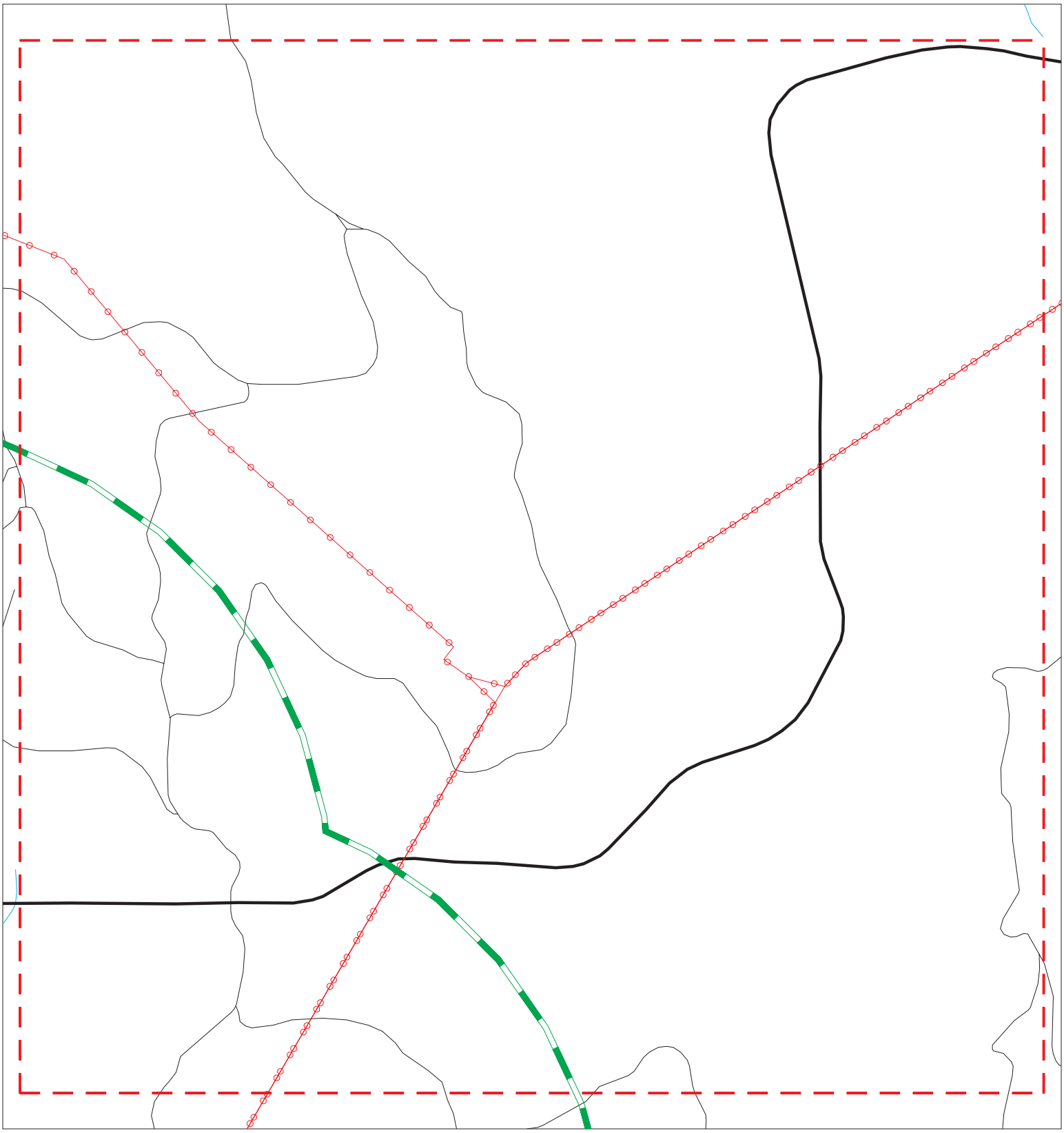
MAPPED SITES SUMMARY - FOCUS MAP 12

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 13 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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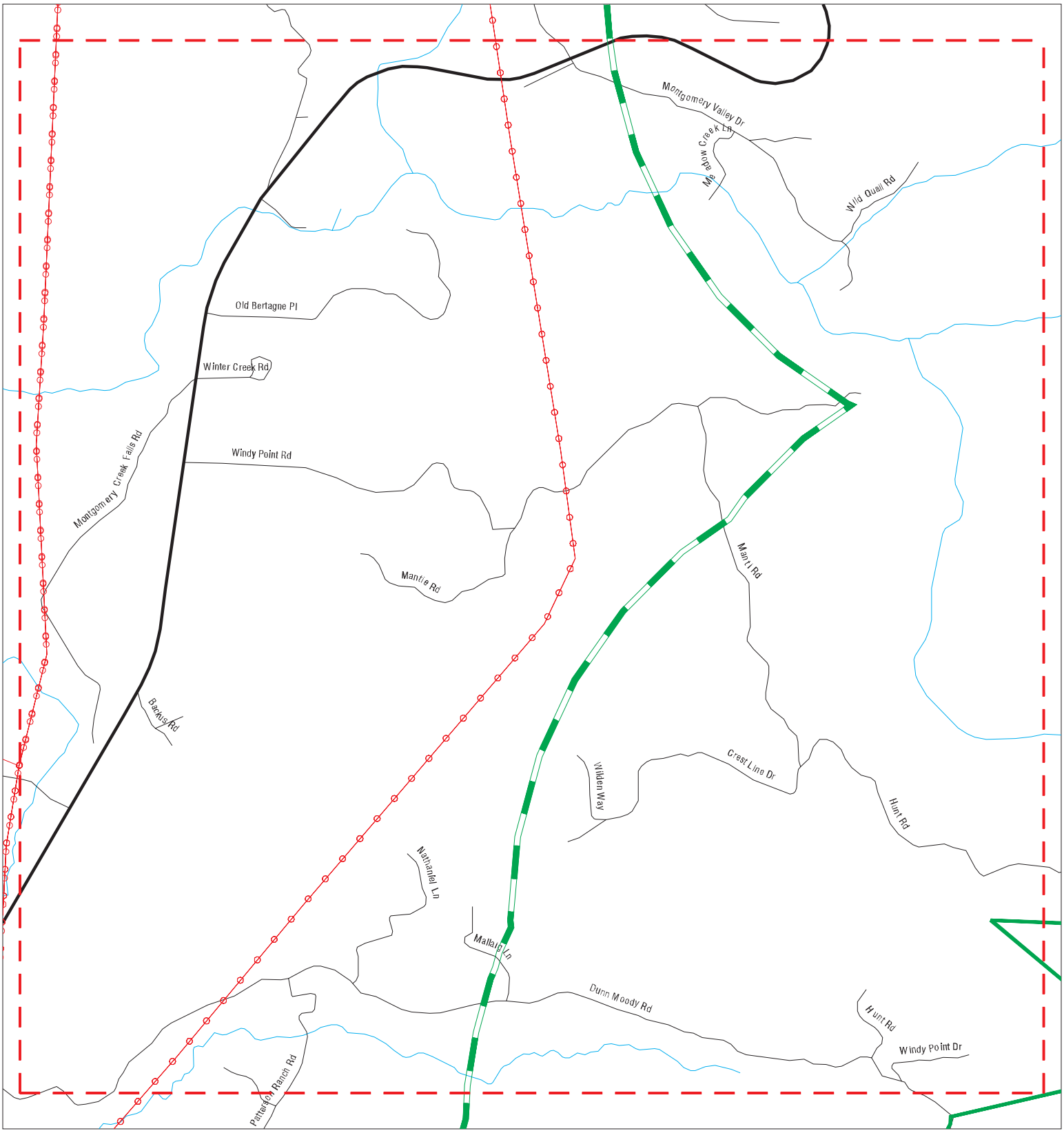
MAPPED SITES SUMMARY - FOCUS MAP 13

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 14 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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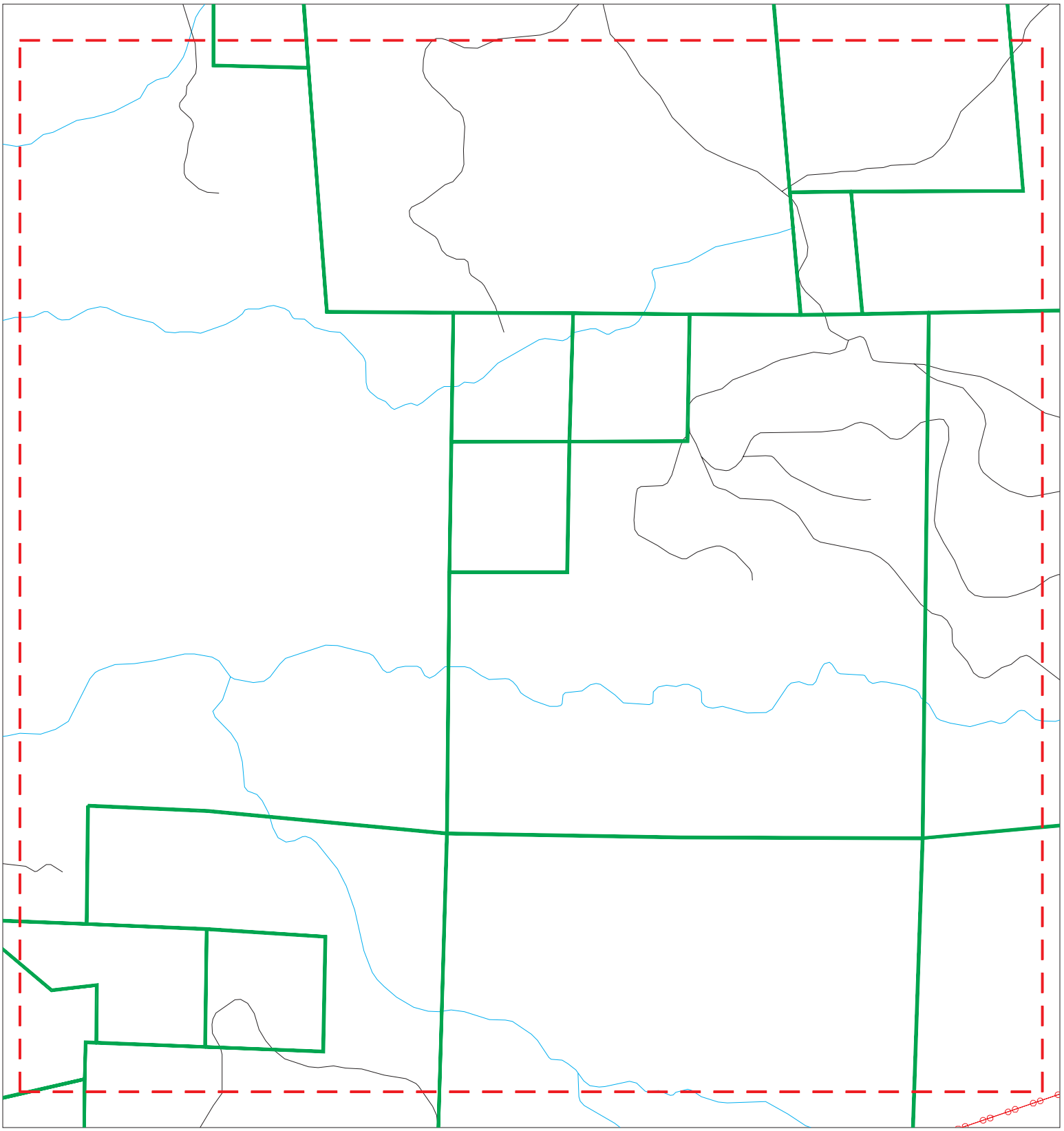
MAPPED SITES SUMMARY - FOCUS MAP 14

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 15 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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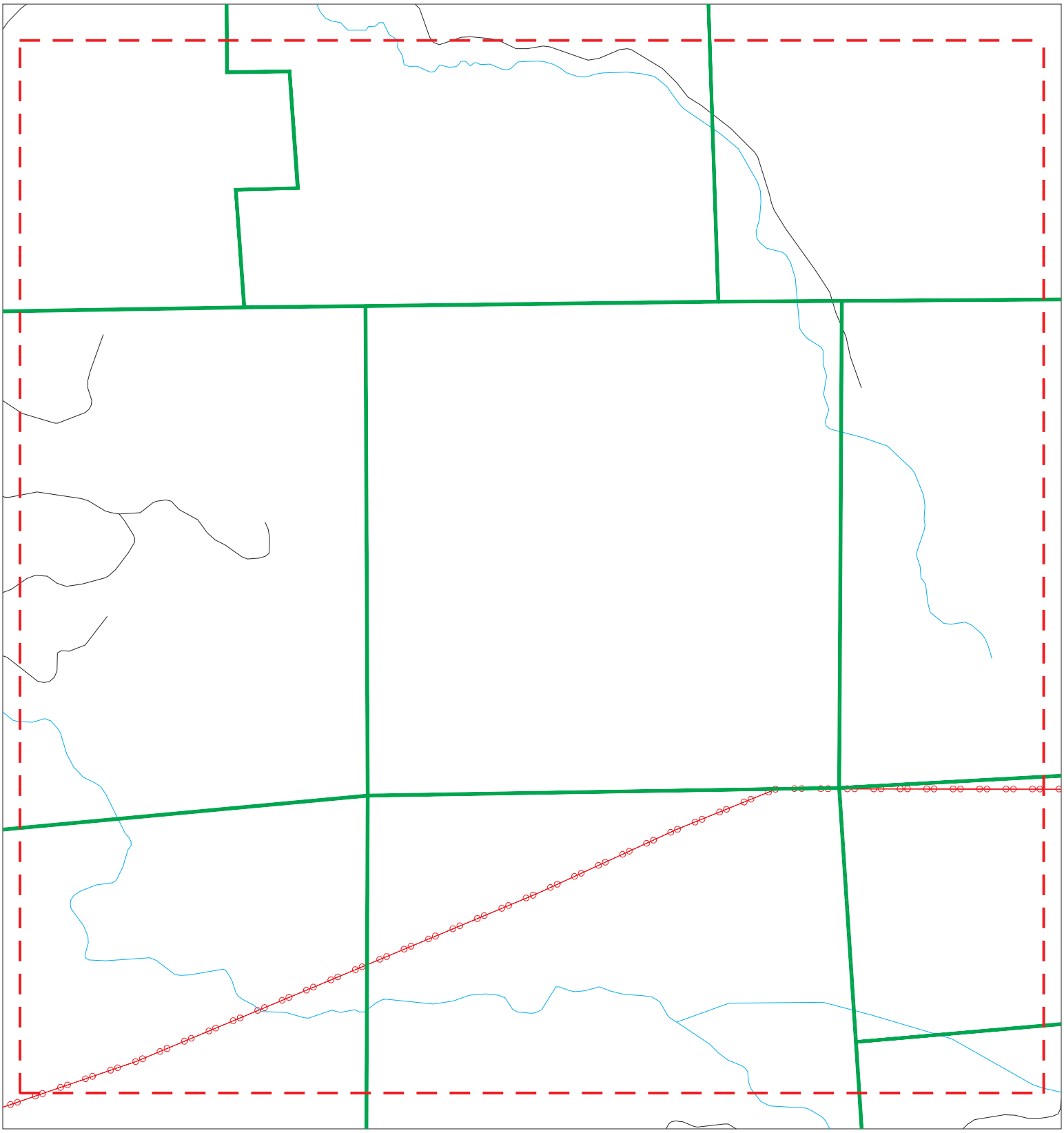
MAPPED SITES SUMMARY - FOCUS MAP 15

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 16 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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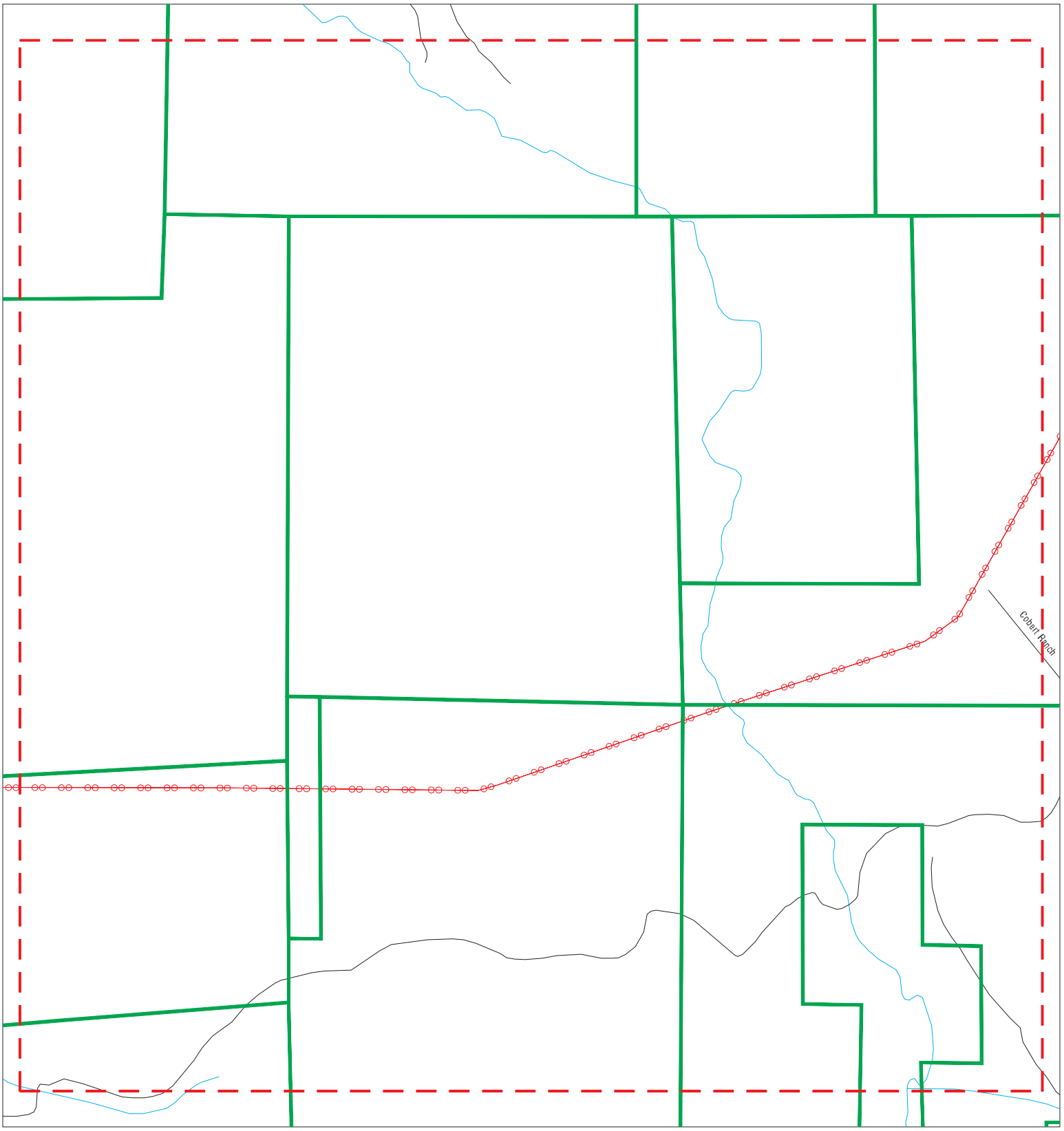
MAPPED SITES SUMMARY - FOCUS MAP 16

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 17 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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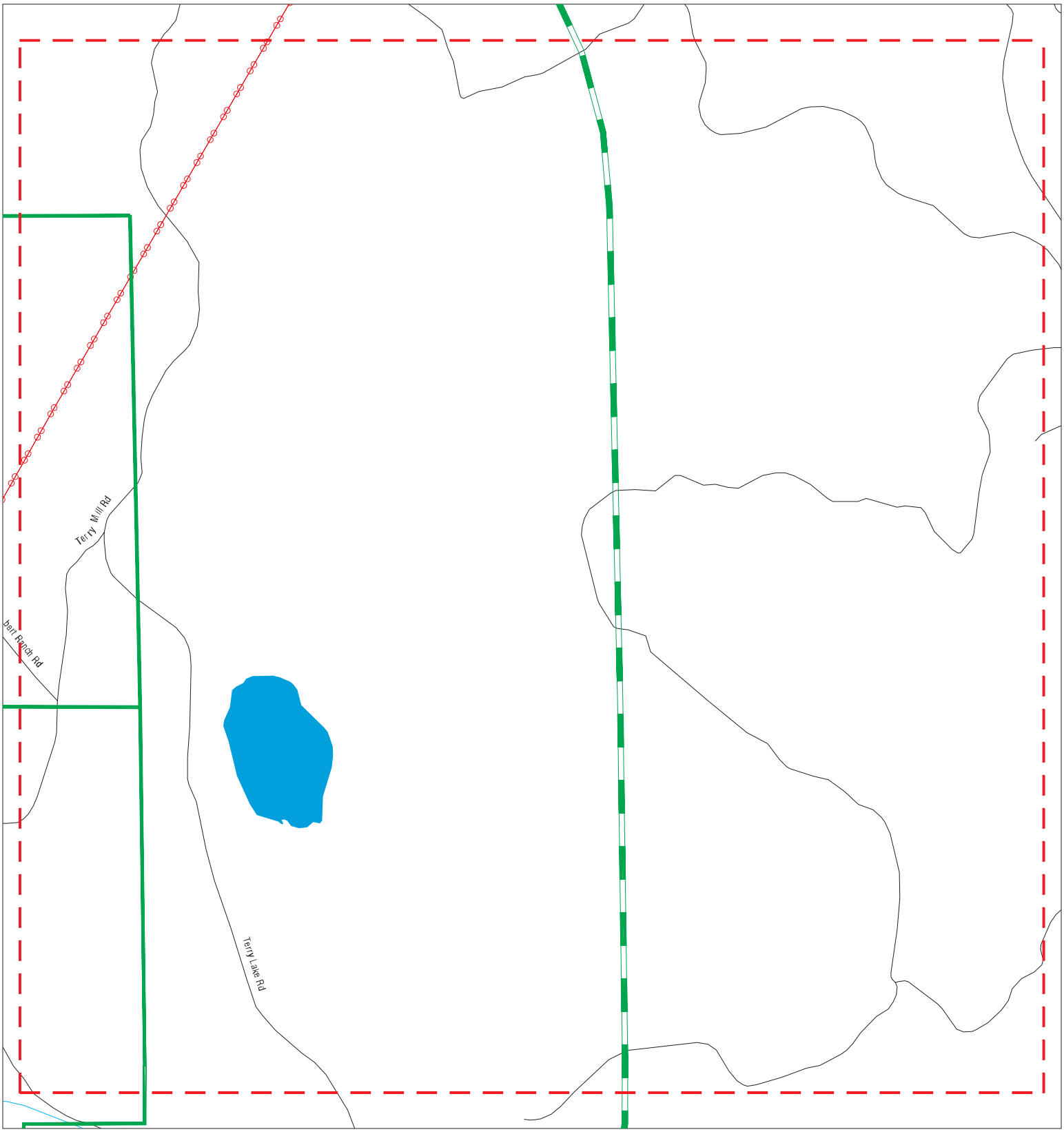
MAPPED SITES SUMMARY - FOCUS MAP 17

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 18 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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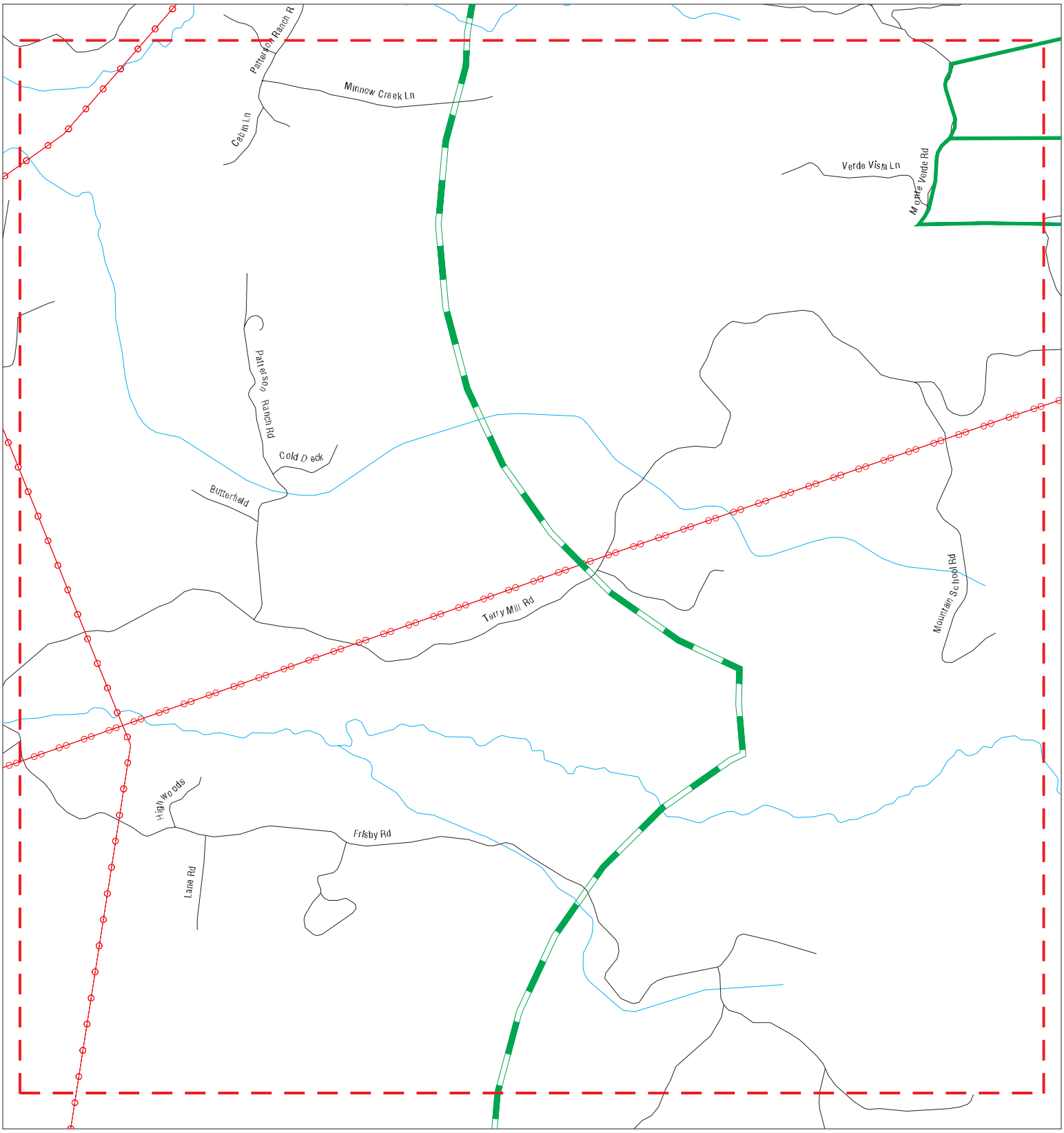
MAPPED SITES SUMMARY - FOCUS MAP 18

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 19 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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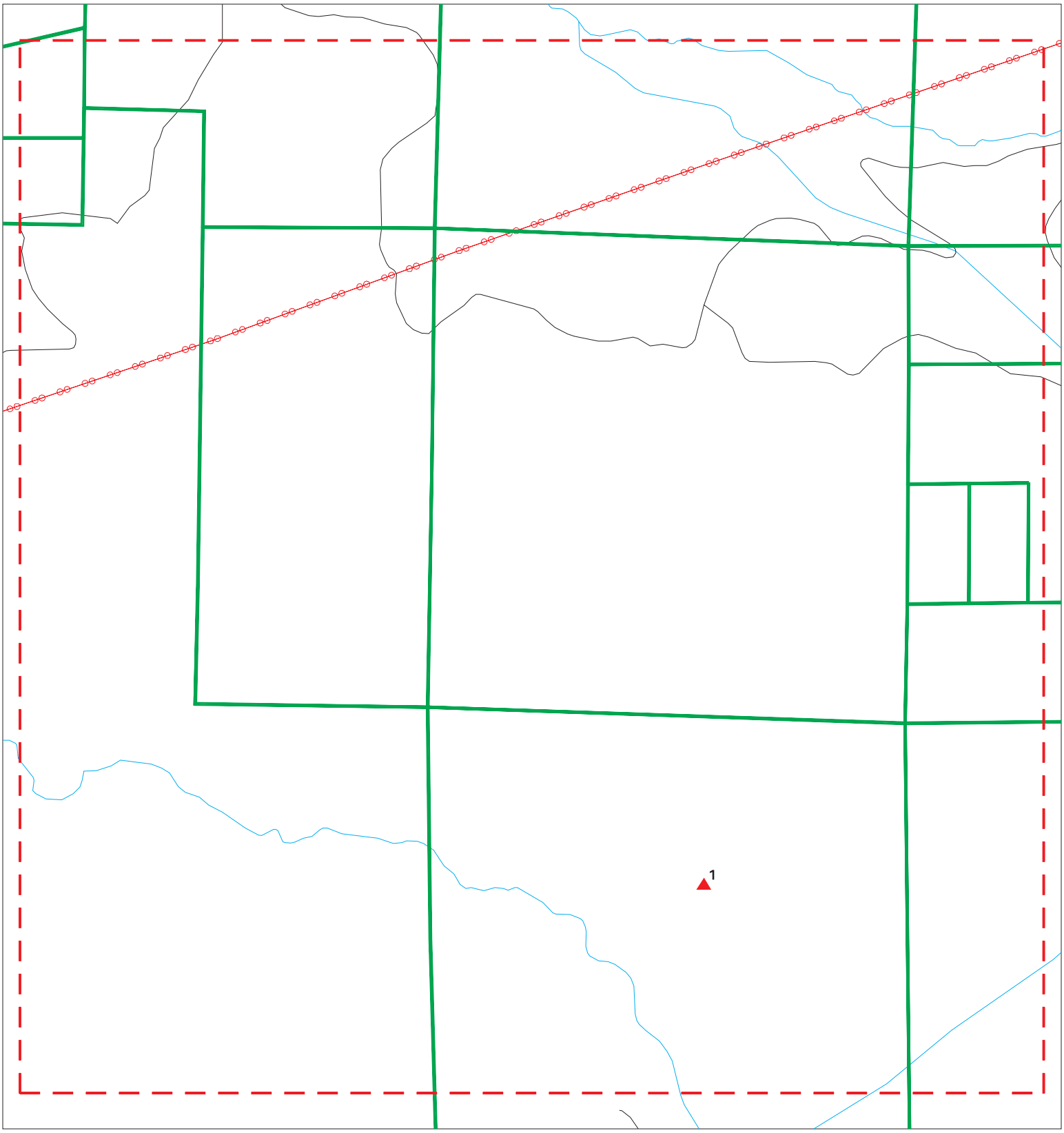
MAPPED SITES SUMMARY - FOCUS MAP 19

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 20 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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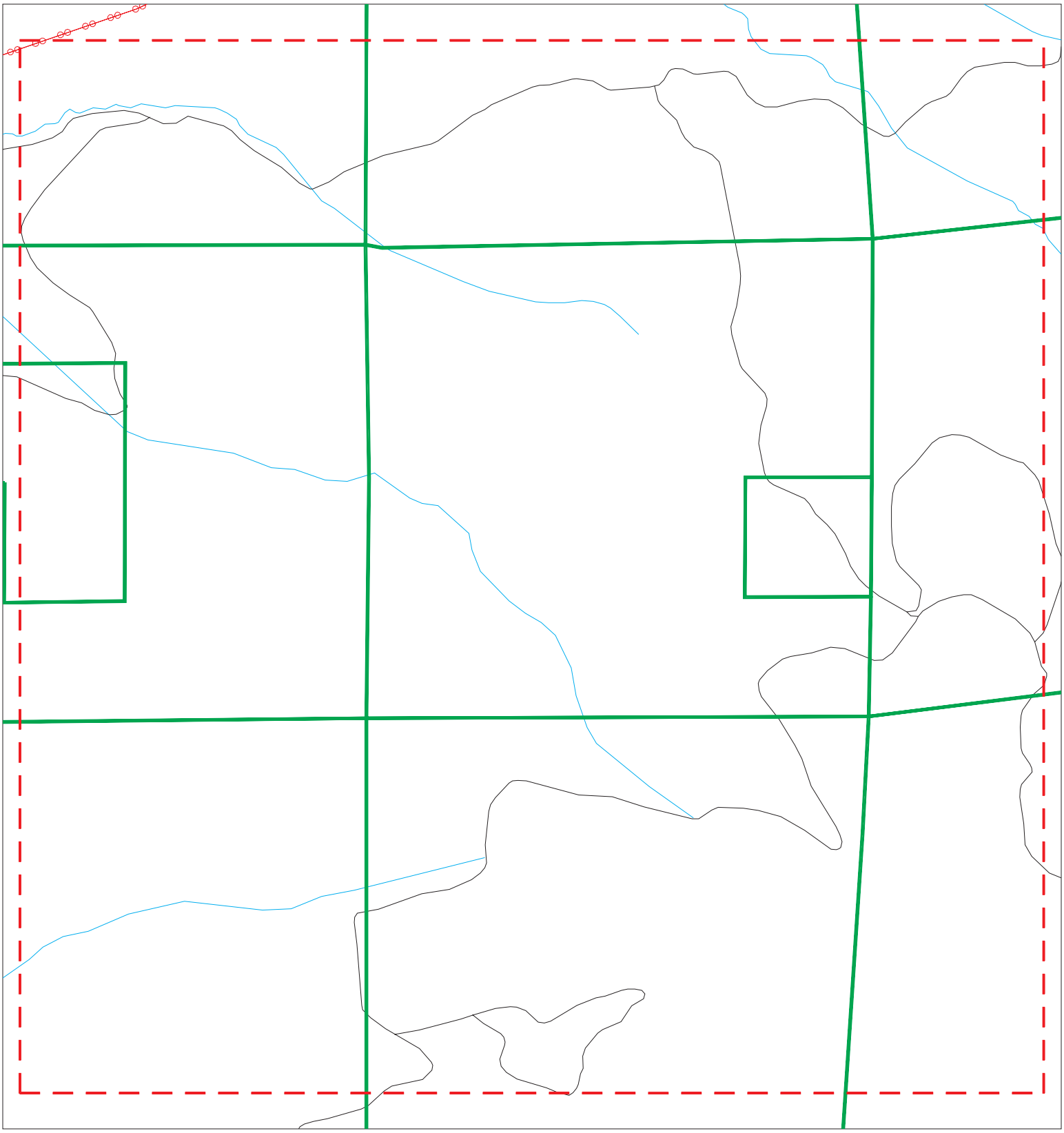
MAPPED SITES SUMMARY - FOCUS MAP 20

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION
1 / 20	THP 2-16-063-SHA GOO		CIWQS	TP

Focus Map - 21 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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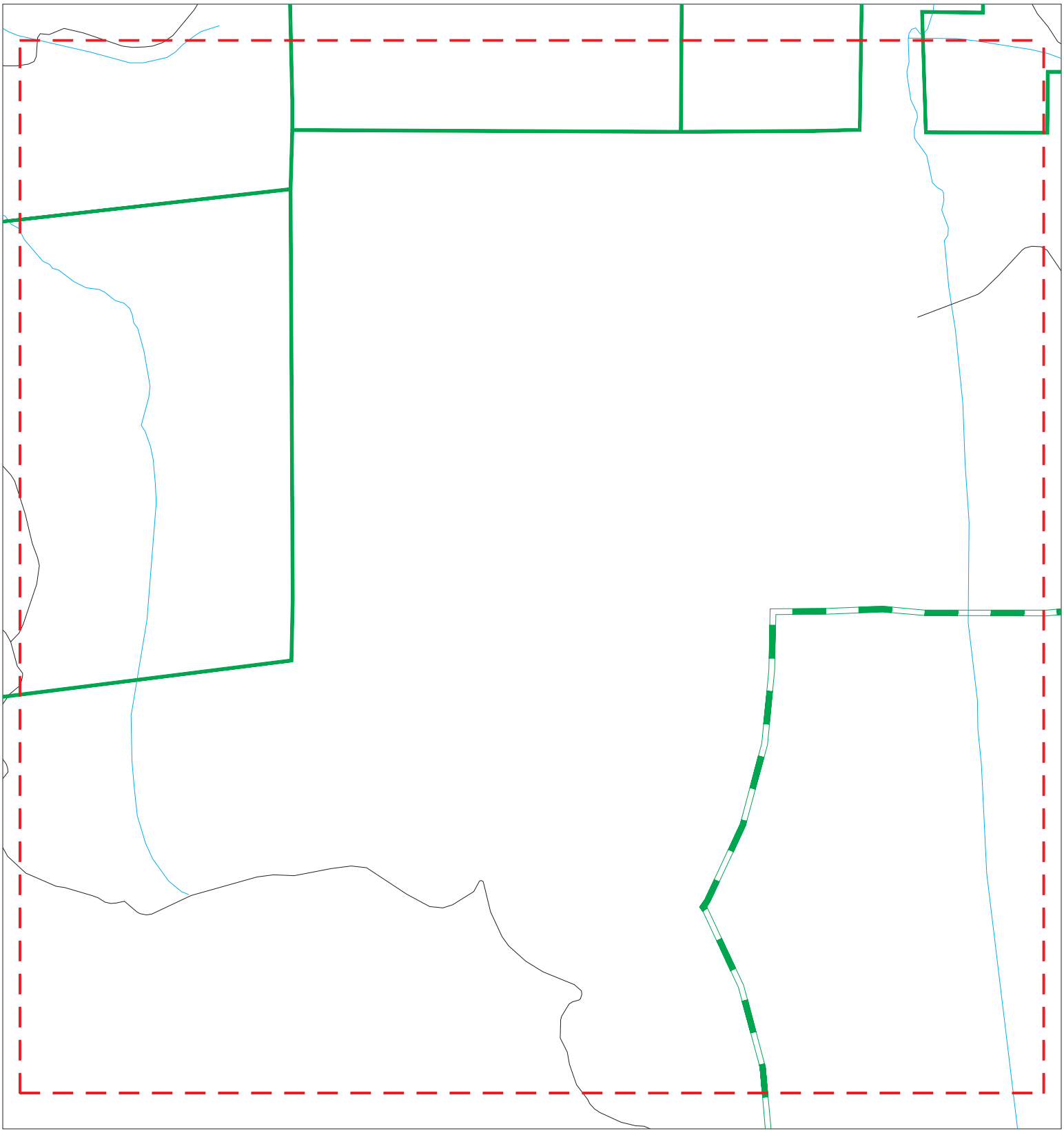
MAPPED SITES SUMMARY - FOCUS MAP 21

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 22 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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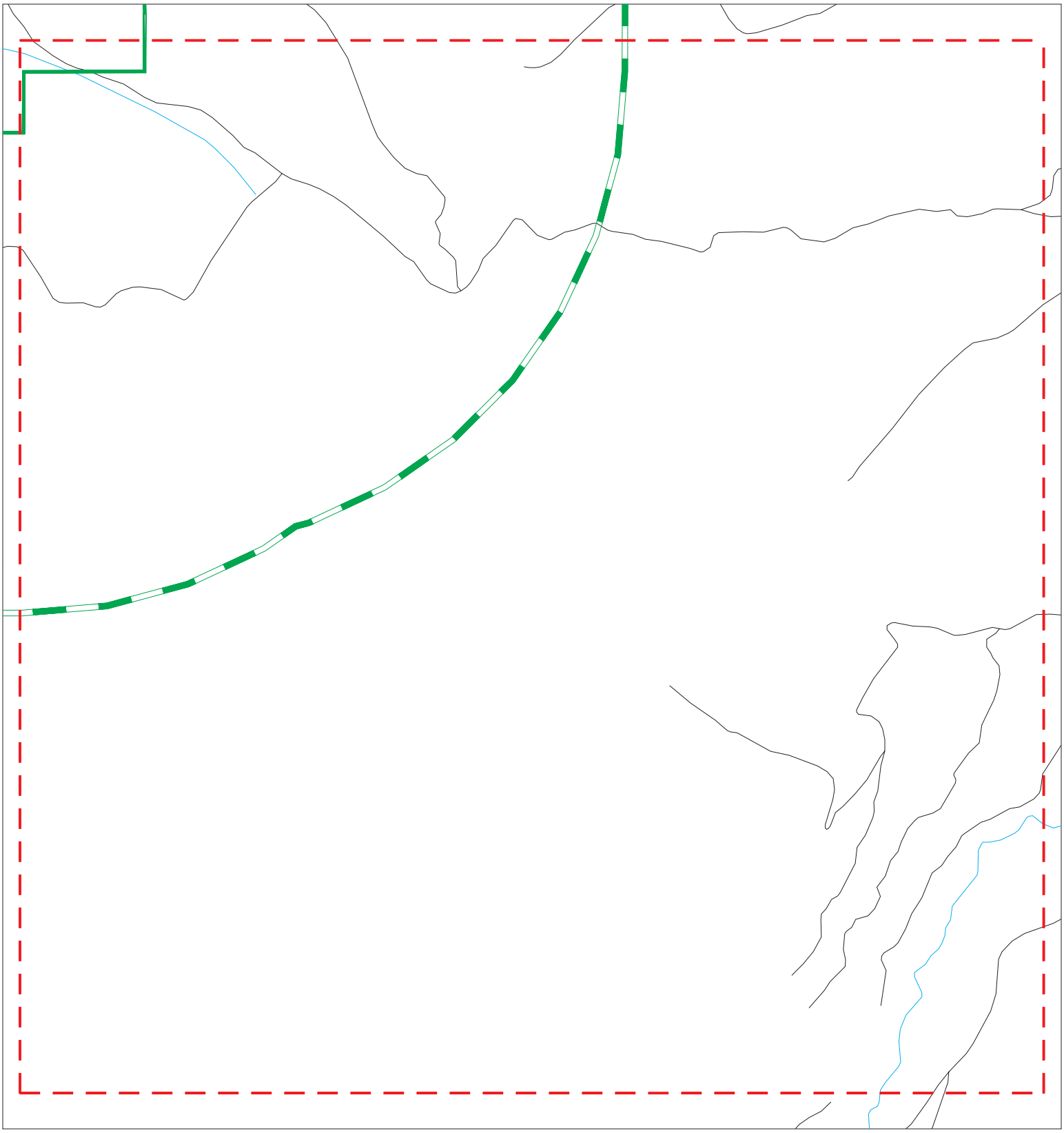
MAPPED SITES SUMMARY - FOCUS MAP 22

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 23 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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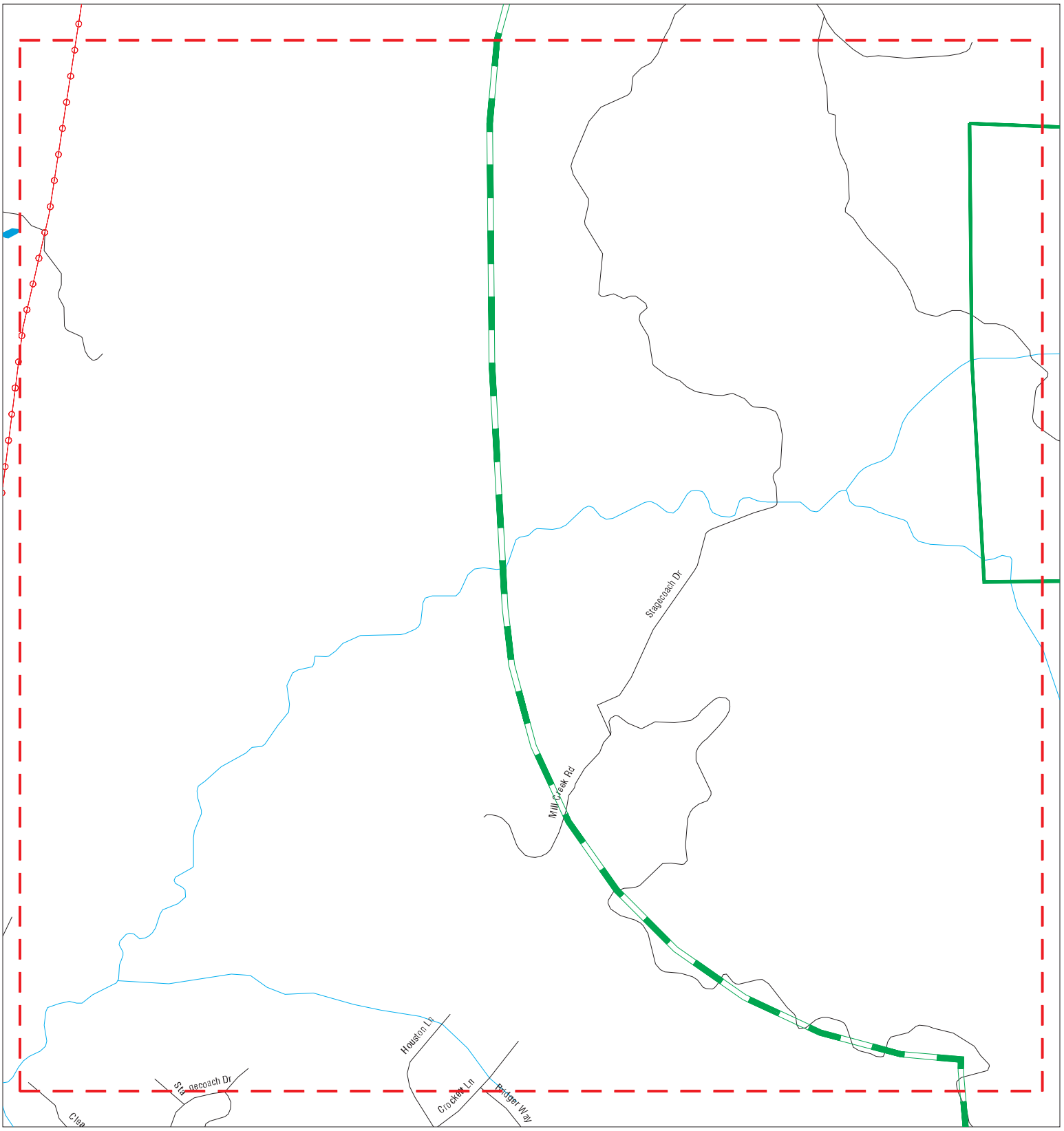
MAPPED SITES SUMMARY - FOCUS MAP 23

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 24 - 5564109.2s



- Sites
- Target Property
- Search Buffer
- Focus Map - No Sites
- Focus Map - Sites
- Power Line
- National Priority List Sites
- Areas of Concern
- Dept. Defense Sites
- Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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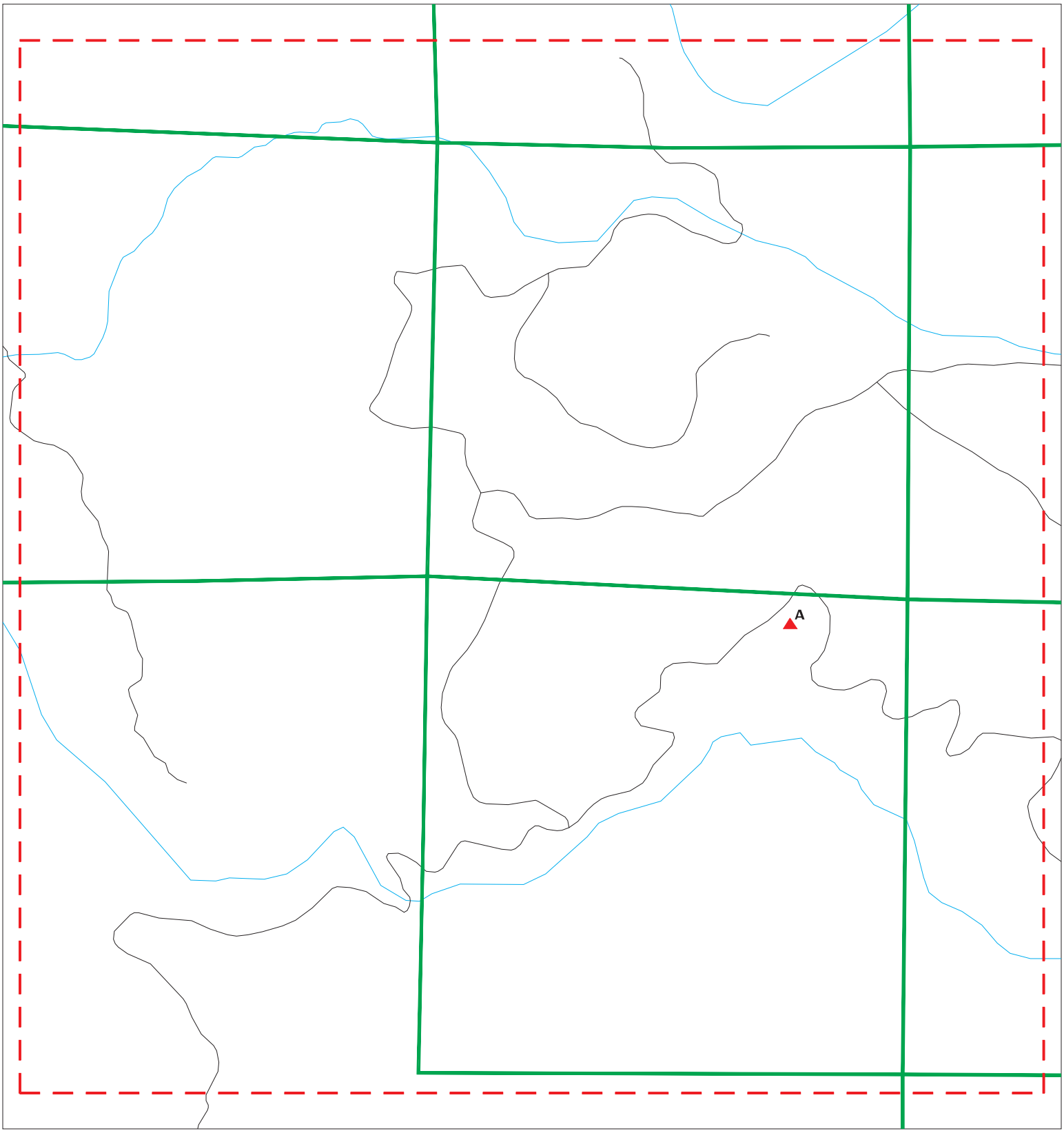
MAPPED SITES SUMMARY - FOCUS MAP 24

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 25 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project ADDRESS: Shasta County CITY/STATE: Montgomery Creek CA ZIP: 96065	CLIENT: Stantec CONTACT: Steve Little INQUIRY #: 5564109.2s DATE: 02/15/19

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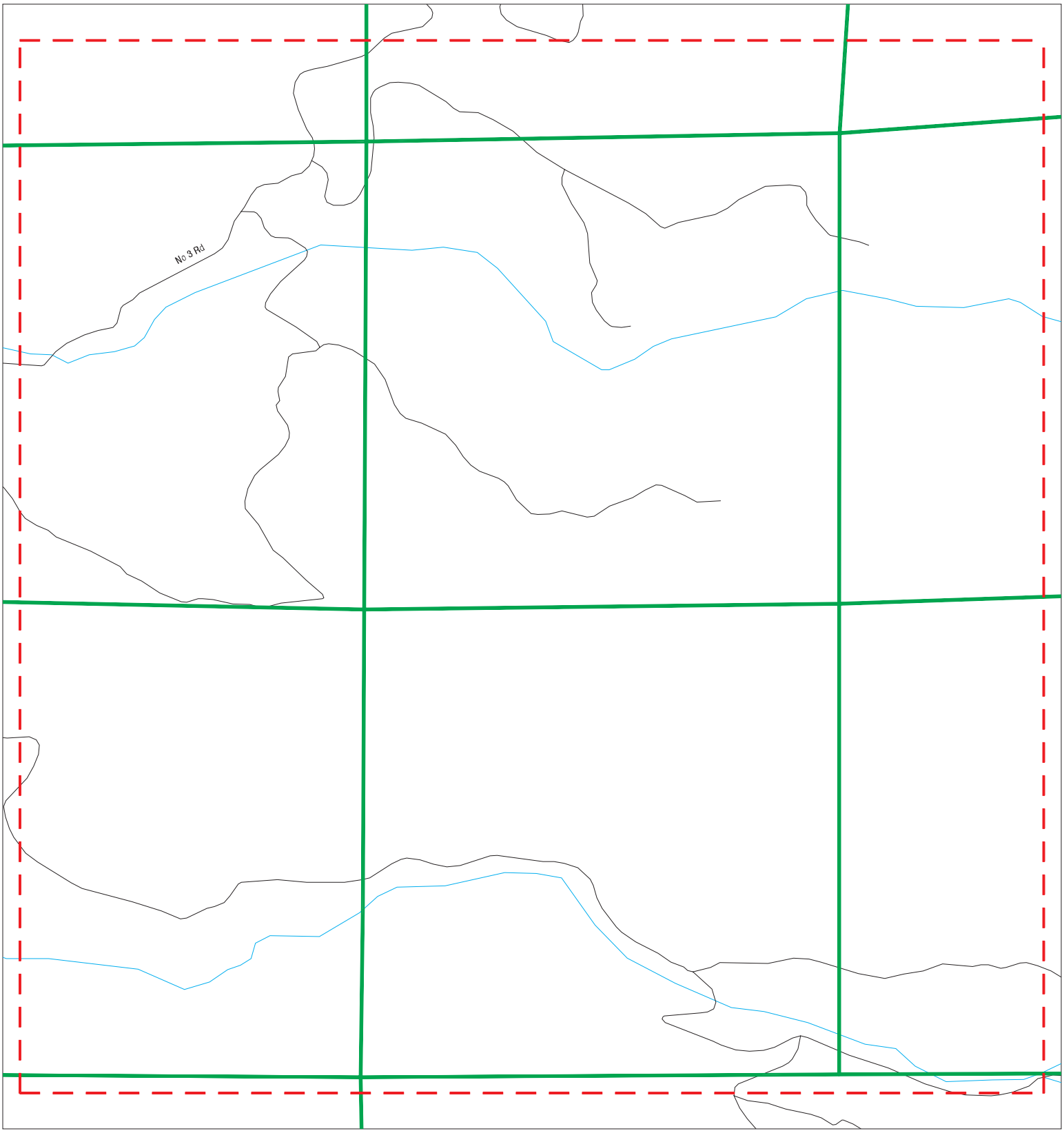
MAPPED SITES SUMMARY - FOCUS MAP 25

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION
A2 / 25	THP 2-16-077-SHA CED		CIWQS	TP
A3 / 25	THP 2-16-077-SHA CED		CERS	TP

Focus Map - 26 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME:	Fountain Wind Project	CLIENT:	Stantec
ADDRESS:	Shasta County	CONTACT:	Steve Little
CITY/STATE:	Montgomery Creek CA	INQUIRY #:	5564109.2s
ZIP:	96065	DATE:	02/15/19

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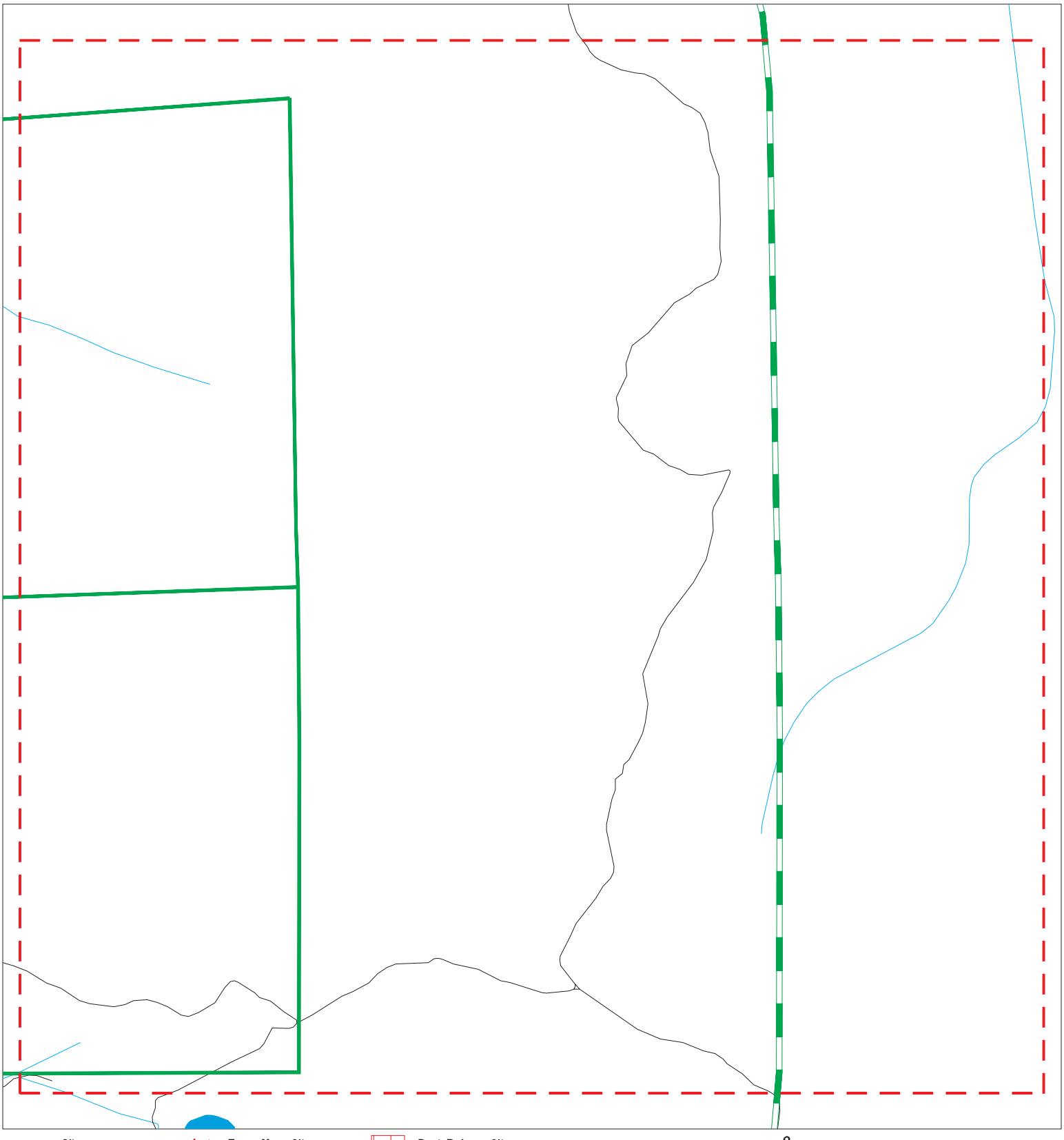
MAPPED SITES SUMMARY - FOCUS MAP 26

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 27 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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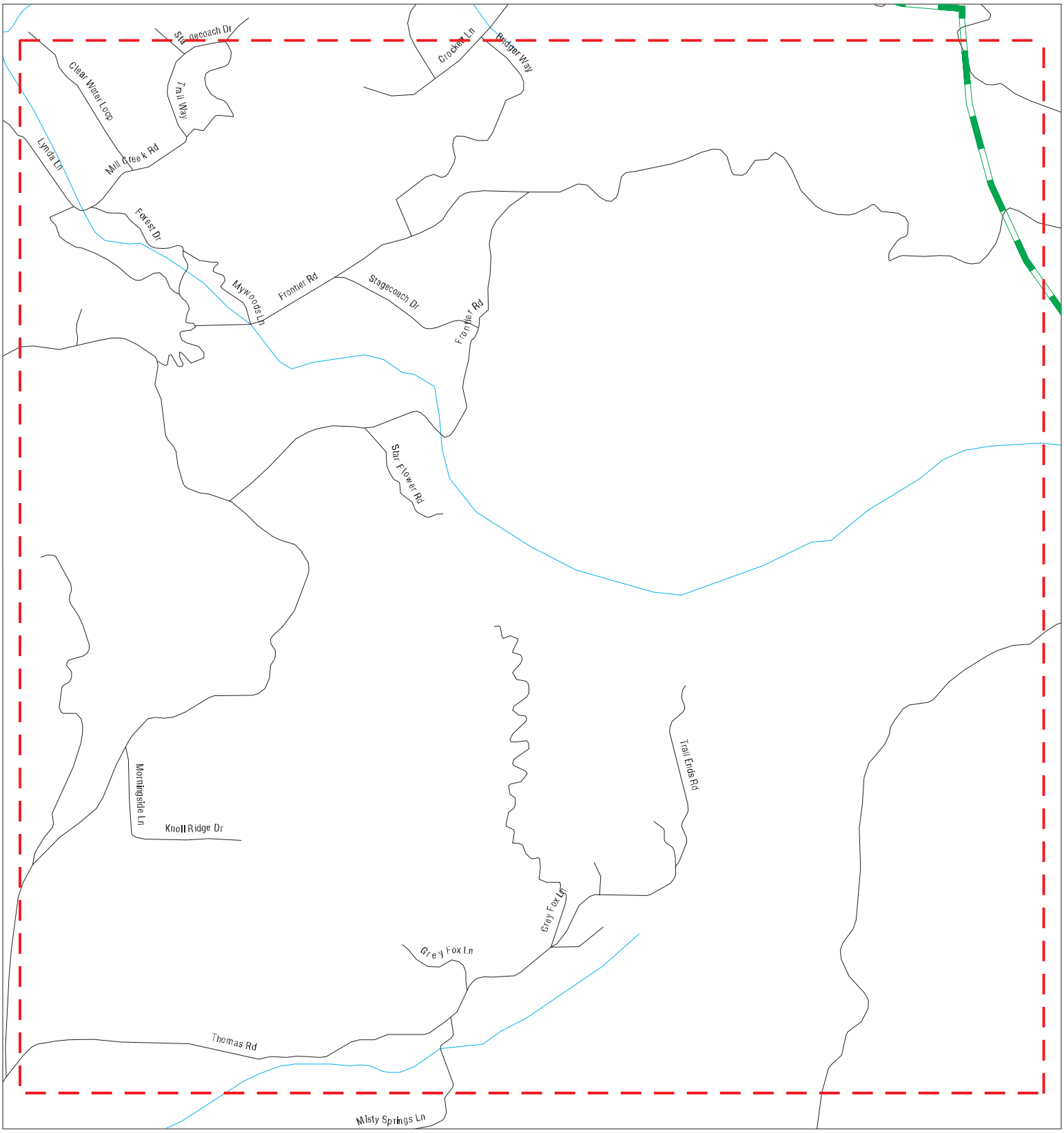
MAPPED SITES SUMMARY - FOCUS MAP 27

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 28 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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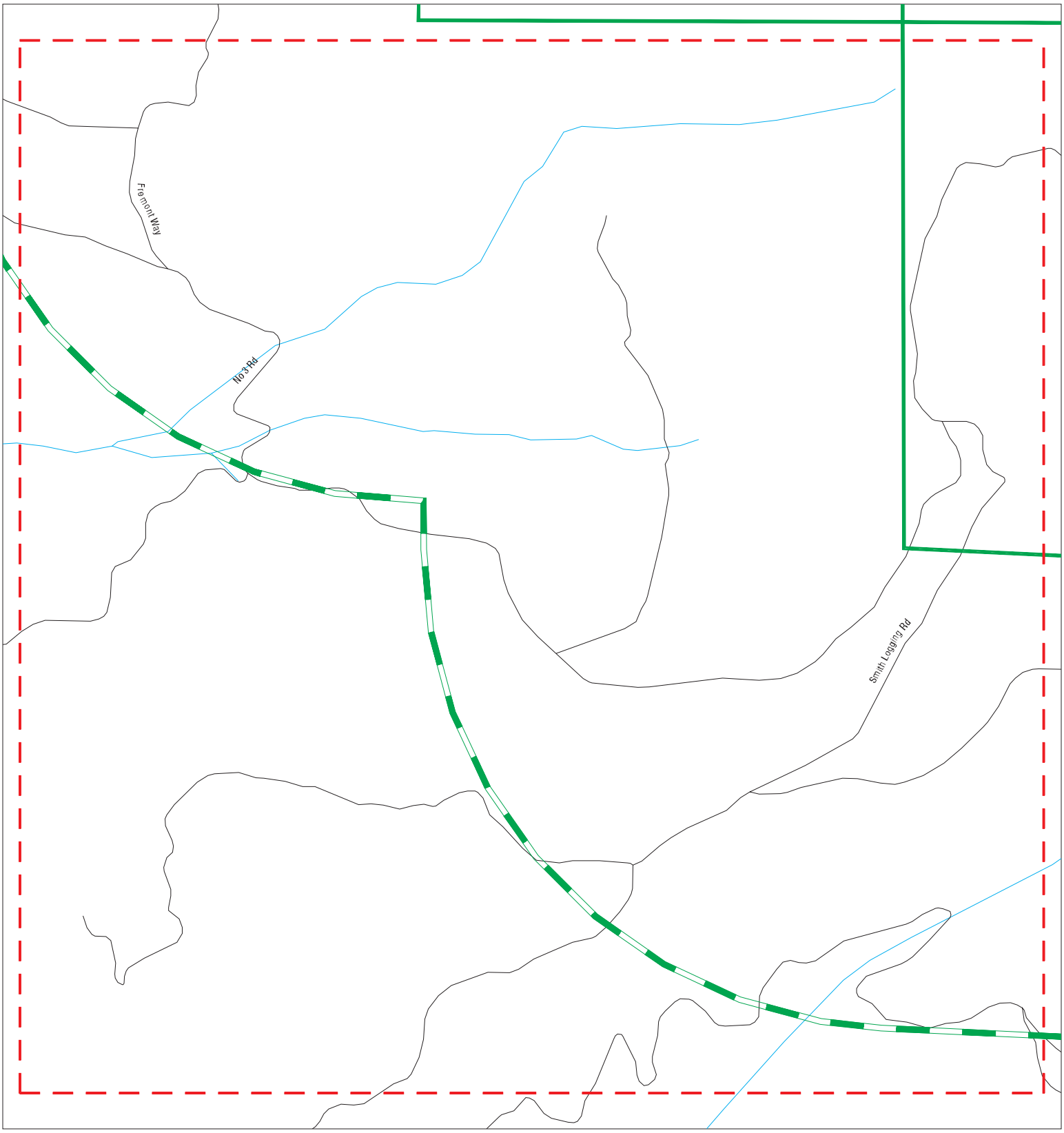
MAPPED SITES SUMMARY - FOCUS MAP 28

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 29 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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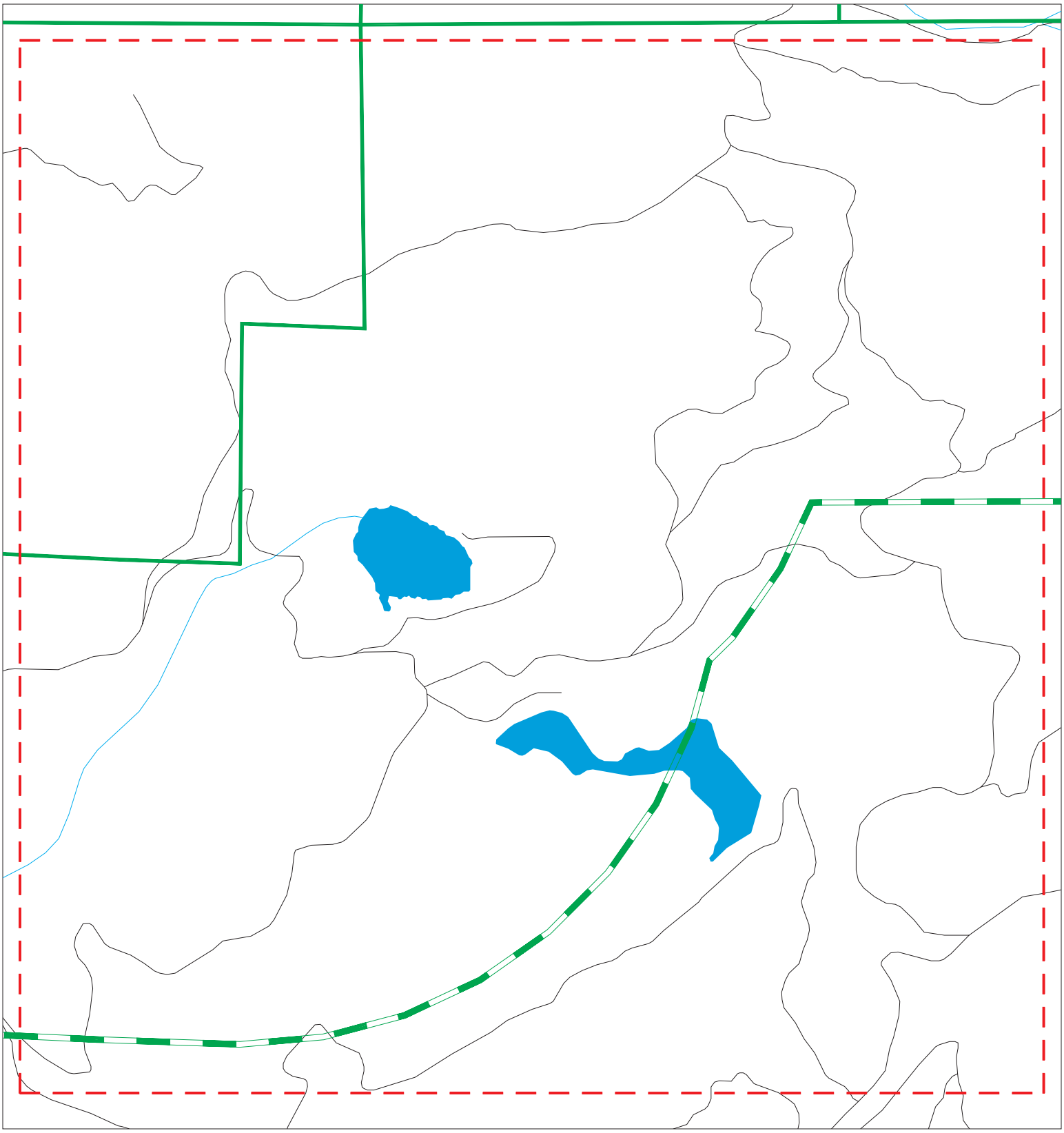
MAPPED SITES SUMMARY - FOCUS MAP 29

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 30 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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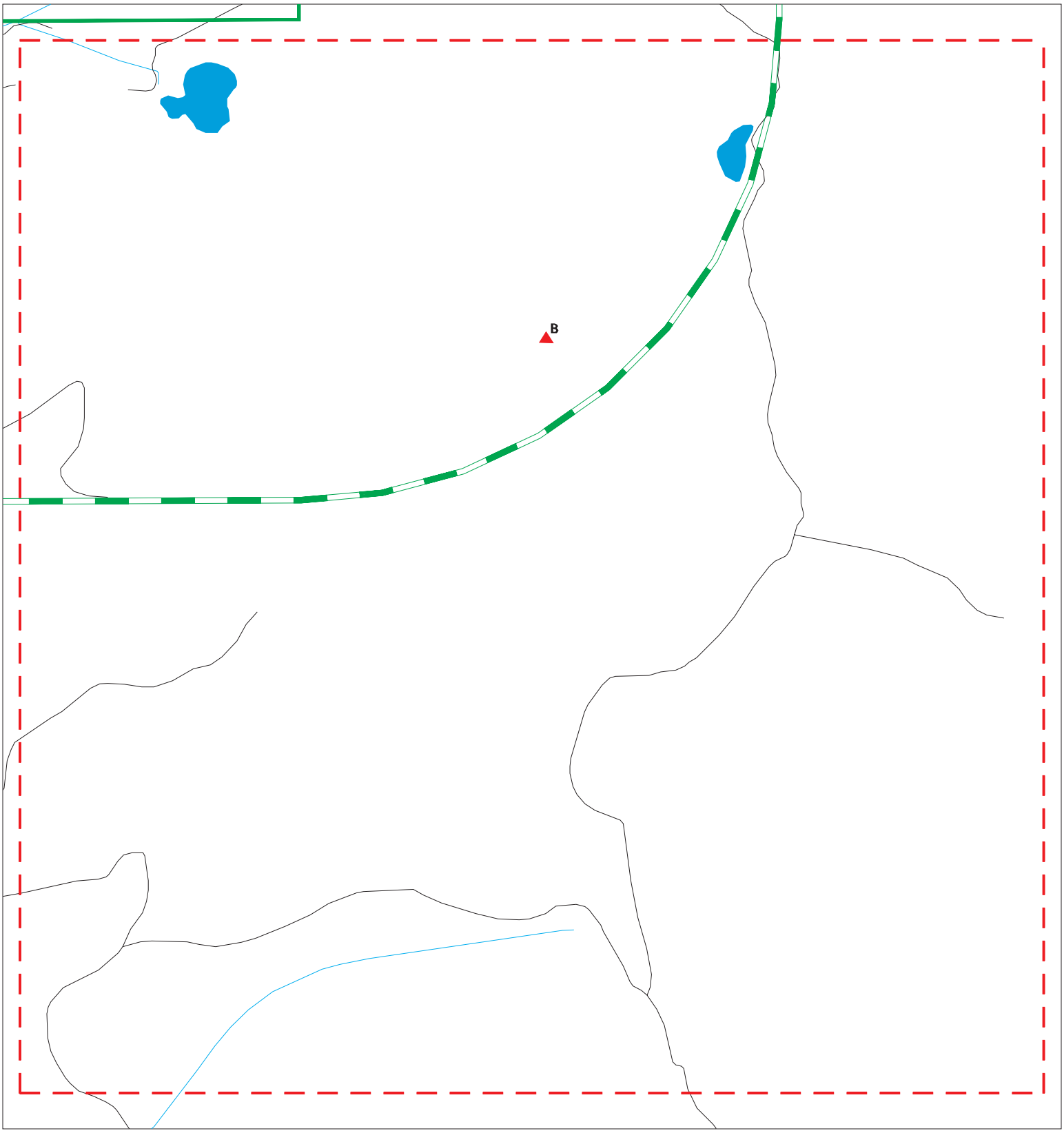
MAPPED SITES SUMMARY - FOCUS MAP 30

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION

NO MAPPED SITES FOUND

Focus Map - 31 - 5564109.2s



Sites
Target Property
Search Buffer
Focus Map - No Sites
Focus Map - Sites
Power Line
National Priority List Sites
Areas of Concern
Dept. Defense Sites
Indian Reservations BIA

0 1/4 1/2 Miles

SITE NAME: Fountain Wind Project	CLIENT: Stantec
ADDRESS: Shasta County	CONTACT: Steve Little
CITY/STATE: Montgomery Creek CA	INQUIRY #: 5564109.2s
ZIP: 96065	DATE: 02/15/19

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MAPPED SITES SUMMARY - FOCUS MAP 31

Target Property:
SHASTA COUNTY
MONTGOMERY CREEK, CA 96065

MAP ID / FOCUS MAP	SITE NAME	ADDRESS	DATABASE ACRONYMS	DIST (ft. & mi.) DIRECTION
B4 / 31	WHITMORE GAP FILLER	LOCATED IN SHAST COU	ENVIROSTOR	4425 0.838 SE
B5 / 31	WHITMORE GAP FILLER		FUDS	4516 0.855 SE

1 **THP 2-16-063-SHA GOOSE** **CIWQS** **S121682117**
Target Property **ROUND MOUNTAIN, CA 96084** **N/A**

Actual: 4375 ft.
Focus Map: 20

CIWQS:

Agency:	Sierra Pacific Industries Burney
Agency Address:	Po Box 2677, Burney, CA 96013
Place/Project Type:	Timber Harvest Area
SIC/NAICS:	Not reported
Region:	5R
Program:	TH
Regulatory Measure Status:	Active
Regulatory Measure Type:	Enrollee - WDR
Order Number:	R5-2017-0061
WDID:	Not reported
NPDES Number:	Not reported
Adoption Date:	Not reported
Effective Date:	02/14/2018
Termination Date:	Not reported
Expiration/Review Date:	06/08/2032
Design Flow:	Not reported
Major/Minor:	Not reported
Complexity:	Not reported
TTWQ:	Not reported
Enforcement Actions within 5 years:	0
Violations within 5 years:	0
Latitude:	40.78937
Longitude:	-121.8655

A2 **THP 2-16-077-SHA CEDAR BOOTS** **CIWQS** **S121682123**
Target Property **OAK RUN, CA 96069** **N/A**

Site 1 of 2 in cluster A

Actual: 3980 ft.
Focus Map: 25

CIWQS:

Agency:	Oxbow Timber I LLC
Agency Address:	98 Mill Street, Weed, CA 96094
Place/Project Type:	Timber Harvest Area
SIC/NAICS:	Not reported
Region:	5R
Program:	TH
Regulatory Measure Status:	Active
Regulatory Measure Type:	Enrollee - WDR
Order Number:	R5-2017-0061
WDID:	Not reported
NPDES Number:	Not reported
Adoption Date:	Not reported
Effective Date:	10/24/2017
Termination Date:	Not reported
Expiration/Review Date:	06/08/2032
Design Flow:	Not reported
Major/Minor:	Not reported
Complexity:	Not reported
TTWQ:	Not reported
Enforcement Actions within 5 years:	0
Violations within 5 years:	0
Latitude:	40.76545
Longitude:	-121.86207

A3 **THP 2-16-077-SHA CEDAR BOOTS** **CERS** **S121783789**
Target **N/A**
Property **OAK RUN, CA 96069**

Site 2 of 2 in cluster A

Actual: **3980 ft.**
Focus Map: **25**

CERS TANKS:

Site ID:	431832
CERS ID:	835561
CERS Description:	Forestry & Silviculture

Evaluation:

Eval General Type:	Initial Site Inspection
Eval Date:	06-06-2017
Violations Found:	No
Eval Type:	Pre-harvest Inspection
Eval Notes:	Not reported
Eval Division:	Water Boards
Eval Program:	TH
Eval Source:	CIWQS

Affiliation:

Affiliation Type Desc:	Owner and Operator
Entity Name:	Oxbow Timber I LLC
Entity Title:	Not reported
Affiliation Address:	Not reported
Affiliation City:	Not reported
Affiliation State:	Not reported
Affiliation Country:	Not reported
Affiliation Zip:	Not reported
Affiliation Phone:	Not reported

B4 **WHITMORE GAP FILLER ANNEX** **ENVIROSTOR** **S107737613**
SE **LOCATED IN SHAST COUNTY** **N/A**
1/2-1 **WHITMORE, CA 96096**
0.838 mi.
4425 ft. **Site 1 of 2 in cluster B**

Actual: **6744 ft.**
Focus Map: **31**

ENVIROSTOR:

Facility ID:	71000058
Status:	No Further Action
Status Date:	01/31/2014
Site Code:	100573
Site Type:	Military Evaluation
Site Type Detailed:	FUDS
Acres:	6.2
NPL:	NO
Regulatory Agencies:	SMBRP, RWQCB 5S - Central Valley
Lead Agency:	RWQCB 5S - Central Valley
Program Manager:	Not reported
Supervisor:	Carrie Tatoian-Cain
Division Branch:	Cleanup Sacramento
Assembly:	01
Senate:	01
Special Program:	Not reported
Restricted Use:	NO
Site Mgmt Req:	NONE SPECIFIED
Funding:	DERA
Latitude:	40.7423

WHITMORE GAP FILLER ANNEX (Continued) **S107737613**

Longitude: -121.7904
APN: NONE SPECIFIED
Past Use: NONE SPECIFIED
Potential COC: NONE SPECIFIED
Confirmed COC: NONE SPECIFIED
Potential Description: NONE SPECIFIED
Alias Name: CLOVER MOUNTAIN GAP FILLER ANNEX (SN-157B)
Alias Type: Alternate Name
Alias Name: WHITMORE GFA SN157B
Alias Type: Alternate Name
Alias Name: CA99799F524200
Alias Type: Federal Facility ID
Alias Name: J09CA0024
Alias Type: INPR
Alias Name: 100573
Alias Type: Project Code (Site Code)
Alias Name: 71000058
Alias Type: Envirostor ID Number

Completed Info:
Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Inventory Project Report (INPR)
Completed Date: 09/26/1994
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: No Department of Defense Action Indicated (NDAI)
Completed Date: 06/22/2011
Comments: DTSC staff do not concur with the recommendations put forward in the NDAI document. The NDAI did not contain sufficient documentation to prove no further defense action was indicated. A site investigation may be warranted at this site.

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: No Department of Defense Action Indicated (NDAI)
Completed Date: 01/31/2014
Comments: DTSC and the RWQCB reviewed the revised NDAI and determined no DoD action was needed. Please note that this determination is based on information in DTSC s and the Water Boards possession at this time concerning Department of Defense (DoD) activities on the sites listed above. DTSC and the Water Boards reserve the right to address any appropriate environmental or human health related issue, should additional information concerning the environmental condition of this site become available in the future.

Future Area Name: Not reported
Future Sub Area Name: Not reported
Future Document Type: Not reported
Future Due Date: Not reported
Schedule Area Name: Not reported
Schedule Sub Area Name: Not reported
Schedule Document Type: Not reported
Schedule Due Date: Not reported
Schedule Revised Date: Not reported

B5 **WHITMORE GAP FILLER ANNEX** **FUDS** **1007211603**
SE **N/A**
1/2-1 **OTHER, CA**
0.855 mi.
4516 ft. **Site 2 of 2 in cluster B**

Actual:
6777 ft.

Focus Map:
31

FUDS:

EPA Region:	09
Congressional District:	01
FUDS Number:	J09CA0024
State:	CA
Facility Name:	WHITMORE GAP FILLER ANNEX
Fiscal Year:	2013
City:	OTHER
Federal Facility ID:	CA9799F5242
Telephone:	916-557-7461
INST ID:	57766
County:	SHASTA
RAB:	Not reported
CORPS_DIST:	Sacramento District (SPK)
NPL Status:	Not Listed
CTC:	588.70000000000005
Current Owner:	Other Federal Government
Future Prog:	Not reported
Description:	The 75.89-acre site is located in Shasta County, 33 miles northeast of Redding, California. It is situated on top of Clover Mountain in the Lassen National Forest. The only evidence of the former radar site is a concrete pad that was once part of the concrete radar control building and concrete and metal building debris. Numerous pipes and conduit protruding from the concrete pad indicate the possible existence of underground storage tanks (USTs). The site is currently owned by the Department of Interior, Bureau of Land Management.
Current Program:	Not reported
History:	On 05 January 1959, the U.S. Government acquired 49.29 easement acres and 18.15 license acres. An additional 8.45 acres were transferred to the Government by public domain. The total acreage acquired was 75.89.The site was used by the Air Defense Command Installation as a gap filler radar site. The improvements were one concrete block building, two 15,000-gallon underground storage tanks and a gravel road.On15 April 1961, 49.29 easement acres, 18.15 license acres, and 6.19 public domain acres were transferred to the Department of Agriculture, U.S. Forest Service. On 01 July 1961, 2.26 public domain acres were transferred to Department of Interior, Bureau of Land Management.
Latitude Degree:	40
Latitude Minute:	45
Latitude Second:	32
Latitude Direction:	N
Longitude Degree:	-121
Longitude Minute:	47
Longitude Second:	24
Longitude Direction:	E

Count: 22 records

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
BURNEY	97417040		SHASTA NATIONAL FOREST		ERNS
BURNEY	S101482461	LOUISIANA-PACIFIC CORP - BURNEY	HIGHWAY 89, 9 MILES NORTHEAST OF BURNEY	96013	ENVIROSTOR
BURNEY	S102436784	SHASTA CO SHERIFF BURNEY	SHASTA ST	96013	LUST, HIST CORTESE
BURNEY	S123100576	CALTRANS-BURNEY	37334 STATE HIGHWAY 299 E	96013	CERS HAZ WASTE, CERS TANKS, C
BURNEY	S123101027	KWIK MART	37047 STATE HIGHWAY 299 E	96013	CERS HAZ WASTE, CERS TANKS, C
BURNEY	S123099745	ED STAUB & SONS PETROLEUM, INC. (BURNEY CARDLOCK)	37289 STATE HIGHWAY 299 E	96013	CERS HAZ WASTE, CERS TANKS, C
BURNEY	S123103489	LES SCHWAB TIRE CENTER #610	37462 STATE HIGHWAY 299 E	96013	CERS HAZ WASTE
BURNEY	S123103443	DOLLAR GENERAL # 15943	37288 STATE HIGHWAY 299 E	96013	CERS HAZ WASTE
BURNEY	S110977745		PIT #3 POWERHOUSE, SOUTHEAST OF BURNEY, SHASTA COUNTY	96013	CHMIRS
BURNEY	1023381477	WESTERN AREA POWER ADMINISTRATIONNA BEAR SPRING MW FACILITY	BUNCH GRASS LOOKOUT ROADNA LAT: 40-54-22NNA LONG:	96013	FINDS
BURNEY	1016430127	FRONTIER CITIZENS TELECOM COMPANY BURNEY SERVICE CNTR	2601 SHASTA ST	96013	FINDS
BURNEY	1023355800	PG&E HATCHET MOUNTAIN REPEATER STATION	BUNCH GRASS LOOKOUT ROADNA 2 MILES NORTH OF HIGHWA	96065	FINDS
BURNEY	S113186563	ZITOMEDIA LLC ANTENNA SITE	BUNCH GRASS LOOKOUT RD		CUPA Listings
BURNEY	S117226717	WESTERN AREA POWER ADMIN - BEAR SPRING MW FACILITY	BUNCH GRASS LOOKOUT RD		CUPA Listings
BURNEY	S110744607	PG&E BURNEY SUBSTATION	SHASTA ST		CUPA Listings
MONTGOMERY CREEK	S113745989	PG&E CLOUD SEEDER SITE M5	BUFFUM RD		CUPA Listings
MONTGOMERY CREEK	S117706533	OAK RUN LUMBER CO	BOOTLEG LANE	96065	NPDES, CIWQS
SHASTA COUNTY	S106391571		1/4 MILE SOUTH OF CAMPBELL CREEK IN THE SACRAMENTO RIVER CANYON NO. OF SHASTA LAKE. SO OF DOG CREEK. DFG ON SCENE		CHMIRS
SHASTA COUNTY	S105637529		HWY 299 E AT SHASTA MILE POST #89.50		CHMIRS
SHASTA COUNTY	1023372102	SHASTA COUNTY CULVERT REPLACEMENT PROJEC 2009	THROUGHOUT SHASTA COUNTY		FINDS
SHASTA COUNTY	S121686595	TURNTABLE BAY MARINA DEVELOPMENT PROJECT	SOUTHERN END OF THE MCCLOUD RIVER ARM OF SHASTA LAKE		CIWQS
SHASTA COUNTY	S123168998	SHASTA COUNTY CULVERT REPLACEMENT PROJEC 2009	THROUGHOUT SHASTA COUNTY		CIWQS

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 12/12/2018
Date Data Arrived at EDR: 12/28/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 14

Source: EPA
Telephone: N/A
Last EDR Contact: 12/28/2018
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 5
Telephone 312-886-6686

EPA Region 6
Telephone: 214-655-6659

EPA Region 7
Telephone: 913-551-7247

EPA Region 8
Telephone: 303-312-6774

EPA Region 9
Telephone: 415-947-4246

EPA Region 10
Telephone 206-553-8665

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 12/12/2018
Date Data Arrived at EDR: 12/28/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 14

Source: EPA
Telephone: N/A
Last EDR Contact: 12/28/2018
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Delisted NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 12/12/2018
Date Data Arrived at EDR: 12/28/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 14

Source: EPA
Telephone: N/A
Last EDR Contact: 12/28/2018
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Quarterly

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 11/07/2016
Date Data Arrived at EDR: 01/05/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 92

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 01/04/2019
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Varies

SEMS: Superfund Enterprise Management System

SEMS (Superfund Enterprise Management System) tracks hazardous waste sites, potentially hazardous waste sites, and remedial activities performed in support of EPA's Superfund Program across the United States. The list was formerly know as CERCLIS, renamed to SEMS by the EPA in 2015. The list contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This dataset also contains sites which are either proposed to or on the National Priorities List (NPL) and the sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 12/12/2018
Date Data Arrived at EDR: 12/28/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 14

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 12/28/2018
Next Scheduled EDR Contact: 04/29/2019
Data Release Frequency: Quarterly

SEMS-ARCHIVE: Superfund Enterprise Management System Archive

SEMS-ARCHIVE (Superfund Enterprise Management System Archive) tracks sites that have no further interest under the Federal Superfund Program based on available information. The list was formerly known as the CERCLIS-NFRAP, renamed to SEMS ARCHIVE by the EPA in 2015. EPA may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available. Archived sites have been removed and archived from the inventory of SEMS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list the site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. The decision does not necessarily mean that there is no hazard associated with a given site; it only means that. based upon available information, the location is not judged to be potential NPL site.

Date of Government Version: 12/13/2018
Date Data Arrived at EDR: 12/28/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 14

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 12/28/2018
Next Scheduled EDR Contact: 04/29/2019
Data Release Frequency: Quarterly

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 03/01/2018
Date Data Arrived at EDR: 03/28/2018
Date Made Active in Reports: 06/22/2018
Number of Days to Update: 86

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 12/03/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 03/01/2018
Date Data Arrived at EDR: 03/28/2018
Date Made Active in Reports: 06/22/2018
Number of Days to Update: 86

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 12/03/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/01/2018
Date Data Arrived at EDR: 03/28/2018
Date Made Active in Reports: 06/22/2018
Number of Days to Update: 86

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 12/03/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 03/01/2018
Date Data Arrived at EDR: 03/28/2018
Date Made Active in Reports: 06/22/2018
Number of Days to Update: 86

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 12/03/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/01/2018
Date Data Arrived at EDR: 03/28/2018
Date Made Active in Reports: 06/22/2018
Number of Days to Update: 86

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 12/03/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 10/17/2018
Date Data Arrived at EDR: 10/25/2018
Date Made Active in Reports: 12/07/2018
Number of Days to Update: 43

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 02/07/2019
Next Scheduled EDR Contact: 05/27/2019
Data Release Frequency: Varies

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 07/31/2018
Date Data Arrived at EDR: 08/28/2018
Date Made Active in Reports: 09/14/2018
Number of Days to Update: 17

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 02/04/2019
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 07/31/2018
Date Data Arrived at EDR: 08/28/2018
Date Made Active in Reports: 09/14/2018
Number of Days to Update: 17

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 02/04/2019
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Varies

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 09/24/2018
Date Data Arrived at EDR: 09/25/2018
Date Made Active in Reports: 11/09/2018
Number of Days to Update: 45

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 02/08/2019
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

STANDARD ENVIRONMENTAL RECORDS

State- and tribal - equivalent NPL

CA RESPONSE: State Response Sites

Identifies confirmed release sites where DTSC is involved in remediation, either in a lead or oversight capacity. These confirmed release sites are generally high-priority and high potential risk.

Date of Government Version: 10/29/2018
Date Data Arrived at EDR: 10/30/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 44

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 01/29/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Quarterly

State- and tribal - equivalent CERCLIS

CA ENVIROSTOR: EnviroStor Database

The Department of Toxic Substances Control's (DTSC's) Site Mitigation and Brownfields Reuse Program's (SMBRP's) EnviroStor database identifes sites that have known contamination or sites for which there may be reasons to investigate further. The database includes the following site types: Federal Superfund sites (National Priorities List (NPL)); State Response, including Military Facilities and State Superfund; Voluntary Cleanup; and School sites. EnviroStor provides similar information to the information that was available in CalSites, and provides additional site information, including, but not limited to, identification of formerly-contaminated properties that have been released for reuse, properties where environmental deed restrictions have been recorded to prevent inappropriate land uses, and risk characterization information that is used to assess potential impacts to public health and the environment at contaminated sites.

Date of Government Version: 10/29/2018
Date Data Arrived at EDR: 10/30/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 44

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 01/29/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Quarterly

State and tribal landfill and/or solid waste disposal site lists

CA SWF/LF (SWIS): Solid Waste Information System
Active, Closed and Inactive Landfills. SWF/LF records typically contain an inve ntory of solid waste disposal facilities or landfills. These may be active or i nactive facilities or open dumps that failed to meet RCRA Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 11/12/2018
Date Data Arrived at EDR: 11/14/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 29

Source: Department of Resources Recycling and Recovery
Telephone: 916-341-6320
Last EDR Contact: 02/12/2019
Next Scheduled EDR Contact: 05/27/2019
Data Release Frequency: Quarterly

State and tribal leaking storage tank lists

CA LUST REG 9: Leaking Underground Storage Tank Report
Orange, Riverside, San Diego counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 03/01/2001
Date Data Arrived at EDR: 04/23/2001
Date Made Active in Reports: 05/21/2001
Number of Days to Update: 28

Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-637-5595
Last EDR Contact: 09/26/2011
Next Scheduled EDR Contact: 01/09/2012
Data Release Frequency: No Update Planned

CA LUST REG 7: Leaking Underground Storage Tank Case Listing
Leaking Underground Storage Tank locations. Imperial, Riverside, San Diego, Santa Barbara counties.

Date of Government Version: 02/26/2004
Date Data Arrived at EDR: 02/26/2004
Date Made Active in Reports: 03/24/2004
Number of Days to Update: 27

Source: California Regional Water Quality Control Board Colorado River Basin Region (7)
Telephone: 760-776-8943
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

CA LUST REG 6V: Leaking Underground Storage Tank Case Listing
Leaking Underground Storage Tank locations. Inyo, Kern, Los Angeles, Mono, San Bernardino counties.

Date of Government Version: 06/07/2005
Date Data Arrived at EDR: 06/07/2005
Date Made Active in Reports: 06/29/2005
Number of Days to Update: 22

Source: California Regional Water Quality Control Board Victorville Branch Office (6)
Telephone: 760-241-7365
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: No Update Planned

CA LUST REG 5: Leaking Underground Storage Tank Database
Leaking Underground Storage Tank locations. Alameda, Alpine, Amador, Butte, Colusa, Contra Costa, Calveras, El Dorado, Fresno, Glenn, Kern, Kings, Lake, Lassen, Madera, Mariposa, Merced, Modoc, Napa, Nevada, Placer, Plumas, Sacramento, San Joaquin, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Yolo, Yuba counties.

Date of Government Version: 07/01/2008
Date Data Arrived at EDR: 07/22/2008
Date Made Active in Reports: 07/31/2008
Number of Days to Update: 9

Source: California Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-464-4834
Last EDR Contact: 07/01/2011
Next Scheduled EDR Contact: 10/17/2011
Data Release Frequency: No Update Planned

CA LUST: Leaking Underground Fuel Tank Report (GEOTRACKER)

Leaking Underground Storage Tank (LUST) Sites included in GeoTracker. GeoTracker is the Water Boards data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater.

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: see region list
Last EDR Contact: 12/11/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Quarterly

CA LUST REG 1: Active Toxic Site Investigation

Del Norte, Humboldt, Lake, Mendocino, Modoc, Siskiyou, Sonoma, Trinity counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/01/2001
Date Data Arrived at EDR: 02/28/2001
Date Made Active in Reports: 03/29/2001
Number of Days to Update: 29

Source: California Regional Water Quality Control Board North Coast (1)
Telephone: 707-570-3769
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

CA LUST REG 2: Fuel Leak List

Leaking Underground Storage Tank locations. Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma counties.

Date of Government Version: 09/30/2004
Date Data Arrived at EDR: 10/20/2004
Date Made Active in Reports: 11/19/2004
Number of Days to Update: 30

Source: California Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-622-2433
Last EDR Contact: 09/19/2011
Next Scheduled EDR Contact: 01/02/2012
Data Release Frequency: Quarterly

CA LUST REG 3: Leaking Underground Storage Tank Database

Leaking Underground Storage Tank locations. Monterey, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz counties.

Date of Government Version: 05/19/2003
Date Data Arrived at EDR: 05/19/2003
Date Made Active in Reports: 06/02/2003
Number of Days to Update: 14

Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-542-4786
Last EDR Contact: 07/18/2011
Next Scheduled EDR Contact: 10/31/2011
Data Release Frequency: No Update Planned

CA LUST REG 4: Underground Storage Tank Leak List

Los Angeles, Ventura counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/07/2004
Date Data Arrived at EDR: 09/07/2004
Date Made Active in Reports: 10/12/2004
Number of Days to Update: 35

Source: California Regional Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6710
Last EDR Contact: 09/06/2011
Next Scheduled EDR Contact: 12/19/2011
Data Release Frequency: No Update Planned

CA LUST REG 8: Leaking Underground Storage Tanks

California Regional Water Quality Control Board Santa Ana Region (8). For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/14/2005
Date Data Arrived at EDR: 02/15/2005
Date Made Active in Reports: 03/28/2005
Number of Days to Update: 41

Source: California Regional Water Quality Control Board Santa Ana Region (8)
Telephone: 909-782-4496
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: Varies

CA LUST REG 6L: Leaking Underground Storage Tank Case Listing
For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/09/2003
Date Data Arrived at EDR: 09/10/2003
Date Made Active in Reports: 10/07/2003
Number of Days to Update: 27

Source: California Regional Water Quality Control Board Lahontan Region (6)
Telephone: 530-542-5572
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: No Update Planned

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/13/2018
Date Data Arrived at EDR: 05/18/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 63

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/13/2018
Date Data Arrived at EDR: 05/18/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 63

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/13/2018
Date Data Arrived at EDR: 05/18/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 63

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/13/2018
Date Data Arrived at EDR: 05/18/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 63

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/13/2018
Date Data Arrived at EDR: 05/18/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 63

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/13/2018
Date Data Arrived at EDR: 05/18/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 63

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/13/2018
Date Data Arrived at EDR: 05/18/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 63

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 04/13/2018
Date Data Arrived at EDR: 05/18/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 63

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

CA CPS-SLIC: Statewide SLIC Cases (GEOTRACKER)
Cleanup Program Sites (CPS; also known as Site Cleanups [SC] and formerly known as Spills, Leaks, Investigations, and Cleanups [SLIC] sites) included in GeoTracker. GeoTracker is the Water Boards data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater.

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA SLIC REG 1: Active Toxic Site Investigations
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/03/2003
Date Data Arrived at EDR: 04/07/2003
Date Made Active in Reports: 04/25/2003
Number of Days to Update: 18

Source: California Regional Water Quality Control Board, North Coast Region (1)
Telephone: 707-576-2220
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

CA SLIC REG 2: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/30/2004
Date Data Arrived at EDR: 10/20/2004
Date Made Active in Reports: 11/19/2004
Number of Days to Update: 30

Source: Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-286-0457
Last EDR Contact: 09/19/2011
Next Scheduled EDR Contact: 01/02/2012
Data Release Frequency: Quarterly

CA SLIC REG 3: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 05/18/2006
Date Data Arrived at EDR: 05/18/2006
Date Made Active in Reports: 06/15/2006
Number of Days to Update: 28

Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-549-3147
Last EDR Contact: 07/18/2011
Next Scheduled EDR Contact: 10/31/2011
Data Release Frequency: Semi-Annually

CA SLIC REG 4: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 11/17/2004
Date Data Arrived at EDR: 11/18/2004
Date Made Active in Reports: 01/04/2005
Number of Days to Update: 47

Source: Region Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6600
Last EDR Contact: 07/01/2011
Next Scheduled EDR Contact: 10/17/2011
Data Release Frequency: Varies

CA SLIC REG 5: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/01/2005
Date Data Arrived at EDR: 04/05/2005
Date Made Active in Reports: 04/21/2005
Number of Days to Update: 16

Source: Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-464-3291
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: Semi-Annually

CA SLIC REG 6V: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 05/24/2005
Date Data Arrived at EDR: 05/25/2005
Date Made Active in Reports: 06/16/2005
Number of Days to Update: 22

Source: Regional Water Quality Control Board, Victorville Branch
Telephone: 619-241-6583
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: Semi-Annually

CA SLIC REG 6L: SLIC Sites
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/07/2004
Date Data Arrived at EDR: 09/07/2004
Date Made Active in Reports: 10/12/2004
Number of Days to Update: 35

Source: California Regional Water Quality Control Board, Lahontan Region
Telephone: 530-542-5574
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

CA SLIC REG 7: SLIC List
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 11/24/2004
Date Data Arrived at EDR: 11/29/2004
Date Made Active in Reports: 01/04/2005
Number of Days to Update: 36

Source: California Regional Quality Control Board, Colorado River Basin Region
Telephone: 760-346-7491
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

CA SLIC REG 8: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/03/2008
Date Data Arrived at EDR: 04/03/2008
Date Made Active in Reports: 04/14/2008
Number of Days to Update: 11

Source: California Region Water Quality Control Board Santa Ana Region (8)
Telephone: 951-782-3298
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: Semi-Annually

CA SLIC REG 9: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/10/2007
Date Data Arrived at EDR: 09/11/2007
Date Made Active in Reports: 09/28/2007
Number of Days to Update: 17

Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-467-2980
Last EDR Contact: 08/08/2011
Next Scheduled EDR Contact: 11/21/2011
Data Release Frequency: Annually

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 05/15/2017
Date Data Arrived at EDR: 05/30/2017
Date Made Active in Reports: 10/13/2017
Number of Days to Update: 136

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 01/08/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Varies

State and tribal registered storage tank lists

CA MILITARY UST SITES: Military UST Sites (GEOTRACKER)
Military ust sites

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA UST CLOSURE: Proposed Closure of Underground Storage Tank (UST) Cases
UST cases that are being considered for closure by either the State Water Resources Control Board or the Executive Director have been posted for a 60-day public comment period. UST Case Closures being proposed for consideration by the State Water Resources Control Board. These are primarily UST cases that meet closure criteria under the decisional framework in State Water Board Resolution No. 92-49 and other Board orders. UST Case Closures proposed for consideration by the Executive Director pursuant to State Water Board Resolution No. 2012-0061. These are cases that meet the criteria of the Low-Threat UST Case Closure Policy. UST Case Closure Review Denials and Approved Orders.

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/12/2018
Date Made Active in Reports: 01/16/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 916-327-7844
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA UST: Active UST Facilities
Active UST facilities gathered from the local regulatory agencies

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: SWRCB
Telephone: 916-341-5851
Last EDR Contact: 12/11/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Semi-Annually

CA AST: Aboveground Petroleum Storage Tank Facilities
A listing of aboveground storage tank petroleum storage tank locations.

Date of Government Version: 07/06/2016
Date Data Arrived at EDR: 07/12/2016
Date Made Active in Reports: 09/19/2016
Number of Days to Update: 69

Source: California Environmental Protection Agency
Telephone: 916-327-5092
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 04/01/2019
Data Release Frequency: Quarterly

INDIAN UST R8: Underground Storage Tanks on Indian Land

Date of Government Version: 04/06/2016
Date Data Arrived at EDR: 03/02/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 36

Source: N/A
Telephone: N/A
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN UST R1: Underground Storage Tanks on Indian Land

Date of Government Version: 04/06/2016
Date Data Arrived at EDR: 03/02/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 36

Source: N/A
Telephone: N/A
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN UST R9: Underground Storage Tanks on Indian Land

Date of Government Version: 04/06/2016
Date Data Arrived at EDR: 03/02/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 36

Source: N/A
Telephone: N/A
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN UST R7: Underground Storage Tanks on Indian Land

Date of Government Version: 04/06/2016
Date Data Arrived at EDR: 03/02/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 36

Source: N/A
Telephone: N/A
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN UST R10: Underground Storage Tanks on Indian Land

Date of Government Version: 04/06/2016
Date Data Arrived at EDR: 03/02/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 36

Source: N/A
Telephone: N/A
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN UST R5: Underground Storage Tanks on Indian Land

Date of Government Version: 04/06/2016
Date Data Arrived at EDR: 03/02/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 36

Source: N/A
Telephone: N/A
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land

Date of Government Version: 04/06/2016
Date Data Arrived at EDR: 03/02/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 36

Source: N/A
Telephone: N/A
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land

Date of Government Version: 04/06/2016
Date Data Arrived at EDR: 03/02/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 36

Source: N/A
Telephone: N/A
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

State and tribal voluntary cleanup sites

CA VCP: Voluntary Cleanup Program Properties

Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents have request that DTSC oversee investigation and/or cleanup activities and have agreed to provide coverage for DTSC's costs.

Date of Government Version: 10/29/2018
Date Data Arrived at EDR: 10/30/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 44

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 01/29/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Quarterly

INDIAN VCP R1: Voluntary Cleanup Priority Lisitng

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

State and tribal Brownfields sites

CA BROWNFIELDS: Considered Brownfieds Sites Listing

A listing of sites the SWRCB considers to be Brownfields since these are sites have come to them through the MOA Process.

Date of Government Version: 09/24/2018
Date Data Arrived at EDR: 09/25/2018
Date Made Active in Reports: 10/15/2018
Number of Days to Update: 20

Source: State Water Resources Control Board
Telephone: 916-323-7905
Last EDR Contact: 12/21/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 12/17/2018
Date Data Arrived at EDR: 12/18/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 24

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 12/18/2018
Next Scheduled EDR Contact: 04/01/2019
Data Release Frequency: Semi-Annually

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

ADDITIONAL ENVIRONMENTAL RECORDS

Local Lists of Landfill / Solid Waste Disposal Sites

CA WMUDS/SWAT: Waste Management Unit Database

Waste Management Unit Database System. WMUDS is used by the State Water Resources Control Board staff and the Regional Water Quality Control Boards for program tracking and inventory of waste management units. WMUDS is composed of the following databases: Facility Information, Scheduled Inspections Information, Waste Management Unit Information, SWAT Program Information, SWAT Report Summary Information, SWAT Report Summary Data, Chapter 15 (formerly Subchapter 15) Information, Chapter 15 Monitoring Parameters, TPCA Program Information, RCRA Program Information, Closure Information, and Interested Parties Information.

Date of Government Version: 04/01/2000
Date Data Arrived at EDR: 04/10/2000
Date Made Active in Reports: 05/10/2000
Number of Days to Update: 30

Source: State Water Resources Control Board
Telephone: 916-227-4448
Last EDR Contact: 01/28/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: No Update Planned

CA SWRCY: Recycler Database

A listing of recycling facilities in California.

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/12/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 34

Source: Department of Conservation
Telephone: 916-323-3836
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Quarterly

CA HAULERS: Registered Waste Tire Haulers Listing

A listing of registered waste tire haulers.

Date of Government Version: 09/26/2018
Date Data Arrived at EDR: 09/28/2018
Date Made Active in Reports: 11/01/2018
Number of Days to Update: 34

Source: Integrated Waste Management Board
Telephone: 916-341-6422
Last EDR Contact: 02/12/2019
Next Scheduled EDR Contact: 05/27/2019
Data Release Frequency: Varies

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands

Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 01/29/2019
Next Scheduled EDR Contact: 05/13/2019
Data Release Frequency: Varies

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: No Update Planned

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

IHS OPEN DUMPS: Open Dumps on Indian Land

A listing of all open dumps located on Indian Land in the United States.

Date of Government Version: 04/01/2014
Date Data Arrived at EDR: 08/06/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 176

Source: Department of Health & Human Serivces, Indian Health Service
Telephone: 301-443-1452
Last EDR Contact: 02/01/2019
Next Scheduled EDR Contact: 05/13/2019
Data Release Frequency: Varies

US HIST CDL: National Clandestine Laboratory Register

A listing of clandestine drug lab locations that have been removed from the DEAs National Clandestine Laboratory Register.

Date of Government Version: 09/21/2018
Date Data Arrived at EDR: 09/21/2018
Date Made Active in Reports: 11/09/2018
Number of Days to Update: 49

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 11/26/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: No Update Planned

Local Lists of Hazardous waste / Contaminated Sites

CA HIST CAL-SITES: Calsites Database

The Calsites database contains potential or confirmed hazardous substance release properties. In 1996, California EPA reevaluated and significantly reduced the number of sites in the Calsites database. No longer updated by the state agency. It has been replaced by ENVIROSTOR.

Date of Government Version: 08/08/2005
Date Data Arrived at EDR: 08/03/2006
Date Made Active in Reports: 08/24/2006
Number of Days to Update: 21

Source: Department of Toxic Substance Control
Telephone: 916-323-3400
Last EDR Contact: 02/23/2009
Next Scheduled EDR Contact: 05/25/2009
Data Release Frequency: No Update Planned

CA SCH: School Property Evaluation Program

This category contains proposed and existing school sites that are being evaluated by DTSC for possible hazardous materials contamination. In some cases, these properties may be listed in the CalSites category depending on the level of threat to public health and safety or the environment they pose.

Date of Government Version: 10/29/2018
Date Data Arrived at EDR: 10/30/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 44

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 01/29/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Quarterly

CA CDL: Clandestine Drug Labs

A listing of drug lab locations. Listing of a location in this database does not indicate that any illegal drug lab materials were or were not present there, and does not constitute a determination that the location either requires or does not require additional cleanup work.

Date of Government Version: 12/31/2017
Date Data Arrived at EDR: 06/12/2018
Date Made Active in Reports: 08/06/2018
Number of Days to Update: 55

Source: Department of Toxic Substances Control
Telephone: 916-255-6504
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Varies

CA TOXIC PITS: Toxic Pits Cleanup Act Sites

Toxic PITS Cleanup Act Sites. TOXIC PITS identifies sites suspected of containing hazardous substances where cleanup has not yet been completed.

Date of Government Version: 07/01/1995
Date Data Arrived at EDR: 08/30/1995
Date Made Active in Reports: 09/26/1995
Number of Days to Update: 27

Source: State Water Resources Control Board
Telephone: 916-227-4364
Last EDR Contact: 01/26/2009
Next Scheduled EDR Contact: 04/27/2009
Data Release Frequency: No Update Planned

CA CERS HAZ WASTE: CERS HAZ WASTE

List of sites in the California Environmental Protection Agency (CalEPA) Regulated Site Portal which fall under the Hazardous Chemical Management, Hazardous Waste Onsite Treatment, Household Hazardous Waste Collection, Hazardous Waste Generator, and RCRA LQ HW Generator programs.

Date of Government Version: 10/22/2018
Date Data Arrived at EDR: 10/23/2018
Date Made Active in Reports: 11/30/2018
Number of Days to Update: 38

Source: CalEPA
Telephone: 916-323-2514
Last EDR Contact: 01/24/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Quarterly

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 09/21/2018
Date Data Arrived at EDR: 09/21/2018
Date Made Active in Reports: 11/09/2018
Number of Days to Update: 49

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 11/26/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Quarterly

Local Lists of Registered Storage Tanks

CA SWEEPS UST: SWEEPS UST Listing

Statewide Environmental Evaluation and Planning System. This underground storage tank listing was updated and maintained by a company contacted by the SWRCB in the early 1990's. The listing is no longer updated or maintained. The local agency is the contact for more information on a site on the SWEEPS list.

Date of Government Version: 06/01/1994
Date Data Arrived at EDR: 07/07/2005
Date Made Active in Reports: 08/11/2005
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: N/A
Last EDR Contact: 06/03/2005
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

CA UST MENDOCINO: Mendocino County UST Database

A listing of underground storage tank locations in Mendocino County.

Date of Government Version: 12/04/2018
Date Data Arrived at EDR: 12/06/2018
Date Made Active in Reports: 12/14/2018
Number of Days to Update: 8

Source: Department of Public Health
Telephone: 707-463-4466
Last EDR Contact: 11/26/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Annually

CA HIST UST: Hazardous Substance Storage Container Database

The Hazardous Substance Storage Container Database is a historical listing of UST sites. Refer to local/county source for current data.

Date of Government Version: 10/15/1990
Date Data Arrived at EDR: 01/25/1991
Date Made Active in Reports: 02/12/1991
Number of Days to Update: 18

Source: State Water Resources Control Board
Telephone: 916-341-5851
Last EDR Contact: 07/26/2001
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

CA SAN FRANCISCO AST: Aboveground Storage Tank Site Listing

Aboveground storage tank sites

Date of Government Version: 09/11/2018
Date Data Arrived at EDR: 09/12/2018
Date Made Active in Reports: 10/11/2018
Number of Days to Update: 29

Source: San Francisco County Department of Public Health
Telephone: 415-252-3896
Last EDR Contact: 01/31/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Varies

CA FID UST: Facility Inventory Database

The Facility Inventory Database (FID) contains a historical listing of active and inactive underground storage tank locations from the State Water Resource Control Board. Refer to local/county source for current data.

Date of Government Version: 10/31/1994
Date Data Arrived at EDR: 09/05/1995
Date Made Active in Reports: 09/29/1995
Number of Days to Update: 24

Source: California Environmental Protection Agency
Telephone: 916-341-5851
Last EDR Contact: 12/28/1998
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

CA CERS TANKS: California Environmental Reporting System (CERS) Tanks

List of sites in the California Environmental Protection Agency (CalEPA) Regulated Site Portal which fall under the Aboveground Petroleum Storage and Underground Storage Tank regulatory programs.

Date of Government Version: 10/22/2018
Date Data Arrived at EDR: 10/23/2018
Date Made Active in Reports: 11/30/2018
Number of Days to Update: 38

Source: California Environmental Protection Agency
Telephone: 916-323-2514
Last EDR Contact: 01/24/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Quarterly

Local Land Records

CA LIENS: Environmental Liens Listing

A listing of property locations with environmental liens for California where DTSC is a lien holder.

Date of Government Version: 11/29/2018
Date Data Arrived at EDR: 12/04/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 38

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 11/29/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Varies

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 12/12/2018
Date Data Arrived at EDR: 12/28/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 14

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 12/28/2018
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Semi-Annually

CA DEED: Deed Restriction Listing

Site Mitigation and Brownfields Reuse Program Facility Sites with Deed Restrictions & Hazardous Waste Management Program Facility Sites with Deed / Land Use Restriction. The DTSC Site Mitigation and Brownfields Reuse Program (SMBRP) list includes sites cleaned up under the program's oversight and generally does not include current or former hazardous waste facilities that required a hazardous waste facility permit. The list represents deed restrictions that are active. Some sites have multiple deed restrictions. The DTSC Hazardous Waste Management Program (HWMP) has developed a list of current or former hazardous waste facilities that have a recorded land use restriction at the local county recorder's office. The land use restrictions on this list were required by the DTSC HWMP as a result of the presence of hazardous substances that remain on site after the facility (or part of the facility) has been closed or cleaned up. The types of land use restriction include deed notice, deed restriction, or a land use restriction that binds current and future owners.

Date of Government Version: 12/03/2018
Date Data Arrived at EDR: 12/05/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 37

Source: DTSC and SWRCB
Telephone: 916-323-3400
Last EDR Contact: 12/05/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Semi-Annually

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 03/26/2018
Date Data Arrived at EDR: 03/27/2018
Date Made Active in Reports: 06/08/2018
Number of Days to Update: 73

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 02/08/2019
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

Records of Emergency Release Reports

CA CHMIRS: California Hazardous Material Incident Report System

California Hazardous Material Incident Reporting System. CHMIRS contains information on reported hazardous material incidents (accidental releases or spills).

Date of Government Version: 04/06/2018
Date Data Arrived at EDR: 04/24/2018
Date Made Active in Reports: 06/14/2018
Number of Days to Update: 51

Source: Office of Emergency Services
Telephone: 916-845-8400
Last EDR Contact: 01/24/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Semi-Annually

CA LDS: Land Disposal Sites Listing (GEOTRACKER)

Land Disposal sites (Landfills) included in GeoTracker. GeoTracker is the Water Boards data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater.

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Qualilty Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Quarterly

CA MCS: Military Cleanup Sites Listing (GEOTRACKER)

Military sites (consisting of: Military UST sites; Military Privatized sites; and Military Cleanup sites [formerly known as DoD non UST]) included in GeoTracker. GeoTracker is the Water Boards data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater.

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

CA SPILLS 90: SPILLS90 data from FirstSearch

Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 06/06/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/22/2013
Number of Days to Update: 50

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 03/01/2018
Date Data Arrived at EDR: 03/28/2018
Date Made Active in Reports: 06/22/2018
Number of Days to Update: 86

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 12/03/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 01/31/2015
Date Data Arrived at EDR: 07/08/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 97

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 11/19/2018
Next Scheduled EDR Contact: 03/04/2019
Data Release Frequency: Varies

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 01/11/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Semi-Annually

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 01/11/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: N/A

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing

The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 01/01/2017
Date Data Arrived at EDR: 02/03/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 63
Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 11/16/2018
Next Scheduled EDR Contact: 02/25/2019
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information

All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 08/31/2018
Date Data Arrived at EDR: 09/25/2018
Date Made Active in Reports: 11/09/2018
Number of Days to Update: 45
Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 02/04/2019
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88
Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 02/08/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Quarterly

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 09/30/2017
Date Data Arrived at EDR: 05/08/2018
Date Made Active in Reports: 07/20/2018
Number of Days to Update: 73
Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 02/08/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Varies

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2016
Date Data Arrived at EDR: 06/21/2017
Date Made Active in Reports: 01/05/2018
Number of Days to Update: 198
Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 12/21/2018
Next Scheduled EDR Contact: 04/01/2019
Data Release Frequency: Every 4 Years

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2016
Date Data Arrived at EDR: 01/10/2018
Date Made Active in Reports: 01/12/2018
Number of Days to Update: 2

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 11/16/2018
Next Scheduled EDR Contact: 03/04/2019
Data Release Frequency: Annually

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Annually

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 12/12/2018
Date Data Arrived at EDR: 12/28/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 14

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 12/28/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Annually

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 10/26/2018
Date Data Arrived at EDR: 11/06/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 66

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 01/22/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

PRP: Potentially Responsible Parties
A listing of verified Potentially Responsible Parties

Date of Government Version: 08/13/2018
Date Data Arrived at EDR: 10/04/2018
Date Made Active in Reports: 11/09/2018
Number of Days to Update: 36
Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 02/08/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Quarterly

PADS: PCB Activity Database System
PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 09/14/2018
Date Data Arrived at EDR: 10/11/2018
Date Made Active in Reports: 12/07/2018
Number of Days to Update: 57
Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 01/11/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System
The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 11/18/2016
Date Data Arrived at EDR: 11/23/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 79
Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 01/07/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Quarterly

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25
Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25
Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

MLTS: Material Licensing Tracking System
MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 08/30/2016
Date Data Arrived at EDR: 09/08/2016
Date Made Active in Reports: 10/21/2016
Number of Days to Update: 43
Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 01/22/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Quarterly

COAL ASH DOE: Steam-Electric Plant Operation Data
A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76
Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 12/05/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List
A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 40
Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 12/03/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 05/24/2017
Date Data Arrived at EDR: 11/30/2017
Date Made Active in Reports: 12/15/2017
Number of Days to Update: 15
Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

RADINFO: Radiation Information Database
The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 10/02/2018
Date Data Arrived at EDR: 10/03/2018
Date Made Active in Reports: 11/09/2018
Number of Days to Update: 37
Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 01/03/2019
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40
Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

DOT OPS: Incident and Accident Data

Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 10/01/2018
Date Data Arrived at EDR: 10/30/2018
Date Made Active in Reports: 01/18/2019
Number of Days to Update: 80

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 01/29/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Quarterly

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 09/30/2018
Date Data Arrived at EDR: 10/12/2018
Date Made Active in Reports: 12/07/2018
Number of Days to Update: 56

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 01/07/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2015
Date Data Arrived at EDR: 02/22/2017
Date Made Active in Reports: 09/28/2017
Number of Days to Update: 218

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 06/03/2019
Data Release Frequency: Biennially

INDIAN RESERV: Indian Reservations

This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 07/14/2015
Date Made Active in Reports: 01/10/2017
Number of Days to Update: 546

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 01/07/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Semi-Annually

FUSRAP: Formerly Utilized Sites Remedial Action Program

DOE established the Formerly Utilized Sites Remedial Action Program (FUSRAP) in 1974 to remediate sites where radioactive contamination remained from Manhattan Project and early U.S. Atomic Energy Commission (AEC) operations.

Date of Government Version: 08/08/2017
Date Data Arrived at EDR: 09/11/2018
Date Made Active in Reports: 09/14/2018
Number of Days to Update: 3

Source: Department of Energy
Telephone: 202-586-3559
Last EDR Contact: 01/31/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Varies

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 06/23/2017
Date Data Arrived at EDR: 10/11/2017
Date Made Active in Reports: 11/03/2017
Number of Days to Update: 23

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 12/14/2018
Next Scheduled EDR Contact: 03/04/2019
Data Release Frequency: Varies

LEAD SMELTER 1: Lead Smelter Sites

A listing of former lead smelter site locations.

Date of Government Version: 12/12/2018
Date Data Arrived at EDR: 12/28/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 14

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 12/28/2018
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Varies

LEAD SMELTER 2: Lead Smelter Sites

A listing of former lead smelter site locations.

Date of Government Version: 12/12/2018
Date Data Arrived at EDR: 12/28/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 14

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 12/28/2018
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Varies

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem

Date of Government Version: 10/27/2009
Date Data Arrived at EDR: 11/10/2009
Date Made Active in Reports: 12/08/2009
Number of Days to Update: 28

Source: N/A
Telephone: N/A
Last EDR Contact: 11/12/1996
Next Scheduled EDR Contact: N/A
Data Release Frequency: Annually

US AIRS MINOR: Aerometric Information Retrieval System Facility Subsystem

Date of Government Version: 10/27/2009
Date Data Arrived at EDR: 11/10/2009
Date Made Active in Reports: 12/08/2009
Number of Days to Update: 28

Source: N/A
Telephone: N/A
Last EDR Contact: 11/12/1996
Next Scheduled EDR Contact: N/A
Data Release Frequency: Annually

US MINES: Active Mines & Mineral Plants Database Listing

Active Mines and Mineral Processing Plant operations for commodities monitored by the Minerals Information Team of the USGS.

Date of Government Version: 04/14/2011
Date Data Arrived at EDR: 06/08/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 97

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 11/30/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Varies

US MINES 2: Active Mines & Mineral Plants Database Listing

Active Mines and Mineral Processing Plant operations for commodities monitored by the Minerals Information Team of the USGS.

Date of Government Version: 04/14/2011
Date Data Arrived at EDR: 06/08/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 97

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 11/30/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Varies

US MINES 3: Active Mines & Mineral Plants Database Listing

Active Mines and Mineral Processing Plant operations for commodities monitored by the Minerals Information Team of the USGS.

Date of Government Version: 04/14/2011
Date Data Arrived at EDR: 06/08/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 97

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 11/30/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Varies

ABANDONED MINES: Abandoned Mines

An inventory of land and water impacted by past mining (primarily coal mining) is maintained by OSMRE to provide information needed to implement the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The inventory contains information on the location, type, and extent of AML impacts, as well as, information on the cost associated with the reclamation of those problems. The inventory is based upon field surveys by State, Tribal, and OSMRE program officials. It is dynamic to the extent that it is modified as new problems are identified and existing problems are reclaimed.

Date of Government Version: 09/10/2018
Date Data Arrived at EDR: 09/11/2018
Date Made Active in Reports: 09/14/2018
Number of Days to Update: 3

Source: Department of Interior
Telephone: 202-208-2609
Last EDR Contact: 12/19/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 11/15/2018
Date Data Arrived at EDR: 12/05/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 37

Source: EPA
Telephone: (415) 947-8000
Last EDR Contact: 01/31/2019
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Quarterly

ECHO: Enforcement & Compliance History Information

ECHO provides integrated compliance and enforcement information for about 800,000 regulated facilities nationwide.

Date of Government Version: 09/02/2018
Date Data Arrived at EDR: 09/05/2018
Date Made Active in Reports: 09/14/2018
Number of Days to Update: 9

Source: Environmental Protection Agency
Telephone: 202-564-2280
Last EDR Contact: 01/07/2019
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Quarterly

DOCKET HWC: Hazardous Waste Compliance Docket Listing

A complete list of the Federal Agency Hazardous Waste Compliance Docket Facilities.

Date of Government Version: 05/31/2018
Date Data Arrived at EDR: 07/26/2018
Date Made Active in Reports: 10/05/2018
Number of Days to Update: 71

Source: Environmental Protection Agency
Telephone: 202-564-0527
Last EDR Contact: 11/30/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Varies

UXO: Unexploded Ordnance Sites

A listing of unexploded ordnance site locations

Date of Government Version: 09/30/2017
Date Data Arrived at EDR: 06/19/2018
Date Made Active in Reports: 09/14/2018
Number of Days to Update: 87

Source: Department of Defense
Telephone: 703-704-1564
Last EDR Contact: 01/14/2019
Next Scheduled EDR Contact: 04/29/2019
Data Release Frequency: Varies

FUELS PROGRAM: EPA Fuels Program Registered Listing

This listing includes facilities that are registered under the Part 80 (Code of Federal Regulations) EPA Fuels Programs. All companies now are required to submit new and updated registrations.

Date of Government Version: 08/22/2018
Date Data Arrived at EDR: 08/22/2018
Date Made Active in Reports: 10/05/2018
Number of Days to Update: 44

Source: EPA
Telephone: 800-385-6164
Last EDR Contact: 11/19/2018
Next Scheduled EDR Contact: 03/04/2019
Data Release Frequency: Quarterly

Other Ascertainable Records

CA BOND EXP. PLAN: Bond Expenditure Plan

Department of Health Services developed a site-specific expenditure plan as the basis for an appropriation of Hazardous Substance Cleanup Bond Act funds. It is not updated.

Date of Government Version: 01/01/1989
Date Data Arrived at EDR: 07/27/1994
Date Made Active in Reports: 08/02/1994
Number of Days to Update: 6

Source: Department of Health Services
Telephone: 916-255-2118
Last EDR Contact: 05/31/1994
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

CA CORTESE: "Cortese" Hazardous Waste & Substances Sites List

The sites for the list are designated by the State Water Resource Control Board (LUST), the Integrated Waste Board (SWF/LS), and the Department of Toxic Substances Control (Cal-Sites).

Date of Government Version: 09/24/2018
Date Data Arrived at EDR: 09/25/2018
Date Made Active in Reports: 10/16/2018
Number of Days to Update: 21

Source: CAL EPA/Office of Emergency Information
Telephone: 916-323-3400
Last EDR Contact: 12/21/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

CA CUPA LIVERMORE-PLEASANTON: CUPA Facility Listing

list of facilities associated with the various CUPA programs in Livermore-Pleasanton

Date of Government Version: 08/28/2018
Date Data Arrived at EDR: 08/30/2018
Date Made Active in Reports: 11/01/2018
Number of Days to Update: 63

Source: Livermore-Pleasanton Fire Department
Telephone: 925-454-2361
Last EDR Contact: 02/11/2019
Next Scheduled EDR Contact: 05/27/2019
Data Release Frequency: Varies

CA CUPA SAN FRANCISCO CO: CUPA Facility Listing

Cupa facilities

Date of Government Version: 09/11/2018
Date Data Arrived at EDR: 09/12/2018
Date Made Active in Reports: 09/19/2018
Number of Days to Update: 7

Source: San Francisco County Department of Environmental Health
Telephone: 415-252-3896
Last EDR Contact: 01/31/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Varies

CA DRYCLEAN AVAQMD: Antelope Valley Air Quality Management District Drycleaner Listing

A listing of dry cleaners in the Antelope Valley Air Quality Management District.

Date of Government Version: 11/13/2018
Date Data Arrived at EDR: 12/04/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 42

Source: Antelope Valley Air Quality Management District
Telephone: 661-723-8070
Last EDR Contact: 11/29/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Varies

CA DRYCLEAN SOUTH COAST: South Coast Air Quality Management District Drycleaner Listing
A listing of dry cleaners in the South Coast Air Quality Management District

Date of Government Version: 10/04/2018
Date Data Arrived at EDR: 10/05/2018
Date Made Active in Reports: 11/01/2018
Number of Days to Update: 27

Source: South Coast Air Quality Management District
Telephone: 909-396-3211
Last EDR Contact: 11/26/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Varies

CA DRYCLEANERS: Cleaner Facilities
A list of drycleaner related facilities that have EPA ID numbers. These are facilities with certain SIC codes: power laundries, family and commercial; garment pressing and cleaner's agents; linen supply; coin-operated laundries and cleaning; drycleaning plants, except rugs; carpet and upholster cleaning; industrial launderers; laundry and garment services.

Date of Government Version: 08/30/2018
Date Data Arrived at EDR: 09/27/2018
Date Made Active in Reports: 11/01/2018
Number of Days to Update: 35

Source: Department of Toxic Substance Control
Telephone: 916-327-4498
Last EDR Contact: 11/29/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Annually

CA EMI: Emissions Inventory Data
Toxics and criteria pollutant emissions data collected by the ARB and local air pollution agencies.

Date of Government Version: 12/31/2017
Date Data Arrived at EDR: 06/20/2018
Date Made Active in Reports: 08/06/2018
Number of Days to Update: 47

Source: California Air Resources Board
Telephone: 916-322-2990
Last EDR Contact: 12/21/2018
Next Scheduled EDR Contact: 04/01/2019
Data Release Frequency: Varies

CA ENF: Enforcement Action Listing
A listing of Water Board Enforcement Actions. Formal is everything except Oral/Verbal Communication, Notice of Violation, Expedited Payment Letter, and Staff Enforcement Letter.

Date of Government Version: 11/01/2018
Date Data Arrived at EDR: 11/02/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 41

Source: State Water Resoruces Control Board
Telephone: 916-445-9379
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

CA Financial Assurance 1: Financial Assurance Information Listing
Financial Assurance information

Date of Government Version: 10/19/2018
Date Data Arrived at EDR: 10/23/2018
Date Made Active in Reports: 11/30/2018
Number of Days to Update: 38

Source: Department of Toxic Substances Control
Telephone: 916-255-3628
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

CA Financial Assurance 2: Financial Assurance Information Listing
A listing of financial assurance information for solid waste facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 11/18/2018
Date Data Arrived at EDR: 11/19/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 53

Source: California Integrated Waste Management Board
Telephone: 916-341-6066
Last EDR Contact: 02/11/2019
Next Scheduled EDR Contact: 05/27/2019
Data Release Frequency: Varies

CA HAZNET: Facility and Manifest Data

Facility and Manifest Data. The data is extracted from the copies of hazardous waste manifests received each year by the DTSC. The annual volume of manifests is typically 700,000 - 1,000,000 annually, representing approximately 350,000 - 500,000 shipments. Data are from the manifests submitted without correction, and therefore many contain some invalid values for data elements such as generator ID, TSD ID, waste category, and disposal method. This database begins with calendar year 1993.

Date of Government Version: 12/31/2017
Date Data Arrived at EDR: 10/10/2018
Date Made Active in Reports: 11/16/2018
Number of Days to Update: 37

Source: California Environmental Protection Agency
Telephone: 916-255-1136
Last EDR Contact: 01/07/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Annually

CA ICE: ICE

Contains data pertaining to the Permitted Facilities with Inspections / Enforcements sites tracked in Envirostor.

Date of Government Version: 11/19/2018
Date Data Arrived at EDR: 11/19/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 53

Source: Department of Toxic Subsances Control
Telephone: 877-786-9427
Last EDR Contact: 11/19/2018
Next Scheduled EDR Contact: 03/04/2019
Data Release Frequency: Quarterly

CA HIST CORTESE: Hazardous Waste & Substance Site List

The sites for the list are designated by the State Water Resource Control Board [LUST], the Integrated Waste Board [SWF/LS], and the Department of Toxic Substances Control [CALSITES]. This listing is no longer updated by the state agency.

Date of Government Version: 04/01/2001
Date Data Arrived at EDR: 01/22/2009
Date Made Active in Reports: 04/08/2009
Number of Days to Update: 76

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 01/22/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

CA HWP: EnviroStor Permitted Facilities Listing

Detailed information on permitted hazardous waste facilities and corrective action ("cleanups") tracked in EnviroStor.

Date of Government Version: 11/19/2018
Date Data Arrived at EDR: 11/19/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 53

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 11/19/2018
Next Scheduled EDR Contact: 03/04/2019
Data Release Frequency: Quarterly

CA HWT: Registered Hazardous Waste Transporter Database

A listing of hazardous waste transporters. In California, unless specifically exempted, it is unlawful for any person to transport hazardous wastes unless the person holds a valid registration issued by DTSC. A hazardous waste transporter registration is valid for one year and is assigned a unique registration number.

Date of Government Version: 10/09/2018
Date Data Arrived at EDR: 10/10/2018
Date Made Active in Reports: 11/16/2018
Number of Days to Update: 37

Source: Department of Toxic Substances Control
Telephone: 916-440-7145
Last EDR Contact: 01/08/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Quarterly

CA MINES: Mines Site Location Listing
A listing of mine site locations from the Office of Mine Reclamation.

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/12/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 34
Source: Department of Conservation
Telephone: 916-322-1080
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Quarterly

CA MWMP: Medical Waste Management Program Listing
The Medical Waste Management Program (MWMP) ensures the proper handling and disposal of medical waste by permitting and inspecting medical waste Offsite Treatment Facilities (PDF) and Transfer Stations (PDF) throughout the state. MWMP also oversees all Medical Waste Transporters.

Date of Government Version: 11/09/2018
Date Data Arrived at EDR: 12/05/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 37
Source: Department of Public Health
Telephone: 916-558-1784
Last EDR Contact: 12/05/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Varies

CA NPDES: NPDES Permits Listing
A listing of NPDES permits, including stormwater.

Date of Government Version: 11/12/2018
Date Data Arrived at EDR: 11/14/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 29
Source: State Water Resources Control Board
Telephone: 916-445-9379
Last EDR Contact: 02/12/2019
Next Scheduled EDR Contact: 05/27/2019
Data Release Frequency: Quarterly

CA PEST LIC: Pesticide Regulation Licenses Listing
A listing of licenses and certificates issued by the Department of Pesticide Regulation. The DPR issues licenses and/or certificates to: Persons and businesses that apply or sell pesticides; Pest control dealers and brokers; Persons who advise on agricultural pesticide applications.

Date of Government Version: 12/03/2018
Date Data Arrived at EDR: 12/05/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 37
Source: Department of Pesticide Regulation
Telephone: 916-445-4038
Last EDR Contact: 12/05/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Quarterly

CA PROC: Certified Processors Database
A listing of certified processors.

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/12/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 34
Source: Department of Conservation
Telephone: 916-323-3836
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Quarterly

CA NOTIFY 65: Proposition 65 Records
Listings of all Proposition 65 incidents reported to counties by the State Water Resources Control Board and the Regional Water Quality Control Board. This database is no longer updated by the reporting agency.

Date of Government Version: 09/19/2018
Date Data Arrived at EDR: 09/20/2018
Date Made Active in Reports: 10/19/2018
Number of Days to Update: 29
Source: State Water Resources Control Board
Telephone: 916-445-3846
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 04/01/2019
Data Release Frequency: No Update Planned

CA UIC: UIC Listing

A listing of wells identified as underground injection wells, in the California Oil and Gas Wells database.

Date of Government Version: 04/27/2018
Date Data Arrived at EDR: 06/13/2018
Date Made Active in Reports: 07/17/2018
Number of Days to Update: 34

Source: Deaprtment of Conservation
Telephone: 916-445-2408
Last EDR Contact: 01/25/2019
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA UIC GEO: Underground Injection Control Sites (GEOTRACKER)

Underground control injection sites

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resource Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA WASTEWATER PITS: Oil Wastewater Pits Listing

Water officials discovered that oil producers have been dumping chemical-laden wastewater into hundreds of unlined pits that are operating without proper permits. Inspections completed by the Central Valley Regional Water Quality Control Board revealed the existence of previously unidentified waste sites. The water boards review found that more than one-third of the region's active disposal pits are operating without permission.

Date of Government Version: 05/08/2018
Date Data Arrived at EDR: 07/11/2018
Date Made Active in Reports: 09/13/2018
Number of Days to Update: 64

Source: RWQCB, Central Valley Region
Telephone: 559-445-5577
Last EDR Contact: 01/11/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Varies

CA WDS: Waste Discharge System

Sites which have been issued waste discharge requirements.

Date of Government Version: 06/19/2007
Date Data Arrived at EDR: 06/20/2007
Date Made Active in Reports: 06/29/2007
Number of Days to Update: 9

Source: State Water Resources Control Board
Telephone: 916-341-5227
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 06/03/2019
Data Release Frequency: Quarterly

CA MILITARY PRIV SITES: Military Privatized Sites (GEOTRACKER)

Military privatized sites

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA PROJECT: Project Sites (GEOTRACKER)

Projects sites

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA WDR: Waste Discharge Requirements Listing

In general, the Waste Discharge Requirements (WDRs) Program (sometimes also referred to as the "Non Chapter 15 (Non 15) Program") regulates point discharges that are exempt pursuant to Subsection 20090 of Title 27 and not subject to the Federal Water Pollution Control Act. Exemptions from Title 27 may be granted for nine categories of discharges (e.g., sewage, wastewater, etc.) that meet, and continue to meet, the preconditions listed for each specific exemption. The scope of the WDRs Program also includes the discharge of wastes classified as inert, pursuant to section 20230 of Title 27.

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/12/2018
Date Made Active in Reports: 01/18/2019
Number of Days to Update: 37

Source: State Water Resources Control Board
Telephone: 916-341-5810
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Quarterly

CA CIWQS: California Integrated Water Quality System

The California Integrated Water Quality System (CIWQS) is a computer system used by the State and Regional Water Quality Control Boards to track information about places of environmental interest, manage permits and other orders, track inspections, and manage violations and enforcement activities.

Date of Government Version: 12/03/2018
Date Data Arrived at EDR: 12/04/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 38

Source: State Water Resources Control Board
Telephone: 866-794-4977
Last EDR Contact: 12/04/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Varies

CA CERS: CalEPA Regulated Site Portal Data

The CalEPA Regulated Site Portal database combines data about environmentally regulated sites and facilities in California into a single database. It combines data from a variety of state and federal databases, and provides an overview of regulated activities across the spectrum of environmental programs for any given location in California. These activities include hazardous materials and waste, state and federal cleanups, impacted ground and surface waters, and toxic materials

Date of Government Version: 10/22/2018
Date Data Arrived at EDR: 10/23/2018
Date Made Active in Reports: 11/30/2018
Number of Days to Update: 38

Source: California Environmental Protection Agency
Telephone: 916-323-2514
Last EDR Contact: 01/24/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

CA WIP: Well Investigation Program Case List

Well Investigation Program case in the San Gabriel and San Fernando Valley area.

Date of Government Version: 07/03/2009
Date Data Arrived at EDR: 07/21/2009
Date Made Active in Reports: 08/03/2009
Number of Days to Update: 13

Source: Los Angeles Water Quality Control Board
Telephone: 213-576-6726
Last EDR Contact: 12/19/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Varies

CA NON-CASE INFO: Non-Case Information Sites (GEOTRACKER)

Non-Case Information sites

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA OTHER OIL GAS: Other Oil & Gas Projects Sites (GEOTRACKER)

Other Oil & Gas Projects sites

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA PROD WATER PONDS: Produced Water Ponds Sites (GEOTRACKER)

Produced water ponds sites

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA SAMPLING POINT: Sampling Point ? Public Sites (GEOTRACKER)
Sampling point - public sites

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

CA WELL STIM PROJ: Well Stimulation Project (GEOTRACKER)
Includes areas of groundwater monitoring plans, a depiction of the monitoring network, and the facilities, boundaries, and subsurface characteristics of the oilfield and the features (oil and gas wells, produced water ponds, UIC wells, water supply wells, etc?) being monitored

Date of Government Version: 12/10/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Varies

EDR MGP: EDR Proprietary Manufactured Gas Plants
The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR Hist Auto: EDR Exclusive Historical Auto Stations
EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR Hist Cleaner: EDR Exclusive Historical Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

CA RGA LF: Recovered Government Archive Solid Waste Facilities List

The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Resources Recycling and Recovery in California.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/13/2014
Number of Days to Update: 196

Source: Department of Resources Recycling and Recovery
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

CA RGA LUST: Recovered Government Archive Leaking Underground Storage Tank

The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the State Water Resources Control Board in California.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 12/30/2013
Number of Days to Update: 182

Source: State Water Resources Control Board
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

COUNTY RECORDS

ALAMEDA COUNTY:

Contaminated Sites

A listing of contaminated sites overseen by the Toxic Release Program (oil and groundwater contamination from chemical releases and spills) and the Leaking Underground Storage Tank Program (soil and ground water contamination from leaking petroleum USTs).

Date of Government Version: 10/05/2018
Date Data Arrived at EDR: 10/10/2018
Date Made Active in Reports: 11/01/2018
Number of Days to Update: 22

Source: Alameda County Environmental Health Services
Telephone: 510-567-6700
Last EDR Contact: 01/07/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Semi-Annually

Underground Tanks

Underground storage tank sites located in Alameda county.

Date of Government Version: 10/05/2018
Date Data Arrived at EDR: 10/10/2018
Date Made Active in Reports: 11/02/2018
Number of Days to Update: 23

Source: Alameda County Environmental Health Services
Telephone: 510-567-6700
Last EDR Contact: 01/07/2019
Next Scheduled EDR Contact: 04/24/2047
Data Release Frequency: Semi-Annually

AMADOR COUNTY:

CUPA Facility List
Cupa Facility List

Date of Government Version: 07/01/2018
Date Data Arrived at EDR: 07/24/2018
Date Made Active in Reports: 08/20/2018
Number of Days to Update: 27

Source: Amador County Environmental Health
Telephone: 209-223-6439
Last EDR Contact: 01/04/2019
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Varies

BUTTE COUNTY:

CUPA Facility Listing
Cupa facility list.

Date of Government Version: 04/21/2017
Date Data Arrived at EDR: 04/25/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 106

Source: Public Health Department
Telephone: 530-538-7149
Last EDR Contact: 01/07/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: No Update Planned

CALVERAS COUNTY:

CUPA Facility Listing
Cupa Facility Listing

Date of Government Version: 10/31/2018
Date Data Arrived at EDR: 12/04/2018
Date Made Active in Reports: 12/12/2018
Number of Days to Update: 8

Source: Calveras County Environmental Health
Telephone: 209-754-6399
Last EDR Contact: 12/21/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

COLUSA COUNTY:

CUPA Facility List
Cupa facility list.

Date of Government Version: 05/23/2018
Date Data Arrived at EDR: 05/24/2018
Date Made Active in Reports: 07/13/2018
Number of Days to Update: 50

Source: Health & Human Services
Telephone: 530-458-0396
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Semi-Annually

CONTRA COSTA COUNTY:

Site List
List includes sites from the underground tank, hazardous waste generator and business plan/2185 programs.

Date of Government Version: 11/26/2018
Date Data Arrived at EDR: 11/30/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 46

Source: Contra Costa Health Services Department
Telephone: 925-646-2286
Last EDR Contact: 01/28/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Semi-Annually

DEL NORTE COUNTY:

CUPA Facility List
Cupa Facility list

Date of Government Version: 08/16/2018
Date Data Arrived at EDR: 11/06/2018
Date Made Active in Reports: 11/14/2018
Number of Days to Update: 8

Source: Del Norte County Environmental Health Division
Telephone: 707-465-0426
Last EDR Contact: 01/28/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Varies

EL DORADO COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 12/13/2018
Date Data Arrived at EDR: 12/18/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 28

Source: El Dorado County Environmental Management Department
Telephone: 530-621-6623
Last EDR Contact: 01/28/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Varies

FRESNO COUNTY:

CUPA Resources List
Certified Unified Program Agency. CUPA's are responsible for implementing a unified hazardous materials and hazardous waste management regulatory program. The agency provides oversight of businesses that deal with hazardous materials, operate underground storage tanks or aboveground storage tanks.

Date of Government Version: 10/16/2018
Date Data Arrived at EDR: 10/18/2018
Date Made Active in Reports: 11/14/2018
Number of Days to Update: 27

Source: Dept. of Community Health
Telephone: 559-445-3271
Last EDR Contact: 12/26/2018
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Semi-Annually

GLENN COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 01/22/2018
Date Data Arrived at EDR: 01/24/2018
Date Made Active in Reports: 03/14/2018
Number of Days to Update: 49

Source: Glenn County Air Pollution Control District
Telephone: 830-934-6500
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

HUMBOLDT COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 12/11/2018
Date Data Arrived at EDR: 12/13/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 33

Source: Humboldt County Environmental Health
Telephone: N/A
Last EDR Contact: 11/19/2018
Next Scheduled EDR Contact: 03/04/2019
Data Release Frequency: Semi-Annually

IMPERIAL COUNTY:

CUPA Facility List
Cupa facility list.

Date of Government Version: 10/22/2018
Date Data Arrived at EDR: 10/25/2018
Date Made Active in Reports: 11/14/2018
Number of Days to Update: 20

Source: San Diego Border Field Office
Telephone: 760-339-2777
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

INYO COUNTY:

CUPA Facility List
Cupa facility list.

Date of Government Version: 04/02/2018
Date Data Arrived at EDR: 04/03/2018
Date Made Active in Reports: 06/14/2018
Number of Days to Update: 72

Source: Inyo County Environmental Health Services
Telephone: 760-878-0238
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 06/03/2019
Data Release Frequency: Varies

KERN COUNTY:

Underground Storage Tank Sites & Tank Listing
Kern County Sites and Tanks Listing.

Date of Government Version: 11/02/2018
Date Data Arrived at EDR: 11/07/2018
Date Made Active in Reports: 12/14/2018
Number of Days to Update: 37

Source: Kern County Environment Health Services Department
Telephone: 661-862-8700
Last EDR Contact: 01/31/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Quarterly

KINGS COUNTY:

CUPA Facility List
A listing of sites included in the county's Certified Unified Program Agency database. California's Secretary for Environmental Protection established the unified hazardous materials and hazardous waste regulatory program as required by chapter 6.11 of the California Health and Safety Code. The Unified Program consolidates the administration, permits, inspections, and enforcement activities.

Date of Government Version: 11/21/2018
Date Data Arrived at EDR: 11/27/2018
Date Made Active in Reports: 12/12/2018
Number of Days to Update: 15

Source: Kings County Department of Public Health
Telephone: 559-584-1411
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 06/03/2019
Data Release Frequency: Varies

LAKE COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 11/07/2018
Date Data Arrived at EDR: 11/08/2018
Date Made Active in Reports: 11/14/2018
Number of Days to Update: 6

Source: Lake County Environmental Health
Telephone: 707-263-1164
Last EDR Contact: 01/14/2019
Next Scheduled EDR Contact: 04/29/2019
Data Release Frequency: Varies

LASSEN COUNTY:

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

CUPA Facility List
Cupa facility list

Date of Government Version: 10/15/2018
Date Data Arrived at EDR: 10/23/2018
Date Made Active in Reports: 11/14/2018
Number of Days to Update: 22

Source: Lassen County Environmental Health
Telephone: 530-251-8528
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

LOS ANGELES COUNTY:

Key Areas of Concerns in Los Angeles County
San Gabriel Valley areas where VOC contamination is at or above the MCL as designated by region 9 EPA office. Date of Government Version: 3/30/2009 Exide Site area is a cleanup plan of lead-impacted soil surrounding the former Exide Facility as designated by the DTSC. Date of Government Version: 7/17/2017

Date of Government Version: 03/30/2009
Date Data Arrived at EDR: 03/31/2009
Date Made Active in Reports: 10/23/2009
Number of Days to Update: 206

Source: N/A
Telephone: N/A
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 04/01/2019
Data Release Frequency: No Update Planned

HMS: Street Number List
Industrial Waste and Underground Storage Tank Sites.

Date of Government Version: 09/20/2018
Date Data Arrived at EDR: 10/12/2018
Date Made Active in Reports: 11/16/2018
Number of Days to Update: 35

Source: Department of Public Works
Telephone: 626-458-3517
Last EDR Contact: 01/07/2019
Next Scheduled EDR Contact: 04/22/2019
Data Release Frequency: Semi-Annually

List of Solid Waste Facilities
Solid Waste Facilities in Los Angeles County.

Date of Government Version: 10/15/2018
Date Data Arrived at EDR: 10/16/2018
Date Made Active in Reports: 11/16/2018
Number of Days to Update: 31

Source: La County Department of Public Works
Telephone: 818-458-5185
Last EDR Contact: 01/15/2019
Next Scheduled EDR Contact: 04/29/2019
Data Release Frequency: Varies

City of Los Angeles Landfills
Landfills owned and maintained by the City of Los Angeles.

Date of Government Version: 01/01/2018
Date Data Arrived at EDR: 05/01/2018
Date Made Active in Reports: 05/14/2018
Number of Days to Update: 13

Source: Engineering & Construction Division
Telephone: 213-473-7869
Last EDR Contact: 01/15/2019
Next Scheduled EDR Contact: 04/29/2019
Data Release Frequency: Varies

Site Mitigation List
Industrial sites that have had some sort of spill or complaint.

Date of Government Version: 07/01/2018
Date Data Arrived at EDR: 10/16/2018
Date Made Active in Reports: 11/16/2018
Number of Days to Update: 31

Source: Community Health Services
Telephone: 323-890-7806
Last EDR Contact: 02/01/2019
Next Scheduled EDR Contact: 04/29/2019
Data Release Frequency: Annually

City of El Segundo Underground Storage Tank
Underground storage tank sites located in El Segundo city.

Date of Government Version: 01/21/2017
Date Data Arrived at EDR: 04/19/2017
Date Made Active in Reports: 05/10/2017
Number of Days to Update: 21

Source: City of El Segundo Fire Department
Telephone: 310-524-2236
Last EDR Contact: 01/14/2019
Next Scheduled EDR Contact: 04/29/2019
Data Release Frequency: Semi-Annually

City of Long Beach Underground Storage Tank
Underground storage tank sites located in the city of Long Beach.

Date of Government Version: 03/09/2017
Date Data Arrived at EDR: 03/10/2017
Date Made Active in Reports: 05/03/2017
Number of Days to Update: 54

Source: City of Long Beach Fire Department
Telephone: 562-570-2563
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Annually

City of Torrance Underground Storage Tank
Underground storage tank sites located in the city of Torrance.

Date of Government Version: 10/02/2018
Date Data Arrived at EDR: 10/05/2018
Date Made Active in Reports: 11/02/2018
Number of Days to Update: 28

Source: City of Torrance Fire Department
Telephone: 310-618-2973
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Semi-Annually

MADERA COUNTY:

CUPA Facility List
A listing of sites included in the county's Certified Unified Program Agency database. California's Secretary for Environmental Protection established the unified hazardous materials and hazardous waste regulatory program as required by chapter 6.11 of the California Health and Safety Code. The Unified Program consolidates the administration, permits, inspections, and enforcement activities.

Date of Government Version: 11/26/2018
Date Data Arrived at EDR: 11/27/2018
Date Made Active in Reports: 12/12/2018
Number of Days to Update: 15

Source: Madera County Environmental Health
Telephone: 559-675-7823
Last EDR Contact: 11/14/2018
Next Scheduled EDR Contact: 03/04/2019
Data Release Frequency: Varies

MARIN COUNTY:

Underground Storage Tank Sites
Currently permitted USTs in Marin County.

Date of Government Version: 09/26/2018
Date Data Arrived at EDR: 10/04/2018
Date Made Active in Reports: 11/02/2018
Number of Days to Update: 29

Source: Public Works Department Waste Management
Telephone: 415-473-6647
Last EDR Contact: 01/14/2019
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Semi-Annually

MERCED COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 08/29/2018
Date Data Arrived at EDR: 08/31/2018
Date Made Active in Reports: 09/19/2018
Number of Days to Update: 19

Source: Merced County Environmental Health
Telephone: 209-381-1094
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 06/03/2019
Data Release Frequency: Varies

MONO COUNTY:

CUPA Facility List
CUPA Facility List

Date of Government Version: 12/07/2018
Date Data Arrived at EDR: 12/11/2018
Date Made Active in Reports: 01/24/2019
Number of Days to Update: 44

Source: Mono County Health Department
Telephone: 760-932-5580
Last EDR Contact: 12/06/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Varies

MONTEREY COUNTY:

CUPA Facility Listing
CUPA Program listing from the Environmental Health Division.

Date of Government Version: 10/29/2018
Date Data Arrived at EDR: 11/01/2018
Date Made Active in Reports: 11/16/2018
Number of Days to Update: 15

Source: Monterey County Health Department
Telephone: 831-796-1297
Last EDR Contact: 12/27/2018
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Varies

NAPA COUNTY:

Sites With Reported Contamination
A listing of leaking underground storage tank sites located in Napa county.

Date of Government Version: 01/09/2017
Date Data Arrived at EDR: 01/11/2017
Date Made Active in Reports: 03/02/2017
Number of Days to Update: 50

Source: Napa County Department of Environmental Management
Telephone: 707-253-4269
Last EDR Contact: 11/21/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: No Update Planned

Closed and Operating Underground Storage Tank Sites
Underground storage tank sites located in Napa county.

Date of Government Version: 11/28/2018
Date Data Arrived at EDR: 11/30/2018
Date Made Active in Reports: 12/14/2018
Number of Days to Update: 14

Source: Napa County Department of Environmental Management
Telephone: 707-253-4269
Last EDR Contact: 11/26/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: No Update Planned

NEVADA COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 11/06/2018
Date Data Arrived at EDR: 11/08/2018
Date Made Active in Reports: 11/14/2018
Number of Days to Update: 6

Source: Community Development Agency
Telephone: 530-265-1467
Last EDR Contact: 01/28/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Varies

ORANGE COUNTY:

List of Industrial Site Cleanups
Petroleum and non-petroleum spills.

Date of Government Version: 10/04/2018
Date Data Arrived at EDR: 11/14/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 29

Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 02/04/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Annually

List of Underground Storage Tank Cleanups
Orange County Underground Storage Tank Cleanups (LUST).

Date of Government Version: 10/04/2018
Date Data Arrived at EDR: 11/14/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 29

Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 02/04/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Quarterly

List of Underground Storage Tank Facilities
Orange County Underground Storage Tank Facilities (UST).

Date of Government Version: 10/04/2018
Date Data Arrived at EDR: 11/06/2018
Date Made Active in Reports: 12/14/2018
Number of Days to Update: 38

Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 02/05/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Quarterly

PLACER COUNTY:

Master List of Facilities
List includes aboveground tanks, underground tanks and cleanup sites.

Date of Government Version: 11/29/2018
Date Data Arrived at EDR: 12/04/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 38

Source: Placer County Health and Human Services
Telephone: 530-745-2363
Last EDR Contact: 11/29/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Semi-Annually

PLUMAS COUNTY:

CUPA Facility List
Plumas County CUPA Program facilities.

Date of Government Version: 07/19/2018
Date Data Arrived at EDR: 07/25/2018
Date Made Active in Reports: 09/05/2018
Number of Days to Update: 42

Source: Plumas County Environmental Health
Telephone: 530-283-6355
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

RIVERSIDE COUNTY:

Listing of Underground Tank Cleanup Sites
Riverside County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 10/10/2018
Date Data Arrived at EDR: 10/12/2018
Date Made Active in Reports: 10/16/2018
Number of Days to Update: 4

Source: Department of Environmental Health
Telephone: 951-358-5055
Last EDR Contact: 12/17/2018
Next Scheduled EDR Contact: 04/01/2019
Data Release Frequency: Quarterly

Underground Storage Tank Tank List
Underground storage tank sites located in Riverside county.

Date of Government Version: 10/10/2018
Date Data Arrived at EDR: 10/12/2018
Date Made Active in Reports: 11/05/2018
Number of Days to Update: 24

Source: Department of Environmental Health
Telephone: 951-358-5055
Last EDR Contact: 12/17/2018
Next Scheduled EDR Contact: 04/01/2019
Data Release Frequency: Quarterly

SACRAMENTO COUNTY:

Toxic Site Clean-Up List
List of sites where unauthorized releases of potentially hazardous materials have occurred.

Date of Government Version: 08/03/2018
Date Data Arrived at EDR: 10/02/2018
Date Made Active in Reports: 11/01/2018
Number of Days to Update: 30

Source: Sacramento County Environmental Management
Telephone: 916-875-8406
Last EDR Contact: 01/04/2019
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Quarterly

Master Hazardous Materials Facility List
Any business that has hazardous materials on site - hazardous material storage sites, underground storage tanks, waste generators.

Date of Government Version: 08/23/2018
Date Data Arrived at EDR: 10/02/2018
Date Made Active in Reports: 11/02/2018
Number of Days to Update: 31

Source: Sacramento County Environmental Management
Telephone: 916-875-8406
Last EDR Contact: 12/28/2018
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Quarterly

SAN BENITO COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 11/15/2018
Date Data Arrived at EDR: 11/16/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 27

Source: San Benito County Environmental Health
Telephone: N/A
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Varies

SAN BERNARDINO COUNTY:

Hazardous Material Permits
This listing includes underground storage tanks, medical waste handlers/generators, hazardous materials handlers, hazardous waste generators, and waste oil generators/handlers.

Date of Government Version: 11/28/2018
Date Data Arrived at EDR: 11/30/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 42

Source: San Bernardino County Fire Department Hazardous Materials Division
Telephone: 909-387-3041
Last EDR Contact: 02/04/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Quarterly

SAN DIEGO COUNTY:

Hazardous Materials Management Division Database

The database includes: HE58 - This report contains the business name, site address, business phone number, establishment 'H' permit number, type of permit, and the business status. HE17 - In addition to providing the same information provided in the HE58 listing, HE17 provides inspection dates, violations received by the establishment, hazardous waste generated, the quantity, method of storage, treatment/disposal of waste and the hauler, and information on underground storage tanks. Unauthorized Release List - Includes a summary of environmental contamination cases in San Diego County (underground tank cases, non-tank cases, groundwater contamination, and soil contamination are included.)

Date of Government Version: 12/03/2018
Date Data Arrived at EDR: 12/05/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 37

Source: Hazardous Materials Management Division
Telephone: 619-338-2268
Last EDR Contact: 12/05/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Quarterly

Solid Waste Facilities

San Diego County Solid Waste Facilities.

Date of Government Version: 04/18/2018
Date Data Arrived at EDR: 04/24/2018
Date Made Active in Reports: 06/19/2018
Number of Days to Update: 56

Source: Department of Health Services
Telephone: 619-338-2209
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

Local Oversight Program Listing

A listing of all LOP release sites that are or were under the County of San Diego's jurisdiction. Included are closed or transferred cases, open cases, and cases that did not have a case type indicated. The cases without a case type are mostly complaints; however, some of them could be LOP cases.

Date of Government Version: 10/22/2018
Date Data Arrived at EDR: 10/23/2018
Date Made Active in Reports: 11/30/2018
Number of Days to Update: 38

Source: Department of Environmental Health
Telephone: 858-505-6874
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

Environmental Case Listing

The listing contains all underground tank release cases and projects pertaining to properties contaminated with hazardous substances that are actively under review by the Site Assessment and Mitigation Program.

Date of Government Version: 03/23/2010
Date Data Arrived at EDR: 06/15/2010
Date Made Active in Reports: 07/09/2010
Number of Days to Update: 24

Source: San Diego County Department of Environmental Health
Telephone: 619-338-2371
Last EDR Contact: 11/29/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: No Update Planned

SAN FRANCISCO COUNTY:

Local Oversite Facilities

A listing of leaking underground storage tank sites located in San Francisco county.

Date of Government Version: 09/19/2008
Date Data Arrived at EDR: 09/19/2008
Date Made Active in Reports: 09/29/2008
Number of Days to Update: 10

Source: Department Of Public Health San Francisco County
Telephone: 415-252-3920
Last EDR Contact: 01/31/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Quarterly

Underground Storage Tank Information

Underground storage tank sites located in San Francisco county.

Date of Government Version: 11/05/2018
Date Data Arrived at EDR: 11/06/2018
Date Made Active in Reports: 12/14/2018
Number of Days to Update: 38

Source: Department of Public Health
Telephone: 415-252-3920
Last EDR Contact: 01/31/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Quarterly

SAN JOAQUIN COUNTY:

San Joaquin Co. UST
A listing of underground storage tank locations in San Joaquin county.

Date of Government Version: 06/22/2018
Date Data Arrived at EDR: 06/26/2018
Date Made Active in Reports: 07/11/2018
Number of Days to Update: 15

Source: Environmental Health Department
Telephone: N/A
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 04/01/2019
Data Release Frequency: Semi-Annually

SAN LUIS OBISPO COUNTY:

CUPA Facility List
Cupa Facility List.

Date of Government Version: 11/14/2018
Date Data Arrived at EDR: 11/15/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 28

Source: San Luis Obispo County Public Health Department
Telephone: 805-781-5596
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 06/03/2019
Data Release Frequency: Varies

SAN MATEO COUNTY:

Business Inventory
List includes Hazardous Materials Business Plan, hazardous waste generators, and underground storage tanks.

Date of Government Version: 12/03/2018
Date Data Arrived at EDR: 12/12/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 34

Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Annually

Fuel Leak List
A listing of leaking underground storage tank sites located in San Mateo county.

Date of Government Version: 12/13/2018
Date Data Arrived at EDR: 12/18/2018
Date Made Active in Reports: 01/23/2019
Number of Days to Update: 36

Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921
Last EDR Contact: 09/10/2018
Next Scheduled EDR Contact: 12/24/2018
Data Release Frequency: Semi-Annually

SANTA BARBARA COUNTY:

CUPA Facility Listing
CUPA Program Listing from the Environmental Health Services division.

Date of Government Version: 09/08/2011
Date Data Arrived at EDR: 09/09/2011
Date Made Active in Reports: 10/07/2011
Number of Days to Update: 28

Source: Santa Barbara County Public Health Department
Telephone: 805-686-8167
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 06/03/2019
Data Release Frequency: Varies

SANTA CLARA COUNTY:

Cupa Facility List
Cupa facility list

Date of Government Version: 11/16/2018
Date Data Arrived at EDR: 11/16/2018
Date Made Active in Reports: 12/13/2018
Number of Days to Update: 27

Source: Department of Environmental Health
Telephone: 408-918-1973
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 06/03/2019
Data Release Frequency: Varies

HIST LUST - Fuel Leak Site Activity Report
A listing of open and closed leaking underground storage tanks. This listing is no longer updated by the county. Leaking underground storage tanks are now handled by the Department of Environmental Health.

Date of Government Version: 03/29/2005
Date Data Arrived at EDR: 03/30/2005
Date Made Active in Reports: 04/21/2005
Number of Days to Update: 22

Source: Santa Clara Valley Water District
Telephone: 408-265-2600
Last EDR Contact: 03/23/2009
Next Scheduled EDR Contact: 06/22/2009
Data Release Frequency: No Update Planned

LOP Listing
A listing of leaking underground storage tanks located in Santa Clara county.

Date of Government Version: 03/03/2014
Date Data Arrived at EDR: 03/05/2014
Date Made Active in Reports: 03/18/2014
Number of Days to Update: 13

Source: Department of Environmental Health
Telephone: 408-918-3417
Last EDR Contact: 11/21/2018
Next Scheduled EDR Contact: 03/11/2019
Data Release Frequency: Annually

Hazardous Material Facilities
Hazardous material facilities, including underground storage tank sites.

Date of Government Version: 11/01/2018
Date Data Arrived at EDR: 11/06/2018
Date Made Active in Reports: 12/14/2018
Number of Days to Update: 38

Source: City of San Jose Fire Department
Telephone: 408-535-7694
Last EDR Contact: 01/31/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Annually

SANTA CRUZ COUNTY:

CUPA Facility List
CUPA facility listing.

Date of Government Version: 01/21/2017
Date Data Arrived at EDR: 02/22/2017
Date Made Active in Reports: 05/23/2017
Number of Days to Update: 90

Source: Santa Cruz County Environmental Health
Telephone: 831-464-2761
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 06/03/2019
Data Release Frequency: Varies

SHASTA COUNTY:

CUPA Facility List
Cupa Facility List.

Date of Government Version: 06/15/2017
Date Data Arrived at EDR: 06/19/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 51

Source: Shasta County Department of Resource Management
Telephone: 530-225-5789
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 06/03/2019
Data Release Frequency: Varies

SOLANO COUNTY:

Leaking Underground Storage Tanks
A listing of leaking underground storage tank sites located in Solano county.

Date of Government Version: 11/29/2018
Date Data Arrived at EDR: 12/04/2018
Date Made Active in Reports: 01/11/2019
Number of Days to Update: 38

Source: Solano County Department of Environmental Management
Telephone: 707-784-6770
Last EDR Contact: 11/29/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Quarterly

Underground Storage Tanks
Underground storage tank sites located in Solano county.

Date of Government Version: 11/29/2018
Date Data Arrived at EDR: 12/04/2018
Date Made Active in Reports: 12/14/2018
Number of Days to Update: 10

Source: Solano County Department of Environmental Management
Telephone: 707-784-6770
Last EDR Contact: 11/29/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Quarterly

SONOMA COUNTY:

Cupa Facility List
Cupa Facility list

Date of Government Version: 12/21/2018
Date Data Arrived at EDR: 12/27/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 19

Source: County of Sonoma Fire & Emergency Services Department
Telephone: 707-565-1174
Last EDR Contact: 12/19/2018
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Varies

Leaking Underground Storage Tank Sites
A listing of leaking underground storage tank sites located in Sonoma county.

Date of Government Version: 10/02/2018
Date Data Arrived at EDR: 10/04/2018
Date Made Active in Reports: 10/25/2018
Number of Days to Update: 21

Source: Department of Health Services
Telephone: 707-565-6565
Last EDR Contact: 01/07/2019
Next Scheduled EDR Contact: 04/08/2019
Data Release Frequency: Quarterly

STANISLAUS COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 12/11/2018
Date Data Arrived at EDR: 12/13/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 33

Source: Stanislaus County Department of Ennvironmental Protection
Telephone: 209-525-6751
Last EDR Contact: 12/13/2018
Next Scheduled EDR Contact: 04/29/2019
Data Release Frequency: Varies

SUTTER COUNTY:

Underground Storage Tanks
Underground storage tank sites located in Sutter county.

Date of Government Version: 09/18/2018
Date Data Arrived at EDR: 09/20/2018
Date Made Active in Reports: 10/25/2018
Number of Days to Update: 35

Source: Sutter County Environmental Health Services
Telephone: 530-822-7500
Last EDR Contact: 11/29/2018
Next Scheduled EDR Contact: 03/18/2019
Data Release Frequency: Semi-Annually

TEHAMA COUNTY:

CUPA Facility List
Cupa facilities

Date of Government Version: 12/13/2018
Date Data Arrived at EDR: 12/18/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 28

Source: Tehama County Department of Environmental Health
Telephone: 530-527-8020
Last EDR Contact: 01/31/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Varies

TRINITY COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 10/22/2018
Date Data Arrived at EDR: 10/25/2018
Date Made Active in Reports: 11/14/2018
Number of Days to Update: 20

Source: Department of Toxic Substances Control
Telephone: 760-352-0381
Last EDR Contact: 01/17/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

TULARE COUNTY:

CUPA Facility List
Cupa program facilities

Date of Government Version: 12/26/2018
Date Data Arrived at EDR: 12/27/2018
Date Made Active in Reports: 01/15/2019
Number of Days to Update: 19

Source: Tulare County Environmental Health Services Division
Telephone: 559-624-7400
Last EDR Contact: 01/31/2019
Next Scheduled EDR Contact: 05/20/2019
Data Release Frequency: Varies

TUOLUMNE COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 04/23/2018
Date Data Arrived at EDR: 04/25/2018
Date Made Active in Reports: 06/25/2018
Number of Days to Update: 61

Source: Divison of Environmental Health
Telephone: 209-533-5633
Last EDR Contact: 02/13/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Varies

VENTURA COUNTY:

Business Plan, Hazardous Waste Producers, and Operating Underground Tanks
The BWT list indicates by site address whether the Environmental Health Division has Business Plan (B), Waste Producer (W), and/or Underground Tank (T) information.

Date of Government Version: 09/26/2018
Date Data Arrived at EDR: 10/25/2018
Date Made Active in Reports: 11/30/2018
Number of Days to Update: 36

Source: Ventura County Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 01/22/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Quarterly

Inventory of Illegal Abandoned and Inactive Sites
Ventura County Inventory of Closed, Illegal Abandoned, and Inactive Sites.

Date of Government Version: 12/01/2011
Date Data Arrived at EDR: 12/01/2011
Date Made Active in Reports: 01/19/2012
Number of Days to Update: 49
Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 12/26/2018
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Annually

Listing of Underground Tank Cleanup Sites

Ventura County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 05/29/2008
Date Data Arrived at EDR: 06/24/2008
Date Made Active in Reports: 07/31/2008
Number of Days to Update: 37
Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 02/07/2019
Next Scheduled EDR Contact: 05/27/2019
Data Release Frequency: Quarterly

Medical Waste Program List

To protect public health and safety and the environment from potential exposure to disease causing agents, the Environmental Health Division Medical Waste Program regulates the generation, handling, storage, treatment and disposal of medical waste throughout the County.

Date of Government Version: 09/25/2018
Date Data Arrived at EDR: 10/25/2018
Date Made Active in Reports: 11/30/2018
Number of Days to Update: 36
Source: Ventura County Resource Management Agency
Telephone: 805-654-2813
Last EDR Contact: 01/22/2019
Next Scheduled EDR Contact: 05/06/2019
Data Release Frequency: Quarterly

Underground Tank Closed Sites List

Ventura County Operating Underground Storage Tank Sites (UST)/Underground Tank Closed Sites List.

Date of Government Version: 11/26/2018
Date Data Arrived at EDR: 12/12/2018
Date Made Active in Reports: 01/16/2019
Number of Days to Update: 35
Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 12/12/2018
Next Scheduled EDR Contact: 03/25/2019
Data Release Frequency: Quarterly

YOLO COUNTY:

Underground Storage Tank Comprehensive Facility Report

Underground storage tank sites located in Yolo county.

Date of Government Version: 12/26/2018
Date Data Arrived at EDR: 01/03/2019
Date Made Active in Reports: 01/16/2019
Number of Days to Update: 13
Source: Yolo County Department of Health
Telephone: 530-666-8646
Last EDR Contact: 12/26/2018
Next Scheduled EDR Contact: 04/15/2019
Data Release Frequency: Annually

YUBA COUNTY:

CUPA Facility List

CUPA facility listing for Yuba County.

Date of Government Version: 11/05/2018
Date Data Arrived at EDR: 11/07/2018
Date Made Active in Reports: 11/14/2018
Number of Days to Update: 7
Source: Yuba County Environmental Health Department
Telephone: 530-749-7523
Last EDR Contact: 01/28/2019
Next Scheduled EDR Contact: 05/11/2019
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

Oil/Gas Pipelines
Source: PennWell Corporation
Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Electric Power Transmission Line Data
Source: PennWell Corporation
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Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Licensed Facilities
Source: Department of Social Services
Telephone: 916-657-4041

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetland Inventory
Source: Department of Fish & Game
Telephone: 916-445-0411

STREET AND ADDRESS INFORMATION

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER R5-2017-0061

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER FOR DISCHARGES RELATED TO TIMBERLAND MANAGEMENT ACTIVITIES FOR NON-FEDERAL AND FEDERAL LANDS

The California Regional Water Quality Control Board, Central Valley Region (hereafter, Central Valley Water Board) finds that:

SCOPE OF COVERAGE OF THIS GENERAL ORDER

1. This Order serves as general waste discharge requirements (WDRs) for waste discharges related to timberland management activities on both non-federal and federal lands (managed by the U.S. Forest Service) that could affect waters of the state.

2. Under this Order, "timberland management activities" means commercial activities relating to forest management and timberland conversions, including, but not limited to: cutting or removal of timber and other solid wood forest products; construction, reconstruction and maintenance of roads, fuel breaks, firebreaks, watercourse crossings, landings, skid trails, or beds for the falling of trees; fire hazard abatement and fuel reduction activities; pesticide applications; site preparation that involves disturbance of soil or burning of vegetation following timberland management activities; but excluding preparatory treemarking, surveying or roadflagging.[1]

3. Waste specifically regulated under this Order includes: earthen materials, including soil, silt, sand, clay, rock; organic materials, such as slash, sawdust, or bark; and pesticides that enter or threaten to enter into waters of the state from timberland management activities.

4. Under this Order, the term "Discharger" includes the timberland owner or timber owner, anyone working on behalf of the timberland/timber owner in the conduct of timberland management activities for non-federal lands, the U.S. Forest Service, private timber operators operating on federal lands, and anyone working on behalf of the U.S. Forest Service or a timber operator in the conduct of timberland management activities on federal lands. Although all of the aforementioned persons or entities legally are "Dischargers" for the purposes of this Order, only one Notice of Intent (NOI) shall be submitted for each Project enrollment.

5. Attachment A (Definitions), Attachment B (Monitoring and Reporting Program), Attachment C (Post-Fire Management and Reforestation Plan), and Attachment D (Information Sheet) are hereby incorporated into and made a part of this Order by this reference.

REASONS FOR ISSUING GENERAL ORDER

6. There are approximately 16 million acres of federal and non-federal forested lands located within the Central Valley Region. The water quality impacts from timberland management activities on these forested lands falls within the jurisdiction of the Central Valley Water Board.

7. The adoption of individual WDRs for all timberland management activities in the Central Valley

[1]Definitions for "Pesticide", "Plan", and "Project", as well as other definitions, can be found in Attachment A.

Region is not feasible due to the large number of timber harvesting documents received annually for review, the short mandated timeline for the approval of non-federal timberland management activities, and the time needed to adopt individual WDRs. General WDRs on a watershed-by-watershed basis would also take a significant amount of time given the large number of watersheds and sub-watersheds in the Region, and therefore is not feasible. The Central Valley Water Board currently regulates timberland management activities under the Conditional Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvesting Activities (Waiver), Order No. R5-2014-0144, which expires on March 31, 2018. Without the current Waiver or the adoption of this Order, many timberland management activities would not be subject to any regulation under the California Water Code (Water Code) as required by the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (Nonpoint Source Policy) (see Finding 12 below).

8. On October 8, 2013, amendments to Public Resources Code Article 7.7 (commencing with Section 4597) went into effect and established a new type of timber harvesting permit: the Working Forest Management Plan (WFMP). This new permit will allow non-federal, non-industrial landowners of 15,000 acres or less to harvest timber via a non-expiring permit. The amendments also required the California Board of Forestry (BOF) to develop and implement the process for the WFMP by January 2016; process concerns raised by stakeholders have delayed the implementation of the WFMP, which is now anticipated to occur by January 2018.

9. This Order addresses the anticipated implementation of the WFMP by the BOF; the upcoming Waiver expiration; the need for additional information related to post-fire salvage operations; the creation of a low threat category for Plans; the creation of a new category for non-federal watercourse crossing work outside of a Project; the need to revise and clarify the monitoring and reporting program; and the overall need to improve and streamline the existing Waiver. Individual WDRs would not provide identifiable benefits over this Order because this Order contains essentially the same conditions that would be included in individual WDRs, such as the requirements that implement water quality control plans, and this Order is enforceable to the same extent as individual WDRs.

10. As of the effective date of this Order, the Central Valley Water Board will no longer accept new enrollments under the Timber Waiver (Order No. R5-2014-0114). Projects with existing enrollments under the Timber Waiver may continue to operate under the Timber Waiver until its expiration date, March 31, 2018. Projects that will operate past March 31, 2018, must obtain coverage under this Order prior to that date.

REGULATORY CONSIDERATIONS

11. Pursuant to the Porter-Cologne Water Quality Control Act (Division 7 of the Water Code), the Central Valley Water Board has legal authority to regulate waste discharges that could affect the quality of waters of the state.

12. Federal law requires the states to develop and implement plans to address nonpoint source pollution. (33 U.S.C. §1329.) Pursuant to this federal mandate, the State Water Resources Control Board (State Water Board) adopted its Nonpoint Source Policy in 2004. The Nonpoint Source Policy requires the State Water Board and Regional Water Quality Control Boards (Regional Water Boards) to regulate nonpoint source pollution by using either (1) Waste Discharge

Requirements (Water Code section 13260); (2) a Waiver of Waste Discharge Requirements (Water Code section 13269); or (3) a Basin Plan Prohibition (Water Code section 13243).

13. Water Code section 13260, subdivision (a) requires that any person discharging waste or proposing to discharge waste within any region that could affect the quality of waters of the state, other than into a community sewer system, shall file with the appropriate Regional Water Board a Report of Waste Discharge (ROWD) containing such information and data as the Regional Water Board may require.

14. Water Code section 13263 requires the Central Valley Water Board to prescribe WDRs, or waive WDRs, for proposed, existing, or material changes in discharges of waste that could affect water quality. The board may prescribe WDRs even if no ROWD under Water Code section 13260 has been filed. The WDRs must implement applicable water quality control plans and the Water Code. The Central Valley Water Board may prescribe general WDRs for a category of discharges if all the following criteria apply to the discharges in that category:

    a. The discharges are produced by the same or similar operations.
    b. The discharges involve the same or similar types of waste.
    c. The discharges require the same or similar treatment standards.
    d. The discharges are more appropriately regulated under general requirements than individual requirements.

    The rationales for developing general waste discharge requirements for timberland management activities in the Central Valley Region include: (a) discharges are produced by similar operations (timberland management activities); (b) waste discharges under this Order involve similar types of wastes (typically earthen materials such as soil and rock, organic materials such as slash and bark, and pesticides); (c) water quality management practices are similar for timberland management activities; and (d) due to the large number of timberland management activities that take place in the Central Valley region, timberland management activities are more appropriately regulated under general rather than individual WDRs.

15. The Central Valley Water Board's *Water Quality Control Plan for the Sacramento River Basin and the San* Joaquin *River Basin, Fourth Edition, revised April 2016* and the *Water Quality Control Plan for the Tulare Lake Basin, Second Edition, revised January 2015* (hereinafter Basin Plans) designate beneficial uses, establish water quality objectives, contain programs of implementation needed to achieve water quality objectives, and reference plans and policies adopted by the State Water Board.

16. Whether an individual discharge of waste from timberland management activities may affect the quality of the waters of the state depends on a variety of site-specific factors, including, but not limited to:
    a) Distribution and Sensitivity of the Beneficial Uses of Water
        - Presence of domestic water supplies
        - Presence of aquatic species (including listed species)
        - Close proximity of operations to other critical beneficial uses or sensitive receptors
    b) Current Water Quality Conditions
        - Existing Total Maximum Daily Loads or 303(d) listings
        - Documented non-compliance with Basin Plan standards
        - Known or suspected watershed impacts
    c) Physical Setting

- Unstable geologic setting / steep slopes
- Erodible soils
- Existing landslides or active erosion sites
- Roads or watercourse crossings in poor condition
- Harsh climates and/or intense precipitation regimes
- Post-fire landscape

d) Type and Scope of Proposed Activities
- Intensity of silvicultural prescriptions and/or yarding methods
- Intensity of site preparation and/or road construction/reconstruction
- Winter operations and/or "non-standard" or "in-lieu" practices

17. This Order implements the Basin Plans by requiring the implementation of management practices to prevent exceedances of applicable water quality objectives (both numeric and narrative) and requiring the prevention of nuisance. The Order requires implementation of a monitoring and reporting program to determine effects of waste discharges on water quality and the effectiveness of management practices designed to comply with applicable water quality objectives as defined in the Basin Plans.

18. Water Code section 13242 mandates that Regional Water Boards include in their Basin Plans a plan of implementation describing how the board will regulate discharges of waste to waters of the state in a manner that will achieve water quality objectives. Water Code section 13243 provides further that "[a] regional board, in a water quality control plan or in waste discharge requirements, may specify certain conditions or areas where the discharge of waste, or certain types of waste, will not be permitted." Water Code section 13263 also requires a Regional Water Board to prescribe requirements in WDRs that will implement the Basin Plan, including achievement of applicable water quality objectives. The conditions of this Order, including but not limited to Eligibility Criteria, Prohibitions, and requirements pertaining to Significant Existing or Potential Erosion Sites (SEPES), implement these and other applicable statutory mandates.

REGULATORY HISTORY AND COORDINATION WITH OTHER AGENCIES

19. **Non-Federal Lands**

The California Department of Forestry and Fire Protection (CAL FIRE) and the Board of Forestry (BOF)

Timberland management activities on non-federal lands in California are regulated in accordance with the Z'berg-Nejedly Forest Practice Act (FPA) (Public Resources Code § 4511 et seq.) and the California Forest Practice Rules (FPR) (California Code of Regulations, title 14, § 895 et seq.). The BOF is responsible for promulgation of the FPR in accordance with the FPA while CAL FIRE is the state agency responsible for overseeing implementation and enforcement of the FPR for timber harvest activities on non-federal lands. Non-federal landowners proposing to harvest timber for commercial purposes are required to have an approved Plan, prepared by a Registered Professional Forester (RPF), prior to starting timberland management activities. Pursuant to the FPR, the applicable Regional Water Board, California Department of Fish and Wildlife, California Geological Survey, and other responsible and local agencies participate in the review of Plans and provide recommendations to the CAL FIRE Director as part of an interdisciplinary "Review Team." As a member of the Review Team, Regional Water Board staff review proposed Plans and is provided the opportunity to participate in pre-harvest inspections (inspections conducted prior to Plan approval). CAL FIRE's Plan approval process is the functional equivalent to the California

Environmental Quality Act Environmental Impact Report process (Public Resources Code § 21080.5; see also California Code of Regulations, title 14, § 896).

Section 208 of the federal Clean Water Act (33 U.S.C. § 1288) requires states to identify areas with "substantial water quality problems" and to designate a Water Quality Management Agency (WQMA) to develop an area-wide plan for addressing water pollution. In 1988, the State Water Board (a) conditionally certified the "Water Quality Management Plan for Timber Operations on Nonfederal Lands" which included those FPR selected as best management practices and the process by which those rules are administered; (b) designated CAL FIRE and the BOF as joint Water Quality Management Agencies; and (c) executed a Management Agency Agreement (MAA) with CAL FIRE and BOF for the purpose of implementing the certified plan and WQMA designations.

The MAA required U.S. Environmental Protection Agency (U.S. EPA) approval of the State Water Board's certification of the FPR and administering processes for regulation of timberland management activities on non-federal lands in California. That approval had not occurred by the time State Board adopted the 2004 Nonpoint Source Policy. Thus, U.S. EPA approval of the State Board's certification of the FPR would not negate the legal requirement for Regional Boards to address nonpoint source pollution using one or more of the three regulatory options provided under the Nonpoint Source Policy (see Finding 12).

AB 1492

Assembly Bill 1492 was enacted in 2012 with the intent to promote and encourage sustainable forest practices; ensure continued sustainable funding for the state's forest practice program to protect the state's forest resources; and replace the piecemeal funding structure with a single funding source. To that end, AB 1492 established the Timber Regulation and Forest Restoration Fund for the purposes of achieving those goals as well as supporting forest, fisheries and wildlife habitat and water quality restoration. Further, the bill extended the potential life span of timber harvest plans filed through the CAL FIRE Review Team process on state or private lands (after 2012) from a maximum of 5 years to a maximum of 7.

The bill language also requires increases in inspections from the Review Team agencies; promotes transparency via creation of performance measures; requires identification and implementation of efficiencies in the regulation of timber harvesting between state agencies; and identifies an intent to modify the current regulatory programs to incorporate and provide incentives for best practices, and develop standards or strategies, where appropriate, to protect natural resources, including the development of plans that address road management and riparian function on an ownershipwide, watershedwide, or districtwide scale.

Finally, the bill requires an annual report to the legislature, prepared by the Secretary of the Natural Resources Agency in conjunction with the Secretary for Natural Resource Protection.

Lead responsibility for implementing the bill has been assigned to the Natural Resource Agency. Members of the Review Team agencies, including Central Valley Water Board staff, participate in AB 1492 Leadership Team meetings as well as the multiple sub-groups developed to implement the legislature's vision. Further information can be found on the Natural Resources Agency website: http://resources.ca.gov/forestry

The California Department of Fish and Wildlife (CDFW)
Pursuant to Fish and Game Code sections 1600-1616, CDFW regulates any activity on non-federal lands that does one or more of the following: 1) substantially diverts or obstructs the natural flow of any river, stream or lake; 2) substantially changes or uses any material from the bed, channel, or bank of, any river, stream, or lake; or 3) deposits or disposes of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake. CDFW may issue a Master Agreement for Timber Operations (MATO) or individual Lake or Streambed Alteration Agreements (LSAAs) to Dischargers that propose watercourse crossing work that meet one or more of these three criteria.

Watercourse crossing work conducted outside of a CAL FIRE-approved Plan or accepted Emergency (EM) Notice, but under the purview of CDFW, was not provided coverage under the Waiver; preventing Dischargers from proactively reconstructing or upgrading existing crossings on their timberlands that were not actively under a Plan. This Order creates a new enrollment category for work on existing watercourse crossings on timber production zoned land outside of a Plan or EM Notice by tiering off CDFW-executed MATOs and LSAAs.

20. **Federal Lands – U.S. Forest Service**
In 1981, pursuant to section 208 of the federal Clean Water Act, the State Water Board (a) certified a plan entitled "Water Quality Management for National Forest System Lands in California" that was developed and submitted by the U.S. Department of Agriculture, U.S. Forest Service; (b) designated the U.S. Forest Service as the WQMA for specified activities on National Forest System lands in California that may result in nonpoint source discharges, including timber management, vegetative manipulation, fuels management, road construction and watershed management; and (c) executed a MAA with the U.S. Forest Service for the purpose of implementing the certified plan and WQMA designation.

The U.S. EPA approved the State Water Board's certification of the U.S. Forest Service water quality management plan, and the management practices therein as "best management practices" (BMPs).

The 1981 MAA between the State Water Board and the U.S. Forest Service contemplates that the Water Boards will waive issuance of waste discharge requirements for U.S. Forest Service timber harvest activities that may result in nonpoint source discharges, provided that the U.S. Forest Service designs and implements its projects to fully comply with state water quality standards. However, the Central Valley Water Board's experience and monitoring have demonstrated that relying solely on the MAA framework to regulate nonpoint source activities on lands managed by the U.S. Forest Service does not result in compliance with water quality standards, and thus does not comport with the State Water Board's Nonpoint Source Policy (see Finding 12).

21. **Chronology of Timber Waiver of Waste Discharge Requirements**
On 30 January 2003, in response to legislative amendments to Water Code section 13269, the Central Valley Water Board adopted Resolution No. R5-2003-0005, which included a conditional "Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities" (Waiver) as Attachment A.

On 28 April 2005, the Central Valley Water Board adopted Resolution No. R5-2005-0052, which (1) renewed the Waiver for a term of 5 years; (2) revised Attachment A; and (3) added Attachment B, "Monitoring and Reporting Conditions" and Attachment C, "Implementation, Forensic and Effectiveness Monitoring and Reporting Program".

On 18 March 2010, the Central Valley Water Board adopted Order R5-2010-0022, which renewed the Waiver and Attachments A, B, and C for 5 years.

On 4 December 2014, the Central Valley Water Board adopted Order No. R5-2014-0144, which renewed the Waiver and Attachments A, B, and C for an additional 3 years; the Waiver expires on March 31, 2018.

MONITORING AND REPORTING PROGRAM

22. Water Code section 13267(b)(1) provides:

> *In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.* (2) *When requested by the person furnishing a report, the portions of a report that might disclose trade secrets or secret processes may not be made available for inspection by the public but shall be made available to governmental agencies for use in making studies. However, these portions of a report shall be available for use by the state or any state agency in judicial review or enforcement proceedings involving the person furnishing the report.*

23. Technical reports are necessary to evaluate Discharger compliance with the terms and conditions of this Order and to ensure that applicable water quality objectives are in fact being met. Consistent with Water Code section 13267, this Order requires the implementation of a monitoring and reporting program (MRP) that is designed to determine the effects of a Discharger's nonpoint source activity on water quality, to verify the effectiveness of management practices designed to comply with applicable water quality objectives, to verify the adequacy and effectiveness of the Order's conditions, and to evaluate Discharger compliance with the terms and conditions of the Order. Additional information regarding the justification for monitoring and technical reports under this Order is included in the Information Sheet.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

24. The Central Valley Water Board, acting as the lead agency for this project under the California Environmental Quality Act (CEQA)(Public Resources Code, section 21000 et seq.), conducted an Initial Study in 2002 in accordance with California Code of Regulations, title 14, section 15063. The Central Valley water Board adopted a negative declaration pursuant to CEQA on 30 January 2003 when it issued a Waiver of Waste Discharge Requirements Order No. R5-2003-0005.

25. This action to create a General Order does not require preparation of a subsequent or supplemental environmental document pursuant to the California Code of Regulations, title 14, sections 15162 or 15163. There is no evidence to indicate that substantial changes are proposed for the project, that substantial changes have occurred with respect to the circumstances of the project, or that there is new information of substantial importance with respect to the project, as described in section 15162, subdivision (a). Therefore, the environmental impacts from issuance of this Order have already been adequately assessed in accordance with CEQA (title 14, section 15061(b)(3)).

ANTIDEGRADATION

26. State Water Board Resolution 68-16 ("Statement of Policy with Respect to Maintenance of High Quality Waters in California") requires the Central Valley Water Board to regulate discharges of waste to waters of the state to achieve the highest water quality consistent with maximum benefit to the people of the state. It further requires that the Discharger meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that pollution or nuisance will not occur and that the highest water quality consistent with maximum benefit to the people of the state will be maintained. This Order is consistent with Resolution 68-16 because it requires compliance with applicable water quality control plans, prohibits the creation of pollution or nuisance, and sets forth conditions that require Dischargers to implement additional management practices (beyond those required in the FPR and U.S. Forest Service BMP guidance manuals) to assure protection of beneficial uses of waters of the state and maintain the highest water quality consistent with maximum benefit to the people of the state.

27. This Order is in the public interest and is protective of water quality as described below:
    a) Timberland management activities in California are primarily regulated by other agencies, including CAL FIRE and the U.S. Forest Service. The Central Valley Water Board does not approve timberland management activities, but it does have authority to require compliance with the Water Code.
    b) Without this Order, timberland management activities would continue under authority of those other agencies, but such activities may not be subject to appropriate conditions protective of water quality.
    c) Without this Order, the Central Valley Water Board could regulate a smaller percentage of timberland management activities in the Region individually, but once enrolled in this Order, timberland management activities are subject to enforceable conditions.
    d) This Order contains conditions that require compliance with the Basin Plans, including applicable water quality objectives and prohibitions.
    e) This Order contains conditions requiring compliance with a MRP that will assist in the protection of water quality through assessment and verification of the adequacy and effectiveness of Order conditions and management practices.
    f) Compliance with the conditions of this Order will ensure enrolled Projects are protective of water quality.
    g) This Order does not approve of or authorize a condition of pollution or nuisance.
    h) This Order's conditions are subject to enforcement pursuant to Water Code section 13350.
    i) Given available Central Valley Water Board staff resources, this Order is an effective mechanism to regulate a large number of potential discharges and allows staff to maximize field presence.
    j) This Order allows staff to continue to participate in the review of proposed timberland management Projects, providing staff the opportunity to require implementation of

protective measures beyond those required by CAL FIRE and the U.S. Forest Service for the most critical timber operations.

k) This Order allows for inclusion of staff recommendations developed during review of Projects.

l) This Order allows for watercourse crossing reconstruction on existing crossings on timber production zoned land outside of a Plan or EM Notice that might otherwise go uncorrected for years.

m) The inclusion of a MRP allows for timely application of management practices to protect waters of the state once failures resulting in discharges or potential failures that may result in discharges have been identified.

GENERAL FINDINGS

28. Any person seeking coverage under this Order shall file the applicable eligibility document(s) with the Central Valley Water Board as described herein. Where this Order requires the submittal of a NOI, the Discharger shall complete and submit the NOI form available at: http://www.waterboards.ca.gov/centralvalley/water_issues/forest_activities/index.shtml Dischargers shall file any additional eligibility documents required by the Executive Officer.

29. An annual fee for enrollment under this Order is not required pursuant to Assembly Bill 1492, codified as Public Resources Code section 4629.6(c), which states that no currently authorized or required fees shall be charged by the Regional Water Boards for activities or costs associated with the review of Projects or permits necessary to conduct timberland management activities.

30. This Order does not apply to discharges requiring a National Pollutant Discharge Elimination System (NPDES) permit under the Clean Water Act, including silvicultural point sources as defined in 40 CFR 122.27.

31. This Order does not authorize any act that results in the taking of threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code §§ 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C.A. §§ 1531 to 1544). If a "take" will result from any action authorized under this Order, the Discharger shall obtain appropriate take authorization prior to construction or operation of the Project. The Discharger shall be responsible for meeting all requirements of the applicable Endangered Species Acts.

32. Section 106.3 of the Water Code establishes the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. This Order promotes that policy by requiring Dischargers to implement best management practices designed to achieve applicable water quality objectives developed to protect municipal and domestic water supplies.

PUBLIC NOTICE & BOARD MEETING

33. The Central Valley Water Board has notified interested agencies and persons of its intent to issue this Order for discharges of waste from timberland management activities on non-federal and federal lands, and has provided them an opportunity to participate in public workshops and to submit written comments.

34. The Central Valley Water Board conducted a public hearing on 9 June 2017, and all comments,

testimony, and evidence pertaining to this Order were heard and considered.

35. This Order is effective upon adoption by the Central Valley Water Board on 9 June 2017 and remains in effect unless rescinded or revised by the Central Valley Water Board.

IT IS HEREBY ORDERED that all Dischargers meeting the criteria and conditions for coverage under this Order shall comply with the following:

I. Prohibitions

1. The Discharger shall not create a condition of pollution, contamination, or nuisance, as defined by Water Code section 13050.

2. The Discharger shall not contribute to an exceedance of any applicable water quality objectives (whether numeric or narrative) or of any applicable state or federal water quality criteria.

3. The discharge of any waste not specifically regulated by this Order is prohibited unless (a) the Discharger complies with Water Code section 13260(a) and the Central Valley Water Board either issues WDRs pursuant to Water Code section 13263 or an individual waiver pursuant to Water Code section 13269; or (b) the discharge does not create or threaten a condition of pollution or nuisance and the timeframes in Water Code section 13264(a) have lapsed.

4. The Discharger shall not cause any point source discharge of waste to a water of the United States unless such discharge is in compliance with a duly-approved NDPES permit.

II. Provisions

1. Dischargers covered under this Order shall comply with the terms and conditions contained in this Order.

2. The Discharger shall conduct timberland management activities in accordance with (a) the CAL FIRE-approved Plan, CAL FIRE-accepted Exemption (EX) or EM Notice, or CDFW-executed MATO or LSAA, in the case of timberland management activities on non-federal timberlands; or (b) in accordance with the final environmental document/decision document prepared pursuant to the National Environmental Policy Act (NEPA) and valid third party contracts, in the case of timberland management activities on federal lands managed by the U.S. Forest Service.

3. The Discharger shall allow Central Valley Water Board staff reasonable access onto property where activities covered by this Order occur whenever requested by Central Valley Water Board staff for the purpose of performing inspections and conducting monitoring, including; sample collection, measuring, and photographing/taping to determine compliance with Order conditions. Such inspections and monitoring shall be conducted consistent with Water Code section 13267(c), Public Resources Code section 4604(b)(1), and other applicable law.

4. The Discharger shall incorporate management practices and/or water quality protective measures resulting from Central Valley Water Board staff participation in CAL FIRE's Review Team process, the Federal review process, the CDFW review process, and/or

during Project enrollment that arise from changed conditions/new information into the Project document(s) and/or NOI addendum. The Discharger may propose alternative management practices if it can demonstrate to the satisfaction of the Executive Officer that the proposed alternatives will meet water quality requirements. Alternative management practices proposed by a Discharger must comply with the Prohibitions in this Order. Until such alternative management practices receive written approval from the Executive Officer, the Discharger shall adhere to those management practices provided by Regional Water Board staff.

5. The Discharger shall maintain a copy of this Order at its primary place of business. The Discharger's designee/agents shall be provided a copy and be familiar with the contents and requirements of this Order.

6. Dischargers shall comply with the attached Monitoring and Reporting Program, Order No. R5-2017-0061, and future revisions thereto or with an individual monitoring and reporting program as specified by the Central Valley Water Board or the Executive Officer.

7. The Discharger shall comply with all applicable requirements and prohibitions of the applicable Basin Plan, including any amendments adopted by the Central Valley Water Board and approved by the State Water Board, and with all applicable policies adopted by the State Water Board.

8. The Executive Officer may require the Discharger to submit additional technical reports pursuant to Water Code section 13267.

9. Pursuant to Water Code section 13263, this Order shall not create a vested right to discharge waste to waters of the state, and all such discharges of waste shall be considered a privilege. Accordingly, the regulatory coverage provided by this Order: (a) may be modified or terminated at any time, either in its entirety or as to any individual Dischargers; (b) does not permit an illegal activity; (c) does not preclude the need for permits which may be required by federal, local, or other governmental agencies; and (d) does not preclude the Central Valley Water Board from administering enforcement remedies (including civil liability) pursuant to the Water Code.

III. Criteria and Condition Specifications by Category

Table 1 summarizes the enrollment categories and corresponding requirements under this Order. The Central Valley Water Board may determine that a Discharger's otherwise eligible Project does not qualify for enrollment under the requested category, requires enrollment in a different category, or that the Project does not quality for enrollment under the Order at all. If the Central Valley Water Board makes such a determination, it will provide prompt notice to the Discharger that enrollment in a different category is required or that enrollment under the Order is denied.

Eligibility under Category 1, 2A, or 2B assumes Discharger compliance with applicable criteria/conditions under California Code of Regulations, title 14, section 1038 (for Notices of Exemption) or title 14, section 1052 et seq. (for Emergency Notices). During a declared State of Emergency, an Executive Order may authorize CAL FIRE to suspend some or all of these criteria. In the event of such a suspension, the Central Valley Water Board hereby retains for itself the discretion to require the Discharger to meet otherwise applicable criteria under title 14, section

1038 and/or section 1052 et seq. – whether suspended by CAL FIRE or not – for eligibility under Category 1, 2A, or 2B. The Central Valley Water Board will provide prompt notice to affected Dischargers that it intends to exercise this discretion, if applicable.

Table 1. Summary of Timberland Management Activity Categories and Requirements[1]

Lead Agency		Cat.	Plans/Projects Covered	NOI, operation notification, and monitoring requirements	Pages
	CAL FIRE (non-federal)	1	• 1038 EX Notices[2,3] • 1052.1-1052.5 EM Notices[2] (*except fire salvage*) • 1104.1 Conversion Exemptions[2]	• Automatically enrolled • Agency Monitoring	15-16
		2A	• 1052.1 EM Notice[2] for fire salvage on: o Industrial timberlands; or o Non-industrial timberlands when no residence is within EM	• Automatically enrolled contingent on submittal of *NOI* and *Erosion Site Table* within 30 days of EM Notice acceptance by CAL FIRE • *Post-Fire Management and Reforestation Plan* (if applicable) • Annual Agency, Implementation, Forensic, and Effectiveness Monitoring and Summary of Operations • Updates to *Erosion Site Table* and if applicable, *Post-Fire Management and Reforestation Plan*	16-18
		2B	• 1052.1 EM Notice[2] for fire salvage when a non-industrial timberland owner's residence is within EM	• *NOI* prior to operations • Agency and Effectiveness Monitoring	19-20
		3A	• THPs, PTHPs, WFMPs, NTMPs, and other Plans[4]	• *NOI* prior to operations • Annual Agency, Implementation, Forensic, and Effectiveness Monitoring and Summary of Operations	21-23
		3B	• 1051-1051.7 modified THPs[2]; or • THPs, PTHPs, WFMPs, NTMPs, and other Plans that meet all the low threat criteria in Part III.D.2.a.ii.	• *NOI* prior to operations • Agency and Effectiveness Monitoring	21-23
	CDFW	4	• Watercourse crossing work conducted under CDFW MATO or LSAA on timber production zoned land for replacement/reconstruction of *existing* watercourse crossings outside of a Plan or EM Notice	• Submit copy of CDFW notification 30 days prior to work commencing • *NOI* 30 days prior to operations • Implementation, Forensic, and Effectiveness Monitoring	24

		Cat.	Plans/Projects Covered	NOI, operation notification, and monitoring requirements	Pages
	U.S. Forest Service	5A	• Post-fire timberland management activities (fire salvage and hazard tree removal)	• Automatically enrolled contingent on submittal of *NOI* and *Erosion Site Table* within 30 days of startup of operations • *Post-Fire Management and Reforestation Plan* (if applicable) • Annual Implementation, Forensic, and Effectiveness Monitoring and Summary of Operations • Updates to *Erosion Site Table* and if applicable, *Post-Fire Management and Reforestation Plan*	25-27
		5B	• Timber harvesting sales, vegetation management and fuels reduction, forest stand improvement and hazard tree removal, and pesticide applications associated with the aforementioned.	• *NOI* 15 days prior to operations • Annual Notice of Operations 15 days prior to startup • Annual National Core BMP monitoring protocols OR Implementation, Forensic, and Effectiveness Monitoring and Summary of Operations	28-29

[1]This table only provides an abbreviated summary of the criteria, conditions, and monitoring for categories; refer to category specific criteria/conditions and Attachments B and C for complete information.
[2]California Code of Regulations, title 14, section (as cited in table)
[3]Excludes the cutting and removal of timber and other solids wood forest products for: Christmas trees, structure protection (150 and 300 feet), and woody debris and slash removal (see Attachment A definition of "timber land management activities").
[4]THP – timber harvesting plan, PTHP – program timber harvesting plan, NTMP – non-industrial timber management plan

A. Certification of Notice of Non-Applicability on Federal and Non-Federal Lands

Enrolment under this Order is not required for Projects that (1) do not contain watercourses or wet meadows and other wet areas within or directly adjacent to the Project area AND (2) do not pose a threat to water quality or the beneficial uses of waters of the state (appurtenant roads to be considered in evaluation). **No later than ten days prior** to the startup of operations, Project proponents must submit a *Certification of Notice of Non-Applicability* signed by a duly authorized agent to the Central Valley Water Board certifying that the Project meets the criteria above.

B. Category 1: Low Threat Exemption and Emergency Notices on Non-Federal Lands

1. Eligibility Criteria: Activities that may proceed under Category 1 are those:

   a) Conducted under a CAL FIRE-accepted Exemption pursuant to California Code of Regulations, title 14, section 1038 (excludes the cutting and removal of timber and other solid wood forest products for Christmas trees, structure protection (150 and 300 feet), and woody debris and slash removal), including but not limited to:

      i. Harvesting dead, dying or diseased trees;
      ii. Substantially damaged timberland unmerchantable as sawlog;
      iii. Forest fire prevention;
      iv. Drought mortality.

   -OR-

   b) Conducted under a CAL FIRE accepted Emergency Notice pursuant to the conditions listed in California Code of Regulations, title 14, sections 1052-1052.5 (**substantially damaged timberlands from fire (fire salvage) excluded – see Categories 2A and 2B**), including, but not limited to:

      i. Harvesting dead or dying (fire salvage excluded);
      ii. Fuel hazard reduction;
      iii. Sudden Oak Death disease.

   -OR-

   c) Conducted under a CAL FIRE-accepted Conversion Exemption pursuant to California Code of Regulations, title 14, section 1104.1, including but not limited to:

      i. Less than 3 acres for the purpose of fuels reduction and/or construction activities;
      ii. Public agency, public and private utility right-of-way.

2. Enrollment: Projects meeting the eligibility criteria listed above for Category 1 are *automatically* enrolled under the Order and must comply with the conditions listed below.

3. Conditions:

   a) The Discharger shall submit a copy of the CAL FIRE-accepted Exemption or Emergency Notice if requested by the Central Valley Water Board.

   b) For Conversion Exemptions that will be for the purpose of residential or commercial development, the Discharger must obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit), State Water Board Order No. 2009-0009-DWQ prior to construction activities that disturb one or

more acres or activities that disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres.

c) For Exemption Notices (typically less than 3 acre conversions), for cannabis cultivation, the Discharger may need to obtain coverage under the General Permit for Discharges of Waste Associated with Medicinal Cannabis Cultivation Activities, Order No. R5-2015-0113 or any applicable Order that the State Water Board may adopt in the future to regulate cannabis cultivation.

d) The Discharger shall comply with all conditions specified in Attachment B, Monitoring and Reporting Program, Order No. R5-2017-0061, including notifying the Central Valley Water Board whenever: (1) Agency Monitoring detects a violation of the California Forest Practice Rules that relate to water quality protection measures; or (2) management measures fail and result in a discharge, or the potential to discharge, waste to waters of the state.

C. Categories 2A and 2B: Emergency Notices Related to Fire Salvage on Non-Federal Lands

Category 2A (Industrial Fire Salvage and Non-Industrial Fire Salvage With No Residence)

1. Eligibility Criteria: Activities that may proceed under Category 2A are those conducted under a CAL FIRE-accepted Emergency Notice pursuant to the conditions listed in California Code of Regulations, title 14, section 1052.1 for:

   a) Fire Salvage, for **industrial** timberlands.

   -OR-

   b) Fire salvage, for **non-industrial** timberlands when a **residence is not within the Emergency area**.

2. Enrollment: Projects meeting the eligibility criteria listed above for Category 2A are *automatically* enrolled under the Order when the Discharger submits a copy of the Emergency Notice accepted by CAL FIRE to the Central Valley Water Board.

3. Conditions: Dischargers conducting timberland management activities that meet the eligibility criteria for Category 2A listed above must comply with all of the following conditions, as applicable:

   a) The Central Valley Water Board must receive a **complete *NOI for Category 2A* and *Erosion Site Table*** (see Table 1 in Category 2A *NOI*) **within 30 days of Emergency Notice acceptance by CAL FIRE,** signed by the timberland/timber owner, certifying that the activities meet the criteria and conditions for enrollment in Order Category 2A. The Discharger shall provide timely amendments of the *Erosion Site Table* throughout Emergency Notice enrollment to the Central Valley Water Board when conditions or management objectives have changed.

   b) **IF pesticides will be applied following the fire**, THEN the Discharger shall **EITHER**:

      i. **Submit a Post-Fire Management and Reforestation Plan** (PFP; see Attachment C) **to the Central Valley Water Board for approval prior to application of pesticides** within the post-fire management and reforestation plan area. The PFP shall include measures that will provide equal to or better protection than the conditions under Part III.C.3.b.ii below. **The Executive Officer's written approval of the PFP is required**

before implementation of the PFP can satisfy the requirements of this Part III.C.3.b.; approval or denial of the PFP shall be provided within 30 days of PFP submittal.

-OR-

ii. Meet **ALL** of the following conditions:

1. The Discharger shall **comply with the following pesticide no-spray buffers** (unless more stringent buffers are dictated by application labels/guidance, statute, or regulation):

    a. For Class I and II watercourses, the applicable WLPZ widths specified in the California Code of Regulations, title 14, section 936.5;

    b. For Class III and IV watercourses, a minimum of 25 feet where sideslope steepness is less than 30%, and a minimum of 50 feet where sideslope steepness is 30% or greater.

2. Where management activities are planned on a burned area with **slopes greater than 30%, a minimum of 50% average effective groundcover** (see Attachment C for guidance) **is required to be documented prior to pesticide application**. Documentation shall be provided to the Central Valley Water Board in the pesticide notification **30 days prior to application**.

3. The Discharger shall **notify** the Central Valley Water Board **in writing at least 30 days prior to any proposed application of pesticides**. The notification does *not* need to include information on hack and squirt or individual stump applications. The written notification shall include the pesticide product(s) to be applied, the proposed date(s) of application, the method(s) of application, the area(s) of application (CAL FIRE Notice number and Township/Range/Section), a description of measures that will be employed to assure compliance with the applicable Basin Plan, and documentation of 50% or greater effective groundcover (as applicable). Subsequent changes to the proposal must be submitted in writing no less than 48 hours prior to pesticide application.

c) The Discharger shall meet the following conditions unless Central Valley Water Board staff has been consulted and agrees to alternative protection measures as warranted by site-specific conditions (see Part II.4.) and/or as requested by the Discharger when such protection is inconsistent with land management objectives:

i. A minimum Equipment Limitation Zone for any and all Class III and Class IV watercourses of at minimum 25 feet where sideslope steepness is less than 30%, and at a minimum 50 feet where sideslope steepness is 30% or greater.

ii. Culverts or other permanent in-stream structures at watercourse crossings in which water is flowing at the time of installation shall be installed with their necessary protective structures (i.e. armoring, wing walls, diversion prevention measures) concurrently with fill placement. Additionally, installation shall utilize methods to temporarily isolate or divert stream flows from the installation area while maintaining bypass flows or as specified in an executed MATO or LSAA from CDFW.

iii. Any and all riparian vegetation, other than commercial species, that is found along watercourses and lakes or that is found within or bordering wet meadows and other wet areas shall be retained and protected to the extent feasible during timberland management activities.

d) *IF*:

i. Activities are undertaken pursuant to a CAL FIRE Notice on which Central Valley Water Board staff has not consulted; *AND*

ii. In the CAL FIRE Notice or *NOI* the Discharger proposes *EITHER*

1. Timberland management activities on soils with extreme erosion hazard rating (post-fire), known landslides, and/or unstable areas *that have the potential to impact water quality*, *OR*
2. Any watercourse crossing that involves the placement of more than 500 cubic yards or 25 vertical feet of fill material,

THEN additional field review must be conducted or directed by a licensed civil engineer or licensed geologist prior to the startup of operations to determine if activities conducted under the CAL FIRE Notice could cause or exacerbate the potential for soil erosion or mass soil movement. The CAL FIRE Notice or NOI addendum must incorporate all recommendations made by said licensed engineer or geologist for the specific site conditions listed above.

e) The Discharger shall submit copies of any CDFW **notification(s)** for watercourse crossing work within the burn area associated with a MATO or LSAA **within 30 days of filing the notification with CDFW**.

f) For a CAL FIRE Notice where aquatic or wetland habitat for rare, threatened or endangered species is identified and where timberland management activities may impact such habitat, additional field review shall be conducted prior to the startup of operations by a scientist, with a bachelor's or advanced degree in biological sciences and experience in aquatic systems, and/or a qualified professional trained in biological assessments to determine if the Notice could adversely affect such species or their habitat. The CAL FIRE Notice or NOI addendum must incorporate all project modifications and mitigation measures recommended by the scientist/professional to avoid impacts to rare, threatened, or endangered species.

g) If mine tailings and/or associated waste rock will be disturbed or used as construction materials as part of timberland management activities, the Discharger shall contact Central Valley Water Board staff to discuss proper characterization of the materials to ensure prior to such disturbance or use there will be no adverse impacts to water quality and beneficial uses.

h) The Discharger shall comply with all the conditions specified in Attachment B, Monitoring and Reporting Program, Order No. R5-2017-0061. Category 2A will be subject to agency, implementation, forensic, and effectiveness monitoring; an annual operations summary; and updates to the *Erosion Site Table* and PFP (as applicable).

i) The Discharger shall seek termination of coverage under the Order in accordance with Part V.A., Termination of Coverage.

Category 2B (Non-Industrial Fire Salvage with Residence)

4. Eligibility Criteria: To be eligible for enrollment under Category 2B, activities must be:

    a) Conducted under a CAL FIRE-accepted Emergency Notice pursuant to the conditions listed in California Code of Regulations, title 14, section 1052.1 for **fire salvage**, when a **non-industrial** timberland owner's **residence is within the Emergency area**.

5. Enrollment: Projects that meet the Category 2B eligibility criteria shall enroll under this Order by submitting the following **prior to operations commencing**: (1) a copy of the CAL FIRE-accepted Notice, and (2) a single *NOI for Categories 2B, 3A, and 3B*, signed by the timberland/timber owner, certifying that the activities meet the criteria and conditions for enrollment in Order Category 2B. **Central Valley Water Board staff will review and respond to the *NOI* within 15 days of receipt; activities may commence in compliance with this Order once the Central Valley Water Board has issued a Notice of Applicability (NOA) to the Discharger indicating that the *NOI* is complete**.

6. Conditions: Dischargers conducting timberland management activities under Category 2B must comply with the following conditions, as applicable:

    a) The Discharger must meet the following conditions unless Central Valley Water Board staff has been consulted and agrees to alternative protection measures as warranted by site-specific conditions (see Part II.4.) and/or as requested by the Discharger when such protection is inconsistent with land management objectives:

        i. A minimum Equipment Limitation Zone for any and all Class III and Class IV watercourses of at minimum 25 feet where sideslope steepness is less than 30%, and at a minimum 50 feet where sideslope steepness is 30% or greater.

        ii. Culverts or other permanent in-stream structures at watercourse crossings in which water is flowing at the time of installation shall be installed with their necessary protective structures (i.e. armoring, wing walls, diversion prevention measures) concurrently with fill placement. Additionally, installation shall utilize methods to temporarily isolate or divert stream flows from the installation area while maintaining bypass flows or as specified in an executed MATO or LSAA from CDFW.

        iii. Any and all riparian vegetation, other than commercial species, that is found along watercourses and lakes or that is found within or bordering wet meadows and other wet areas shall be retained and protected to the extent feasible during timberland management activities.

    b) *IF*:

        i. Activities are undertaken pursuant to a CAL FIRE Notice on which Central Valley Water Board staff has not consulted; *AND*

        ii. The CAL FIRE Notice proposes *EITHER*

            1. Timberland management activities on soils with extreme erosion hazard rating (post-fire), known landslides, and/or unstable areas *that have the potential to impact water quality*, *OR*
            2. Any watercourse crossing that involves the placement of more than 500 cubic yards or 25 vertical feet of fill material,

THEN additional field review must be conducted or directed by a licensed civil engineer or registered geologist prior to the startup of operations to determine if the CAL FIRE Notice could cause or exacerbate the potential for soil erosion or mass soil movement. The CAL FIRE Notice or NOI addendum must incorporate all recommendations made by said licensed engineer or geologist for the specific site conditions listed above.

c) The Discharger shall submit copies of any CDFW **notification(s)** for watercourse crossing work within the burn area associated with a MATO or LSAA **within 30 days of filing the notification with CDFW**.

d) For a CAL FIRE Notice where aquatic or wetland habitat for rare, threatened or endangered species is identified and where timberland management activities may impact such habitat, additional field review shall be conducted prior to the startup of operations by a scientist, with a bachelor's or advanced degree in biological sciences and experience in aquatic systems, and/or a qualified professional trained in biological assessments to determine if the Notice could adversely affect such species or their habitat. The CAL FIRE Notice or NOI addendum must incorporate all project modifications and mitigation measures recommended by the scientist/professional to avoid impacts to rare, threatened, or endangered species.

e) The Discharger shall **notify** the Central Valley Water Board in writing at least **15 days prior to any proposed application of pesticides**; the notification does *not* need to include information on hack and squirt or individual stump applications. The written notification shall include the pesticide product(s) to be applied, the proposed date(s) of application, the method(s) of application, the area(s) of application (Notice number and Township/Range/Section), and a description of measures that will be employed to assure compliance with the applicable Basin Plan. Subsequent changes to the proposal must be submitted in writing no less than 48 hours prior to pesticide application.

f) If mine tailings and/or associated waste rock will be disturbed or used as construction materials as part of timberland management activities, the Discharger shall contact Central Valley Water Board staff to discuss proper characterization of the materials to ensure prior to such disturbance or use there will be no adverse impacts to water quality and beneficial uses.

g) The Discharger shall comply with all the conditions specified in Attachment B, Monitoring and Reporting Program, Order No. R5-2017-0061. Category 2B will be subject to agency and effectiveness monitoring.

h) The Discharger shall seek termination of coverage under the Order in accordance with Part V.A., Termination of Coverage.

D. Categories 3A and 3B: Plans that Receive Discretionary Approval from CAL FIRE on Non-Federal Lands

Category 3A (Plans With a Higher Threat to Water Quality)

1. Eligibility Criteria: To be enrolled under Category 3A, activities must meet the following criteria:

   a) The covered activities are timberland management activities on non-federal lands that receive discretionary approval from CAL FIRE, including but not limited to:

      i. Timber harvesting plans;
      ii. Program timber harvesting plans;
      iii. Working forest management plans;
      iv. Non-industrial timber management plans;
      v. Other Plans.

   b) The approved Plan documents or *NOI* addendum include additional management practices and/or water quality protective measures (beyond the requirements of the current Forest Practice Rules) identified during the CAL FIRE Review Team process and/or during Project enrollment (i.e. changed conditions/new information)(see Part II.4.).

Category 3B (Plans With a Lower Threat to Water Quality)

2. Eligibility Criteria: To be enrolled under Category 3B, activities must meet the following criteria:

   a) The covered activities are timberland management activities on non-federal lands that receive discretionary approval from CAL FIRE, including but not limited to:

      i. Modified timber harvesting plans pursuant to California Code of Regulations, title 14, sections 1051-1051.7;

      -OR-

      ii. Timber harvesting plans, program timber harvesting plans, working forest management plans, non-industrial timber management plans, and other Plans that comply with all of the following criteria:

         1) No timberland management activities (i.e. watercourse crossing, road, and/or landing reconstruction/construction/abandonment) within the standard width of a WLPZ or ELZ (as defined in CCR, title 14, section 936.5), wet meadows and other wet areas, ***except*** for: 1) the use and maintenance (not reconstruction) of ***existing*** stable roads and associated watercourse crossings in good working condition that ***will not result in a significant sediment discharge***, and 2) the installation and use of ***dry*** Class III watercourse tractor crossings;
         2) No significant existing or potential erosion sites;
         3) No ground-based equipment on high or extreme Erosion Hazard Rating (EHR) that may result in a significant sediment discharge;
         4) No timberland management activities conducted in-lieu of the standard WLPZ practices contained in the Forest Practice Rules.

   b) The approved Plan documents or *NOI* addendum include additional management practices and/or water quality protective measures (beyond the requirements of the current Forest

Practice Rules) identified during the CAL FIRE Review Team process and/or during Project enrollment (i.e. as a result of changed conditions/new information) (see Part II.4.).

3. Enrollment: Dischargers conducting activities that meet the criteria of Category 3A or 3B shall enroll under this Order as follows:

   a) The Discharger shall submit a copy of the CAL FIRE approved Plan if requested by Central Valley Water Board staff. The Plan must incorporate additional or modified management practices and/or water quality protective measures resulting from the CAL FIRE Review Team process.

   b) The Discharger shall submit a single completed *NOI for Categories 2B, 3A, and 3B* **prior to operations commencing**, signed by the timberland/timber owner, certifying that the activities meet the criteria and conditions contained in either Order Category 3A or 3B. **Central Valley Water Board staff will review and respond to the *NOI* within 15 days of receipt; activities may commence once the Central Valley Water Board has issued a NOA to the Discharger indicating that their NOI is complete**.

4. Conditions: Dischargers conducting timberland management activities under Category 3A or 3B must comply with the following conditions, as applicable:

   a) For CAL FIRE-approved **NTMPs** that do not incorporate the FPR "Road Rules" (Cal. Code Regs., tit. 14, art. 12) which became effective January 2015, the Discharger must submit an inventory of significant existing or potential erosion sites, as detailed in California Code of Regulations, Title 14, section 923.1(e), to the Central Valley Water Board **at least 15 days prior to commencement of timberland management activities**. The erosion inventory shall: (1) be prepared by a RPF; (2) encompass the NTO area and appurtenant roads at a minimum; and (3) include an implementation schedule for treatment of erosion sites.

   b) *IF*:
      i. Activities are undertaken pursuant to a Plan on which Central Valley Water Board staff has not consulted; *AND*

      ii. In the Plan the Discharger proposes *EITHER*
         1. Timberland management activities on soils with extreme erosion hazard rating, known landslides, and/or unstable areas *that have the potential to impact water quality*, *OR*
         2. Any watercourse crossing that involves the placement of more than 500 cubic yards or 25 vertical feet of fill material,

      THEN additional field review must be conducted or directed by a licensed civil engineer or registered geologist prior to the startup of operations to determine if activities conducted under the Plan could cause or exacerbate the potential for soil erosion or mass soil movement. The Plan or NOI addendum must incorporate all recommendations made by said licensed engineer or geologist for the specific site conditions listed above.

   c) Culverts or other permanent in-stream structures at watercourse crossings in which water is flowing at the time of installation shall be installed with their necessary protective structures (e.g. armoring, wing walls, diversion prevention measures) concurrently with fill placement. Additionally, installation shall utilize methods to temporarily isolate or divert stream flows

from the installation area while maintaining bypass flows or as specified in an executed MATO or LSAA from CDFW.

d) For Plans that will be for the purpose of cannabis cultivation, the Discharger may need to obtain coverage under the General Permit for Discharges of Waste Associated with Medicinal Cannabis Cultivation Activities, Order No. R5-2015-0113 or any applicable Order that the State Water Board may adopt in the future to regulate cannabis cultivation.

e) If mine tailings and/or associated waste rock will be disturbed or used as construction materials as part of timberland management activities, the Discharger shall contact Central Valley Water Board staff to discuss proper characterization of the materials to ensure prior to such disturbance or use there will be no adverse impacts to water quality and beneficial uses.

f) The Discharger shall comply with all the conditions specified in Attachment B, Monitoring and Reporting Program, Order No. R5-2017-0061.

g) The Discharger shall **notify** the Central Valley Water Board in writing at least **15 days prior to any proposed application of pesticides**; the notification does *not* need to include information on hack and squirt or individual stump applications. The written notification shall include the pesticide product(s) to be applied, the proposed date(s) of application, the method(s) of application, the area(s) of application (Plan number and Township/Range/Section), and a description of measures that will be employed to assure compliance with the applicable Basin Plan. Subsequent changes to the proposal must be submitted in writing no less than 48 hours prior to pesticide application.

h) The Discharger shall seek termination of coverage under the Order in accordance with Part V.A., Termination of Coverage.

For **non-expiring Plans** (such as NTMPs and WFMPs), the Discharger has the following enrollment/termination options: (1) enroll and terminate with each entry (NTO/Notice), or (2) remain continuously enrolled for the duration of the Plan with an additional requirement to certify in the annual report when discharges associated with timberland management activities for each NTO/Notice area have ceased prior to cessation of monitoring for that entry (see Attachment B, Part V.B.).

E. Category 4: Watercourse Crossing Work Conducted under a MATO or LSAA Outside of a Plan / Emergency Notice on Non-Federal Lands

1. Eligibility Criteria: To be enrolled under Category 4, activities must meet the following criteria:

    a) The activities are conducted under a CDFW-executed MATO or LSAA on timber production zoned land pursuant to the conditions listed in Fish and Game Code sections 1600-1616 for replacement/reconstruction of *existing* watercourse crossings outside of a CAL FIRE accepted EM Notice or approved Plan.

    b) A *NOI* is submitted on a project-by-project basis (i.e. no long-term enrollment of a MATO).

    c) The CDFW notification/sub-notification or *NOI* incorporates any water quality protective measures identified during review of the project (see Part II.4.).

2. Enrollment: Dischargers conducting timberland management activities under Category 4 shall enroll under this Order by complying with the following:

    a) Submit a copy of the CDFW notification to Central Valley Water Board staff concurrent with submittal to CDFW; at a minimum**, the notification must be submitted at least 30 days prior to work commencing**. The scope of the notification shall encompass all information required by the applicable MATO or CDFW Form FG2023 for an individual LSAA. The Discharger shall notify the Central Valley Water Board if CDFW declares the notification incomplete or requests additional information.

    b) Submit a *NOI for Category 4* **at least 30 days prior to operations commencing** signed by the timberland/timber owner certifying that the activities meet the criteria and conditions required in Category 4. Activities may commence once the Central Valley Water Board has issued a NOA to the Discharger indicating that their NOI is complete

3. Conditions: Dischargers conducting timberland management activities enrolled under Category 4 shall comply with the following conditions:

    a) Comply with all water quality management practices identified in the CDFW-executed MATO or LSAA and shall provide any amendments/project changes to the Central Valley Water Board for review in a timely manner. The Discharger shall submit a copy of the LSAA and appropriate CEQA documentation to the Central Valley Water Board. A MATO shall only be submitted when requested.

    b) Notify Central Valley Water Board staff of any scheduled site visit with CDFW staff; Central Valley Water Board staff retains the discretion to require a site visit in accordance with Part II.3.

    c) The Discharger shall comply with all the requirements specified in Attachment B, Monitoring and Reporting Program, Order No. R5-2017-0061. Category 4 will be subject to Implementation, Forensic, and Effectiveness Monitoring.

    d) The Discharger shall seek termination of coverage under the Order in accordance with Part V.A., Termination of Coverage.

F. Categories 5A and 5B: Timberland Management Activities on Federal Lands Managed by the U.S. Forest Service

Category 5A (Post-Fire Activities)

1. Eligibility Criteria: To be enrolled under Category 5A, activities must meet the following criteria:

   a) Post-fire timberland management activities (e.g. fire salvage and post-fire hazard tree removal for commercial purposes) that have the potential to impact water quality, excluding emergency work conducted during or immediately (within 60 days) after the fire, on federal lands where the U.S. Forest Service has conducted the required or appropriate level of multi-disciplinary review of the timber harvesting proposal and has specified best management practices and additional control measures as needed, in order to assure compliance with the applicable Basin Plan.

   b) The U.S. Forest Service has provided Project description documents to the Central Valley Water Board and allowed time for adequate review and comment. These documents include: 1) the NEPA scoping document; and 2) the NEPA draft environmental analysis, which will include site specific information that identifies Significant Existing or Potential Erosion Sites (SEPES) and priority road improvement locations, as well as, proposed treatments and schedule for those sites to improve or protect water quality. Supplemental project documents may also be provided that contain design specifications, management practices, and/or water quality protection measures. Any additional management practices and/or water quality protective measures identified by Central Valley Water Board staff during the scoping period and/or enrollment under this Order will have been discussed with U.S. Forest Service personnel and incorporated into an addendum to the *NOI* (see Part II.4.), including a timeline and checklist for completion. The project will remain enrolled until all identified management practices and/or water quality protective measures have been completed.

   c) The U.S. Forest Service has conducted a cumulative watershed effects (CWEs) analysis, where required or appropriate, and included specific measures needed to reduce the potential for CWEs in order to assure compliance with the applicable Basin Plan.

2. Enrollment: Projects meeting the Category 5A eligibility criteria are *automatically* enrolled under this Order when the U.S. Forest Service submits copies of final project specific decision/NEPA documents that contain information documenting compliance with the eligibility criteria in Part III.F.1.

   The U.S. Forest Service shall include all specific on-the-ground prescriptions designed to adhere to the BMPs described in *National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide*, and all additional management practices and/or water quality protective measures identified by Central Valley Water Board staff (See Part II.4.) within contracts, permits, agreements, and other instruments used to direct the activities of contractors, permittees, U.S. Forest Service personnel, volunteers, and any other third party.

3. Conditions: Dischargers conducting timberland management activities enrolled under Category 5A must comply with the following conditions, as applicable:

   a) The U.S. Forest Service shall submit **a complete *NOI for Category 5A* and *Erosion Site Table*** (see Table 1 in Category 5A NOI) **within 30 days of startup of operations,** signed by

a duly authorized representative, certifying that the activities meet the criteria and conditions for enrollment in Order Category 5A. The U.S. Forest Service shall provide timely amendments of the *Erosion Site Table* to the Central Valley Water Board throughout Project enrollment when conditions or management objectives have changed.

b) For Projects that were included in a Burned Area Emergency Response (BAER) evaluation, the U.S. Forest Service may submit the BAER report in-lieu of the *Erosion Site Table*, if the report includes all the required information (including implementation schedule) and the Discharger intends to implement the BAER recommendations that have a nexus with water quality protection. If the BAER report is incomplete, and does not contain all of the information required in the *Erosion Site Table*, the U.S. Forest Service may submit an addendum to the BAER report with missing or incomplete information.

c) **IF <u>pesticides</u> will be applied following the fire**, THEN the Discharger shall **EITHER**:

i. **Submit a Post-Fire Management and Reforestation Plan** (PFP; see Attachment C) **to the Central Valley Water Board for approval prior to application of pesticides** within the post-fire management and reforestation plan area. The PFP shall include measures that will provide equal to or better protection than the conditions under Part III.F.3.c.ii below. The Executive Officer's written approval of the PFP is required before implementation of the PFP can satisfy the requirements of this Part III.F.3.c.; **approval or denial of the PFP shall be provided within 30 days of PFP submittal**.

-OR-

ii. Meet **ALL** the following conditions:

1. The Discharger must **comply with the following pesticide no-spray buffers** (unless more stringent buffers are dictated by application labels/guidance, statute, or regulation):

a. Perennial or intermittent watercourses which have: (1) surface domestic water use from and/or within 100 feet downstream of operations area and/or (2) fish always or seasonally present onsite, includes habitat to sustain fish migration and spawning, shall utilize the appropriate **Class I WLPZ width(s)** specified in the California Code of Regulations, title 14, section 936.5.

b. Perennial or intermittent watercourses which have: (1) fish always or seasonally present off-site within 1000 feet downstream (excludes intermittent or ephemeral watercourses with no aquatic life that are tributary to watercourses described under (a) above) and/or (2) aquatic habitat for nonfish aquatic species (aquatic insects and/or other physical habitat indicators such as riparian and aquatic vegetation, watercourse debris, and potential for small pool formation), shall utilize the appropriate **Class II WLPZ width(s)** specified in the California Code of Regulations, title 14, section 936.5.

c. Ephemeral or intermittent watercourses with no aquatic life present, watercourse shows evidence of being capable of sediment transport to watercourses described under (a) and (b) above, shall utilize a minimum of **25 feet** where sideslope steepness is **less than 30%,** and a minimum of **50 feet** where sideslope steepness is **30% or greater**.

2. Where management activities are planned on a burned area with **slopes greater than 30%, a minimum of 50% average effective groundcover** (see Attachment C for guidance) **is required to be documented prior to pesticide application**. Documentation shall be provided to the Central Valley Water Board in the pesticide notification **30 days prior to application**.

3. The Discharger shall adhere to the resource protection measures in the Chemical Use Management Activities as designated in the National Best Management Practices for Water Quality Management on National Forest System Lands (USDA April 2012).

4. The Discharger shall **notify** the Central Valley Water Board **in writing at least 30 days prior to any proposed application of pesticides**; the notification does *not* need to include information on hack and squirt or individual stump applications. The written notification shall include the pesticide product(s) to be applied, the proposed date(s) of application, the method(s) of application, the area(s) of application (Township/Range/Section), a description of measures that will be employed to assure compliance with the applicable Basin Plan, and documentation of 50% or greater effective groundcover (as applicable). Subsequent changes to the proposal must be submitted in writing no less than 48 hours prior to pesticide application.

d) For approved Projects that require enrollment under the Order, the Discharger shall **notify the Central Valley Water Board each year at least 15 days prior to start of operations**.

e) The U.S. Forest Service shall comply with all conditions specified in Attachment B, Monitoring and Reporting Program, Order No. R5-2017-0061. Category 5A will be subject to Implementation, Forensic, and Effectiveness Monitoring; an Annual Summary of Operations; and amendments/updates to the *Erosion Site Table* and PFP (as applicable).

f) The U.S. Forest Service shall seek termination of coverage under the Order in accordance with Part V.A., Termination of Coverage.

Category 5B (All timberland management activities except post-fire activities)

4. Eligibility Criteria: To be enrolled under Category 5B, activities must meet the following criteria:

   a) Timberland management activities (see definition of "timberland management activities" as it relates to activities that are commercial in nature) on federal lands where the U.S. Forest Service has conducted a multi-disciplinary review of the timber harvesting proposal and has specified best management practices and additional control measures as needed in order to assure compliance with the applicable Basin Plan. Timberland management activities may include, but are not limited to:

      i. Timber harvesting sales;
      ii. Vegetation management and fuels reduction projects;
      iii. Forest stand improvement and hazard tree removal (excluding hazard tree removal projects that do not pose a threat to water quality (i.e. isolated tree removal in campgrounds, etc.));
      iv. Pesticide applications associated with Part III.F.4.a.i.,ii.,iii. above.

   b) The U.S. Forest Service has provided Project description documents to the Central Valley Water Board and allowed time for adequate review and comment. These documents include: 1) the NEPA scoping document; and 2) the NEPA draft environmental analysis, which will include site specific information that identifies SEPES and priority road improvement locations, as well as, proposed treatments and schedule for those sites to improve or protect water quality. Supplemental project documents may also be provided that contain design specifications, management practices, and/or water quality protection measures. Any additional management practices and/or water quality protective measures identified by Central Valley Water Board staff during the scoping period and/or enrollment under this Order will have been discussed with U.S. Forest Service personnel and incorporated into an addendum to the NOI (see Part II.4.), including a timeline and checklist for completion. The project will remain enrolled until all identified management practices and/or water quality protective measures have been completed.

   c) The U.S. Forest Service has conducted a CWE analysis, where required or appropriate, and included specific measures needed to reduce the potential for CWEs in order to assure compliance with the applicable Basin Plan.

5. Enrollment: To enroll under Category 5B, the U.S. Forest Service shall comply with the following:

   a) Submit to the Central Valley Water Board copies of final decision documents that contain information documenting compliance with the eligibility criteria above. A copy of applicable final NEPA documents shall be submitted upon written request by Central Valley Water Board staff.

   b) Submit a *NOI for Category 5B* **at least 15 days prior to operations commencing**, signed by a duly authorized representative, certifying that the activities meet the criteria and conditions for Order Category 5B. Activities may commence once the Central Valley Water Board has issued a NOA to the Discharger indicating that the NOI is complete.

   c) Submit all specific on-the-ground prescriptions designed to adhere to the U.S. Forest Service BMPs as described in *National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide*, and all additional management practices and/or water quality protective measures

identified by Central Valley Water Board staff (See Part II.4.) within contracts, permits, agreements, and other instruments used to direct the activities of contractors, permittees, U.S. Forest Service personnel, volunteers, and any other third party.

6. Conditions: Dischargers conducting timberland management activities enrolled under Category 5B shall comply with the following conditions, as applicable:

   a) For approved Projects that require enrollment under the Order, the Discharger shall **notify the Central Valley Water Board each year at least 15 days prior to start of operations**.

   b) The Discharger shall **notify the Central Valley Water Board, in writing, at least 15 days prior to any proposed application of pesticides**; the notification does *not* need to include information on hack and squirt or individual stump applications. The written notification shall include the pesticide product(s) to be applied, the proposed date(s) of application, the method(s) of application, project name, area(s) of application (include map), and a description of measures that will be employed to assure compliance with the applicable Basin Plan. Subsequent changes to the proposal must be submitted in writing no less than 48 hours prior to pesticide application.

   c) The U.S. Forest Service shall comply with all conditions specified in Attachment B, Monitoring and Reporting Program, Order No. R5-2017-0061.

      Category 5B will be subject to one National Core BMP monitoring protocol as dictated by Project activities. In addition, one additional National Core BMP monitoring protocol will be required when the Discharger's cumulative watershed effects analysis indicates that the project, combined with other U.S. Forest Service projects conducted in the watershed over the past 10 years, may cause any watershed or sub-watershed to exceed a threshold of concern as determined by various models (i.e., Equivalent Roaded Acres (ERA), Surface Erosion (USLE), Mass Wasting (GEO), etc.). Dischargers have the option to conduct the standard Implementation, Forensic, and Effectiveness monitoring at the Project level in lieu of the National Core BMP monitoring protocols.

   d) The U.S. Forest Service shall seek termination of coverage under the Order in accordance with Part V.A., Termination of Coverage.

IV. Notice of Intent

To apply for coverage under this Order, the Discharger must submit a timely and complete category-specific Notice of Intent for approval by the Executive Officer as follows:

Category	*Non-federal*	*Federal*	*Required Forms*
No threat	X	X	*Notice of Non-Applicability (NONA)*
1	X		None[1]
2A	X		*NOI for Category 2A* and *Erosion Site Table*[2]
2B, 3A, or 3B	X		*NOI for Categories 2B, 3A, and 3B*
4	X		*NOI for Category 4*
5A		X	*NOI for Category 5A* and *Erosion Site Table*[3]
5B		X	*NOI for Category 5B*

[1]Automatically enrolled; submission of a NOI is not required.
[2]Automatically enrolled contingent on submittal of a complete NOI and Erosion Site Table within 30 days of CALFIRE acceptance of EM Notice.
[3]Automatically enrolled contingent on submittal of a complete NOI and Erosion Site Table within 30 days of startup of operations.

Timberland management activities may commence for Categories 2B, 3A, 3B, 4, and 5B once Central Valley Water Board staff has reviewed the NOI for completeness/accuracy and has issued a Notice of Applicability (NOA). Categories 2A and 5A are automatically enrolled but require timely submittal of a complete *NOI* and *Erosion Site Table* as a condition of this Order.

V. Termination of Coverage

A. Initiated by Discharger

The following criteria must be satisfied before termination of Order coverage will be considered by the Executive Officer:

- Timberland management activities are completed;
- All Category specific eligibility criteria/conditions were met;
- All elements of required monitoring and reporting have been completed;
- Soil disturbed by timberland management activities has stabilized;
- Pesticide applications have ceased and are not proposed in the foreseeable future;
- All feasible management measures and mitigations identified in the required Erosion Site Table (Category 2A/5A) and/or Post-Fire Management Plan (as applicable) have been completed and discharges have ceased.

In signing the Notice of Termination (NOT), the Discharger or U.S. Forest Service representative shall certify that: (1) the enrolled Project was conducted in conformance with the approved Plan, accepted CAL FIRE Notice, approved MATO/LSAA, or U.S. Forest Service Project requirements, as well as all applicable eligibility criteria/conditions and other applicable Provisions of this Order; and (2) discharges resulting from timberland management activities (including those associated

with pesticide applications) were in compliance and will continue to comply with all requirements of the applicable Basin Plan.

The NOT shall be reviewed for compliance with the above criteria. A field inspection may be conducted to verify compliance with all applicable requirements under this Order. The Central Valley Water Board shall notify the Discharger **within 90 days** following receipt of a NOT of approval or denial.

Non-federal Projects - The Discharger may terminate coverage under this Order by submitting to the Central Valley Water Board a signed Notice of Termination (NOT) and a CAL FIRE-approved final completion RM-71 form (if available and applicable).

Federal Projects - The Discharger may terminate coverage under this Order by submitting to the Central Valley Water Board a NOT signed by the Forest Supervisor or District Ranger.

B. Initiated by Executive Officer

The Executive Officer may terminate the applicability of this Order for a Project if any of the following determinations are made:

1. The proposed timberland management activities do not comply with the eligibility criteria for this Order.
2. The timberland management activities are not in compliance with the applicable conditions of this Order.
3. The proposed timberland management activities are reasonably likely to cause or contribute to a violation of an applicable Basin Plan or policy. In making this determination, the Executive Officer will consider the recommendations of Central Valley Water Board staff that participated in the review of the proposed timberland management activities, if any.
4. A timberland management activity has varied in whole or in any part from the approved Project, unless these changes result in better protection of water quality.

Upon receipt of notice of termination of applicability of the Order initiated by the Executive Officer, the Discharger shall immediately cease all timberland management activities that may result in discharges to waters of the state, other than activities necessary to control erosion. Before a Discharger may recommence timberland management activities that may result in discharges of waste to waters of the state, the Discharger must follow the applicable procedure either for enrolling under this Order or for obtaining individual waste discharge requirements pursuant to Water Code section 13260. Pursuant to Water Code section 13264, such activities may not recommence unless and until the Discharger receives a NOA under this Order or individual waste discharge requirements are adopted by the Central Valley Water Board.

VI. Petitions

Any person aggrieved by this action of the Central Valley Water Board may petition the State Water Board to review the action in accordance with Water Code section 13320 and California Code of Regulations, title 23, section 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or State holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at:

http://www.waterboards.ca.gov/public_notices/petitions/water_quality

or will be provided upon request.

I, PAMELA C. CREEDON, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 9 June 2017.

Original signed by

PAMELA C. CREEDON, Executive Officer

ATTACHMENT A

DEFINITIONS
FOR
ORDER NO. R5-2017-0061

1. "Timberland management activities" means commercial activities relating to forest management and timberland conversions, including, but not limited to: cutting or removal of timber and other solid wood forest products; construction, reconstruction and maintenance of roads, fuel breaks, firebreaks, watercourse crossings, landings, skid trails, or beds for the falling of trees; fire hazard abatement and fuel reduction activities; pesticide applications; site preparation that involves disturbance of soil or burning of vegetation following timberland management activities; but excluding preparatory treemarking, surveying or roadflagging. This definition excludes the cutting and removal of timber and other solid wood forest products for Christmas trees, structure protection (150 and 300 feet), and woody debris and slash removal associated with CCR, title 14, section 1038 exemptions.

2. "Discharger" means the timberland owner or timber owner and anyone working on behalf of the timberland/timber owner in the conduct of timberland management activities for non-federal lands, and the U.S. Forest Service, private timber operators operating on federal lands, and anyone working on behalf of the U.S. Forest Service or a timber operator in the conduct of timberland management activities on federal lands.

3. "Effective Groundcover" any combination of slash (lopped and in close contact with the ground), mulch (large wood chips, wood shreds, wood strand blends, straw, bark, or surface rock fragments larger than ¾ inch), plants, and plant litter. Large wood chips should be a minimum of 2 inches in length and at least four (4) times longer than they are wide.

4. "Monitoring" refers to all types of monitoring undertaken in connection with determining water quality conditions and factors that may affect water quality conditions, including but not limited to, implementation, effectiveness, forensic, and Order compliance monitoring undertaken in connection with timberland management activities.

5. "Plan" means any Timber Harvesting Plan (THP), Program Timber Harvesting Plan (PTHP), Nonindustrial Timber Management Plan (NTMP), Working Forest Management Plan (WFMP), Modified Timber Harvesting Plan, Notice of Timber Operations, Working Forest Harvest Notice, or other discretionary permit issued by CAL FIRE to harvest timber, including all substantial deviations thereto that propose a change in timberland management activities that may increase the discharge or otherwise pose the potential for increased impacts to water quality. (For example, substantial deviations that propose to add, expand, or extend winter operations shall be considered a "Plan" for purposes of this Order. Minor deviations that do not propose any material change in how or where timberland management activities will be conducted, such as a change in timber operator, a time extension from CAL FIRE, etc., shall not be considered a "Plan" for purposes of this Order.)

6. "Pesticide" means (1) any substance, or mixture of substances which is intended to be used for defoliating plants, regulating plant growth, or for preventing, destroying, repelling, or mitigating any pest, which may infest or be detrimental to vegetation, man, animals, or households, or be present in any agricultural or nonagricultural environment whatsoever, or (2) any spray adjuvant, or (3) any breakdown products of these material that threaten beneficial uses. This definition excludes aquatic pesticide discharges covered under Order No. 2013-0002-DWQ.

7. "Project" means any CAL FIRE Plan (as defined in #5 above), CAL FIRE Emergency/Exemption Notice, or existing watercourse crossing reconstruction not covered under a Plan or Emergency Notice but conducted pursuant to a CDFW-executed MATO or LSAA on timber production zoned

non-federal lands, and any timberland management activities (i.e. timber sales, fire salvage, fuel hazard reduction, forest stand improvement and hazard tree removal) on federal lands.

8. "Significant Existing or Potential Erosion Site (SEPES)" means a location where soil erosion is currently, or there are visible physical conditions to indicate soil erosion may be in the future, discharged to watercourses or lakes in quantities that violate a water quality objective (narrative or numeric), prohibition, Total Maximum Daily Load implementation plan, policy, or other requirement contained in a water quality control plan adopted by the Regional Board and approved by the State Water Board, or a location where soil erosion may result in significant individual or cumulative adverse impacts to the beneficial uses of water.

9. "Watercourse protection zone" means any Watercourse and Lake Protection Zone, Equipment Limitation Zone, and Equipment Exclusion Zone for the protection of waters of the state as defined in California Code of Regulations, title 14, section 895.1 of the California Forest Practice Rules; it also means any Riparian Reserve or Riparian Conservation Area for federal Projects.

10. All other terms shall have the same definitions as defined in California Code of Regulations, title 14, section 895.1 of the California Forest Practice Rules and the Porter-Cologne Water Quality Control Act, unless specified otherwise. A few definitions from the 2017 FPR that are used throughout the Order are cited below for ease of reference:

    "Equipment Exclusion Zone" (EEZ) means the area, as explained in the THP, where heavy equipment associated with timber operations is totally excluded for the protection of water quality, the beneficial uses of water, and/or other forest resources.

    "Equipment Limitation Zone" (ELZ) means the area, as explained in the THP, where heavy equipment associated with timber operations is limited for the protection of water quality, the beneficial uses of water, and/or other forest resources.

    "Erosion Hazard Rating" (EHR) means the rating derived from the procedure specified in 14 CCR § 912.5 [932.5, 952.5] designed to evaluate the susceptibility of the soil within a given location to erosion.

    "Hydrologic Disconnection" means the removal of direct routes of drainage or overland flow of road runoff to a watercourse or lake.

    "Saturated Soil Conditions" means that soil and/or surface material pore spaces are filled with water to such an extent that runoff is likely to occur. Indicators of saturated soil conditions may include, but are not limited to: (1) areas of ponded water, (2) pumping of fines from the soil or road surfacing material during timber operations, (3) loss of bearing strength resulting in the deflection of soil or road surfaces under a load, such as the creation of wheel ruts, (4) spinning or churning of wheels or tracks that produces a wet slurry, or (5) inadequate traction without blading wet soil or surfacing materials.

    "Significant Sediment Discharge" means soil erosion that is currently, or, as determined based upon visible physical conditions, may be in the future, discharged to watercourses or lakes in quantities that violate Water Quality Requirements or result in significant individual or cumulative adverse impacts to the beneficial uses of water. One indicator of a Significant Sediment Discharge is a visible increase in turbidity to receiving Class I, II, III, or IV waters.

    "Water Quality Requirements" means a water quality objective (narrative or numeric), prohibition, TMDL implementation plan, policy, or other requirement contained in a water quality control plan adopted by the Regional Board and approved by the State Water Board.

"Watercourse and Lake Protection Zone" (WLPZ) means a strip of land, along both sides of a watercourse or around the circumference of a lake or spring, where additional practices may be required for protection of the quality and beneficial uses of water, fish and riparian wildlife habitat, other forest resources and for controlling erosion.

ATTACHMENT B
MONITORING AND REPORTING PROGRAM
FOR
ORDER NO. R5-2017-0061

This Monitoring and Reporting Program (MRP) is issued pursuant to Water Code section 13267 and includes requirements for Projects enrolled under the Waste Discharge Requirements General Order for Discharges Related to Timberland Management Activities on Non-federal and Federal Lands, Order No. R5-2017-0061 (hereinafter referred to as the "Order"). The MRP is required to assure compliance with Order criteria and conditions, to verify the adequacy and effectiveness of the Order, to assist Dischargers with implementation and maintenance of water quality protection measures, and to identify and correct waste discharges that violate or threaten to violate water quality control plan (Basin Plan) requirements.

Dischargers with Projects enrolled under this Order are subject to monitoring requirements; however, the comprehensiveness of the monitoring required depends upon the scope of the timberland management activities and the category of enrollment. The inspection plan, monitoring requirements by category, monitoring types (agency, implementation, forensic, and effectiveness), incident reporting, reporting requirements, and potential additional monitoring requirements are described within this MRP.

I. INSPECTION PLAN

Dischargers shall prepare and implement an Inspection Plan for Projects that exceed 100 acres for all Categories (***except*** Category 1 and Category 5B (unless the U.S. Forest Service conducts implementation, forensic, and effectiveness monitoring in the Project area in lieu of National Core BMP Protocol monitoring)). The Inspection Plan shall be designed to ensure that management measures are installed and functioning prior to a precipitation event that generates overland flow, that the measures were effective in controlling significant sediment discharges (see definition in Attachment A) throughout the winter period, and that no new significant sediment discharge sources developed. The Inspection Plan shall include a site map that includes monitoring points and inspection locations to be visited before, during, and after the winter period once operations have begun. Monitoring points are further described as follows:

- *Visual Monitoring Points* - Visual monitoring points shall be delineated on the monitoring points site map and shall address all bulleted inspection items applicable to the enrolled category detailed in the implementation, forensic, and effectiveness monitoring sections that follow (e.g. watercourse crossings, roads, landings, skid trails, water diversions, unstable areas, accessible watercourse confluences).
- *Photo-point Monitoring* – Photo-point monitoring locations shall be delineated on the site map and shall be identified (monumented) in the field by use of rebar, flagging or other method that will last throughout the period of enrollment for the Project. Photo-point locations shall be determined during Project inspections when Central Valley Water Board staff is present and/or as determined by the Discharger to illustrate compliance. If significant sediment discharges are detected during enrollment or monitoring, these locations shall be added to the Inspection Plan and be photo-point monitored for the remainder of the Project's enrollment.

Inspection Plans shall be maintained and updated as needed by the Discharger and/or agents thereof and shall be submitted to the Central Valley Water Board upon request.

II. MONITORING REQUIREMENTS BY CATEGORY

Projects enrolled under this Order are subject to monitoring requirements based on category of enrollment and threat to water quality. Monitoring requirements for each category are detailed below.

NON-FEDERAL PROJECTS (Categories 1 - 4)

Table 1. Monitoring and Reporting Requirements for Non-Federal Projects

Order Category	1	2B/3B	2A	3A	4
Inspection Plan		Prepare for Projects >100 acres - submit copy when requested			
Agency Monitoring	Yes, submit when a violation of the FPR is identified that relates to water quality protection measures				
Implementation Monitoring			Conduct by November 15[1]		
Forensic Monitoring			Conduct Twice Between November 16 and April 1[1, 2]	Conduct Once Between November 16 and April 1[1]	
Effectiveness Monitoring		Conduct Once Between April 2 and June 15[1]			
Summary of Operations / Annual Report			Submit by July 15		
Erosion Site Table and PFP[3] Update(s)			As Needed[4]		

[1]Photo-point monitoring required as determined by Central Valley Water Board staff on Project inspections and/or as self-determined by the Discharger to illustrate compliance AND for significant sediment discharges (Incident Report required, see Part IV.). Monitoring to be included in annual report due July 15 annually.

[2]*Once between Nov. 16 and Jan. 15 AND once between Jan. 16 and April 1 (see Part III.C.).*

[3]Post-Fire Management and Reforestation Plan (PFP), if applicable (see Attachment C).

[4]Timely amendments to be made throughout Project enrollment when conditions or management objectives have changed.

The monitoring requirements above that are in addition to those required by the FPRs, do not supersede or nullify the monitoring requirements required by the FPR

FEDERAL PROJECTS (Categories 5A and 5B)

Table 2. Monitoring and Reporting Requirements for Federal Projects

<table>
<tr><th>Order Category</th><th>5A (Post-Fire)</th><th>5B</th></tr>
<tr><td>Inspection Plan</td><td colspan="2">Prepare for Projects >100 acres - submit copy when requested[1]</td></tr>
<tr><td>Implementation Monitoring</td><td>Conduct by November 15[2]</td><td rowspan="3">Complete one of the following National Core BMP monitoring protocols in the Project area based on the highest threat to water quality from Project activities[2,4,5]
Road B. Completed Road or Waterbody Crossing Construction or Reconstruction;
Road C. Road Operation and Maintenance;
Veg. A. Ground-based Skidding and Harvesting;
Veg. B. Cable or Aerial Yarding;
Veg. C. Mechanical Site Treatments; or
WatUses C. Completed Reconstruction/Repair or Operation and Maintenance of Water Sources (Drafting)</td></tr>
<tr><td>Forensic Monitoring</td><td>Conduct Twice Between November 16 and April 1[2,3]</td></tr>
<tr><td>Effectiveness Monitoring</td><td>Conduct Once Between April 2 and June 15[2]</td></tr>
<tr><td>Summary of Operations / Annual Report</td><td colspan="2">Submit by August 15</td></tr>
<tr><td>Erosion Site Table and PFP[6] Update(s)</td><td>As Needed[7]</td><td></td></tr>
</table>

[1]For Category 5B, prepare only if electing to do traditional implementation, forensic, and effectiveness monitoring in the Project area in lieu of National Core BMP protocols (see footnote 5 below).

[2]Photo-point monitoring required as determined by Central Valley Water Board staff on Project inspections and/or as self-determined by the Discharger to illustrate compliance AND for significant sediment discharges (Incident Report required, see Part IV.). Monitoring to be included in Annual Report that is submitted August 15 annually.

[3]Once between Nov. 16 and Jan. 15 AND once between Jan. 16 and April 1 (see Part III.C.)

[4]One ***additional*** National Core BMP monitoring protocol is required when USFS cumulative watershed effects analysis indicates that the Project, combined with other USFS activities conducted in the watershed over the past 10 years, may cause any watershed or sub-watershed to exceed a threshold of concern as determined by various models (i.e. Equivalent Roaded Acres, Surface Erosion, Mass Wasting). The *National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide* is located at: http://www.fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf

[5]The Discharger may opt to conduct implementation, forensic, and effectiveness monitoring as detailed for Category 3A in lieu of conducting the National Core BMP monitoring protocols; the monitoring must occur in the Project area.

[6]Post-Fire Management and Reforestation Plan (PFP), if applicable (see Attachment C).

[7]Timely amendments to be made throughout Project enrollment when conditions or management objectives have changed.

III. MONITORING TYPES

A. AGENCY MONITORING

Non-federal Projects - Agency monitoring is monitoring (direct field observations) conducted by CAL FIRE to evaluate compliance with the Forest Practice Rules (FPR). The Discharger does not conduct agency monitoring, but should retain copies of all inspection reports from agency monitoring throughout the life of the Project as the reports may be requested by the Central Valley Water Board. The Discharger shall submit a copy of agency monitoring to the Central Valley Water Board when a violation of the FPR is identified that relates to water quality protection measures and the Discharger shall provide notification of such violation within 48 hours of discovery (see Part IV.).

B. IMPLEMENTATION MONITORING

Description	Implementation monitoring consists of detailed visual monitoring within the Project area of hillslope features (i.e. roads, landings, skid trails, watercourse crossings, watercourse protection zones, unstable areas) prior to a precipitation event that generates overland flow; with emphasis placed on determining if management measures (such as erosion control measures, drainage structures, watercourse protection zones) were implemented in accordance with the Project language, FPR, BMP guidance, Central Valley Water Board recommendations, and Order criteria and conditions. For Category 5B, selected National Core BMP monitoring protocols (see Part II, Table 2) will satisfy the Implementation, Forensic, and Effectiveness portions of the monitoring requirements of the Order if the monitoring was conducted *within* the Project area.		
Inspection Timeframe	Prior to a precipitation event that generates overland flow, but no later than November 15		
Inspection Schedule	**Status of Timberland Management Activities**		
	Not Active[1]	Active - No Winter Ops	Active - Winter Ops
Monitoring Required?	No	Yes	Yes
Monitoring Details	N/A	A pre-winter implementation inspection shall be completed **prior to a storm that generates overland flow, but no later than November 15 of each year** to assure that management measures are in place and secure prior to the winter period.	*1st Inspection* - A pre-winter implementation inspection shall be completed **prior to a storm that generates overland flow, but no later than November 15 of each year** to assure that management measures, for areas not subject to winter operations, are in place and secure prior to the winter period. *2nd Inspection* - An Implementation inspection shall be completed **immediately following cessation of winter period operations**, in areas where winter operations occurred, to assure management measures are in place and secure.

[1]Timberland management activities have not commenced on any portion of the Project.

Implementation Inspection – The inspection(s) shall be conducted by the Discharger and is intended to assure that management measures are properly installed; at a minimum, the inspection(s) should focus on the following Project areas:

- Culverts are clear of debris;
- Critical dips are installed and/or diversion potential is addressed at watercourse crossings;
- Fill slopes are adequately armored/stabilized;
- Road runoff is disconnected from watercourse crossings;
- Sufficient drainage facilities installed on roads and skid trails;
- Appropriate watercourse protection zones implemented;
    - Disturbed areas in the watercourse protection zones stabilized;
- Significant existing or potential erosion sites (SEPES) identified in the Project and/or as indicated in an *Erosion Site Table* for Category 2A or 5A;
- Non-standard (in-lieu) practice areas;
    - Landings/skid trails/roads in watercourse protection zones drained/disconnected and/or stabilized;
- Road rocking near watercourses and crossings done to specifications in enrolled Project;
- Temporary and tractor watercourse crossings disconnected and fills excavated to natural grade and orientation;
- Drafting pads and approaches drained and stabilized;
    - Artificial impoundment barriers removed/diversions turned off (if no winter operations);
- Timberland management activities that have the potential to affect unstable areas upslope of watercourses;
- Photo-point monitoring locations (as determined by Central Valley Water Board staff during Project inspections and/or as self-determined by the Discharger to illustrate compliance).

Note: Additional implementation inspections do not need to be conducted for *completed* Project areas where a *full round* of monitoring inspections (implementation, forensic, and effectiveness) have been completed without the occurrence of reportable incidents OR the implementation of new management measures. Project areas that are *newly* active must have an implementation inspection conducted.

C. FORENSIC MONITORING

<table>
<tr><td>Description</td><td colspan="3">Forensic monitoring consists of visual field detection techniques during the winter period within the Project area to determine the condition of installed management measures and to identify threatened or actual significant sediment discharges caused by: failed management measures, failure to implement appropriate management measures, legacy timber activities, non-timber harvesting related land disturbances, and natural sediment sources. The goal of winter forensic monitoring is to locate potential or actual sources of sediment in a timely manner so that rapid corrective action may be taken where feasible and appropriate. If forensic monitoring detects a significant sediment discharge, the Discharger is required to submit photo-point monitoring and an Incident Report (see Part IV.) to the Central Valley Water Board.

For Category 5B, selected National Core BMP monitoring protocols (see Part II, Table 2) will satisfy the Implementation, Forensic, and Effectiveness portion of the monitoring requirements of the Order when the monitoring was conducted *within* the Project area.</td></tr>
<tr><td>Inspection Timeframe</td><td colspan="3">Category 2A and 5A- Once between November 16 and January 15, <u>AND</u>
Once between January 16 and April 1

Category 3A and 4 - Once between November 16 and April 1</td></tr>
<tr><td rowspan="3">Inspection Schedule</td><td colspan="3">Status of Timberland Management Activities</td></tr>
<tr><td>Not Active[1]</td><td>Active - No Winter Ops</td><td>Active - Winter Ops</td></tr>
<tr><td>Monitoring Required?</td><td>No</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Inspection Details and Guidance</td><td colspan="3">The forensic monitoring inspection(s) shall occur after saturated soil conditions have been reached and within 48 hours* after a storm that produces overland flow.

The following bulleted examples may be used as guidance to determine when appropriate conditions (saturated soils and overland flow) may exist for conducting forensic inspections, but are *not* a requirement for inspection(s) as climatic conditions vary widely over the Central Valley Region.

• Within 48 hours* following a 24-hour storm event of at least 2 inches (of rainfall) and after 5 inches (of total precipitation) has accumulated after November 15.

• Within 48 hours* following a 24-hour storm event of at least 2 inches (of rainfall) and after 15 inches (of total precipitation) has accumulated after November 15.

*Inspections that cannot be conducted during or within 48 hours of such a storm event (due to worker safety, access issues or other uncontrollable factors) shall be conducted as soon as possible thereafter.</td></tr>
<tr><td>Photo-Point Monitoring</td><td colspan="3">Forensic photo-point monitoring is required as follows:
• As determined by Central Valley Water Board staff during Project inspections and/or as self-determined by the Discharger to illustrate compliance; and
• When a significant sediment discharge (threatened or actual) is identified resulting from failed management measures, failure to implement management measures, legacy timber activities, non-timber harvesting related land disturbances, and natural sediment sources.</td></tr>
</table>

[1]Timberland management activities have not commenced on any portion of the Project.

Forensic Inspections - Inspections shall be conducted by the Discharger to identify threatened or actual significant sediment discharges such as failed management measures or natural sources (e.g. landslide). The inspection should focus on identifying evidence of erosion (e.g. rilling or gullying of road surfaces and road fills; watercourse crossings with evidence of downcutting, plugging, or overtopping; and increased levels of sediment/turbidity in watercourses). The inspections should focus on the following Project areas, including but not limited to:

- Constructed and reconstructed watercourse crossings;
- Existing undersized watercourse crossings;
- Watercourse protection zones where ground based equipment operations have occurred (e.g. tractor crossings, landing construction/reconstruction, watercourse crossing/road abandonment);
- Project areas of non-standard (in-lieu) practices that have the potential to impact water quality;
- Road segments that were unable to be hydrologically disconnected;
- SEPES identified in the Project and/or as indicated in an *Erosion Site Table* for Category 2A or 5A;
- Road construction or reconstruction within 500 feet of a watercourse;
- Areas rated as high or extreme erosion hazard that have the potential to impact water quality where ground-based equipment operated;
- Areas where ground-based equipment operated on slopes greater than 65% or slopes over 50% rated as high or extreme erosion hazard that have the potential to impact water quality;
- Timberland management activities that have the potential to affect unstable areas near watercourses;
- Photo-point monitoring locations.

D. EFFECTIVENESS MONITORING

<table>
<tr><td>Description</td><td colspan="3">Effectiveness monitoring is a visual evaluation following the winter period of management measures (e.g. erosion control structures) and infrastructure (e.g. roads and watercourse crossings) within the Project area. Effectiveness monitoring is intended to determine the effectiveness of implemented management measures in preventing significant sediment discharges to watercourses and in protecting water quality, and to identify any new sediment sources. If effectiveness monitoring detects a significant sediment discharge resulting from failed management measures or failure to implement management measures, the Discharger is required to submit photo-point monitoring and an Incident Report (see Part IV.) to the Central Valley Water Board.

For Category 5B, selected National Core BMP monitoring protocols (see Part II., Table 2) will satisfy the Implementation, Forensic, and Effectiveness portions of the monitoring requirements of the Order when the monitoring was conducted within the Project area.</td></tr>
<tr><td>Inspection Timeframe</td><td colspan="3">Between April 2 and June 15.</td></tr>
<tr><td rowspan="2">Inspection Schedule</td><td colspan="3">Status of Timberland Management Activities</td></tr>
<tr><td>Not Active[1]</td><td>Active – No Winter Ops</td><td>Active - Winter Ops</td></tr>
<tr><td>Monitoring Required?</td><td>No</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Inspection/ Monitoring Details</td><td colspan="3">The inspection shall be conducted by the Discharger to identify threatened or actual significant sediment discharges from failed management measures and/or failure to implement appropriate management measures. The inspection should evaluate the same Project areas bulleted under the Forensic Inspections Section on the previous page.</td></tr>
<tr><td>Photo-Point Monitoring</td><td colspan="3">Effectiveness photo-point monitoring is required as follows:
As determined by Central Valley Water Board staff during Project inspections and/or as self-determined by the Discharger to illustrate compliance; and
When a significant sediment discharge (threatened or actual) is detected from failed management measures or failure to implement management measures.</td></tr>
</table>

[1]Timberland management activities have not commenced on any portion of the Project.

Effectiveness Inspection – Evaluate the same Project areas bulleted under the *Forensic Inspections* Section on page 7 (see Part III.C.).

IV. INCIDENT REPORT

The Discharger shall notify Central Valley Water Board staff as soon as possible, but **no later than 48 hours after detection** of any of the following, including, but not limited to:

- Violation(s), threatened or actual, of any applicable water quality objective (i.e. for turbidity, sediment, temperature, dissolved oxygen, pesticides, etc.) caused by:
    - Failed management measures (e.g. watercourse crossing fill failure; watercourse diversion; major road, landing, or skid trail failure within or adjacent to a watercourse protection zone);
    - Failure to implement appropriate management measures;
    - Natural sediment sources (landslide/unstable areas);
    - Legacy timber activities (as assessed during Forensic Monitoring);
    - Non-timber harvesting related land disturbances (as assessed during Forensic Monitoring);
- Violation(s) of eligibility criteria or conditions specified in the Order.

Typically, Incident Reporting is a result of forensic or effectiveness monitoring, but can occur at any time during enrollment. After timely notification of an incident, the Discharger should discuss any implemented and planned corrective measures with Central Valley Water Board staff. Central Valley Water Board staff may require additional monitoring (inspections, photo-point, water column sampling, physical stream conditions, etc.) until corrective actions are completed and/or significant sediment discharges/threatened discharges have ceased.

Incident Report - A written report regarding aforementioned incidents(s) shall be submitted to the Central Valley Water Board by the Discharger **within 14 days** following detection and shall include all required information specified in this MRP, including the following:

- The date incident(s) was/were discovered;
- The name and title of person(s) discovering incident(s);
- The name and title of person(s) responsible for follow-up on the incident(s);
- A map indicating location of incident(s);
- Description of recent weather conditions prior to discovering the incident(s);
- Description of the nature and extent of incident(s) (including estimate(s) of sediment/fill volume discharged, if applicable);
- Color photos of site characterizing incident(s) (including impacted watercourse(s));
- Description of corrective management measures implemented to date;
- An implementation schedule for additional corrective actions;
- The signature and title of person preparing the report.

The Executive Officer may modify or rescind this MRP at any time or may issue site-specific and individually developed monitoring and reporting requirements to any Discharger for Projects that could affect the beneficial uses of waters of the state.

V. REPORTING REQUIREMENTS

A. Agency Reporting (Non-Federal Projects)
Dischargers are required to submit a copy of agency monitoring to the Central Valley Water Board when a violation of the FPR is identified that relates to water quality protection measures; the Discharger shall notify the Central Valley Water Board within 48 hours of discovery of such a violation.

B. Annual Reporting (Non-Federal and Federal Projects)
The Discharger shall submit an Annual Monitoring Report to the Executive Officer **by July 15** for Non-Federal Projects and **by August 15** for Federal Projects, for inspections conducted before, during, and after the previous winter period for every year a Project is enrolled in the Order after timberland management activities have commenced; activities that commence after the winter period (April1) shall have monitoring inspections included in the next calendar year annual report.

The Annual Monitoring Report shall include the following (as applicable) as described under Table 1 and Table 2 of this MRP:

Summary of Operations
- The name/number of the Project;
- A table, map, narrative, or combination thereof that includes the following:
    - Watercourse crossings and road segments that have been constructed, reconstructed, and abandoned/deactivated during the past year;
    - SEPES that have been addressed during the past year as identified in the Project and/or *Erosion Site Table*;
    - Units/areas harvested during the past year.

Implementation, Forensic, and Effectiveness Monitoring Inspection Reporting
- Name/number of the Project;
- Name/title of person submitting the report;
- Date of inspection;
- Inspector's name/title;
- Storm event date, precipitation amount, and rainfall station used (forensic only);
- Rainfall accumulation since November 15 (forensic only);
- Color photographs from photo-point monitoring with date/time/location clearly delineated (if applicable);
- Incident Report(s) Update – Include any pertinent updates and/or additional monitoring required by the Central Valley Water Board (if applicable).

- U.S. Forest Service Category 5B (Federal) - Submittal of selected National Core BMP monitoring protocols (see Part II., Table 2) will satisfy the Implementation, Forensic, and Effectiveness portions of the monitoring requirements of the Order when the monitoring was conducted *within* the Project area.

Non-Expiring Plans (NTMPs and WFMPs) (Non-Federal Projects)
- Dischargers that elect to remain continuously enrolled (i.e. not terminate coverage after each entry) under the Order for the duration of the Plan must (1) complete at minimum one full round of monitoring (implementation, forensic, and effectiveness) for each NTO/Harvest Notice area, and (2) be able to certify in a statement (see Part V.C. below) in the annual report that discharges

associated with timberland management activities have ceased for each NTO/Notice area prior to cessation of monitoring for that area.

C. Submission of Reports/Data

The Central Valley Water Board is transitioning to a paperless office; therefore, reports should be submitted in searchable Portable Document Format (PDF), Word, and/or Excel when feasible. Documents that are less than 50 MB should be emailed to the appropriate office:

Rancho Cordova Office: centralvalleysacramento@waterboards.ca.gov;
Redding Office: centralvalleyredding@waterboards.ca.gov;
Fresno Office: centralvalleyfresno@waterboards.ca.gov;

In the subject line of the email, include the program (Forest Activities Program), subject (e.g. annual report, incident report), county, and the name of the staff person that will receive the document (if known). Documents that are 50 MB or larger should be transferred to a disc or flash drive and mailed to the appropriate office. Staff may request that some documents be submitted in hard copy, particularly drawings or maps that require a large size to be readable, or in other electronic formats where evaluation of the data is required.

Monitoring forms (cover letter with certification statement, implementation, forensic, and effectiveness) are provided on the Central Valley Water Board Forest Activities Program website (http://www.waterboards.ca.gov/centralvalley/water_issues/timber_harvest/index.shtml) for Discharger use. If the Discharger elects to create their own monitoring form, it must include all the applicable information detailed under Part V. B. and Tables 1 and 2 or this MRP and include the following certification statement and the signature of the Discharger:

> *I am aware that monitoring and technical reports submitted pursuant to Water Code section 13267 are submitted under penalty of perjury, and I certify that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete.*

In addition, for *non-expiring* Plans that will remain *continuously* enrolled and for which the Discharger intends to cease monitoring in a NTO/Notice Area, the Discharger must include the following statement in the annual report:

> *I certify that all discharges associated with timberland management activities for this NTO/Notice area are and will continue to be in conformance with all applicable Basin Plan requirements and hereby notify the board that no further monitoring is planned for the subject NTO/Notice area.*

The Discharger shall submit all required monitoring reports to the respective Central Valley Water Board office in accordance with the reporting requirements specified in this Order.

The Discharger shall also report monitoring data and results, in a timely manner, for all water quality related monitoring conducted <u>independent</u> of the requirements of this Order.

VI. POTENTIAL ADDITIONAL MONITORING REQUIREMENTS

Pursuant to California Water Code section 13267, the Executive Officer has the authority to issue site-specific and individually developed monitoring and reporting requirements to any Discharger whose activities could affect the beneficial uses of waters of the state.

Additional monitoring requirements may include, but are not limited to:

- Water column sampling (typically for sediment);
- Physical stream condition assessment for:
  - Gravel Embeddedness – Degree gravel is embedded with sand or finer sediments;
  - Pool Sedimentation – Degree of sediment depositions in pools;
  - Stream Channel Aggradation – Degree that stream channel has been raised by sedimentation;
  - Streambank Cutting, Mass Wasting and Stream Downcutting;
  - Stream-Side Vegetation;
- Streamflow data (current, historical, peak flows);
- Bioassessment.

ATTACHMENT C

POST-FIRE MANAGEMENT AND REFORESTATION PLAN GUIDANCE AND TECHNICAL STANDARDS FOR CATEGORIES 2A AND 5A

ORDER NO. R5-2017-0061

Waste Discharge Requirements General Order R5-2017-0061 (hereinafter referred to as Order) requires Dischargers who intend to apply pesticides associated with timberland management and reforestation activities related to fire salvage to develop comply with management measures as described in Part III.C.3.b.ii (Category 2A) and Part III. F.3.c.ii (Category 5A) of the Order OR to prepare a Post-Fire Management and Reforestation Plan (PFP) to help mitigate erosion, sediment delivery, and discharges of waste that could affect waters of the state.

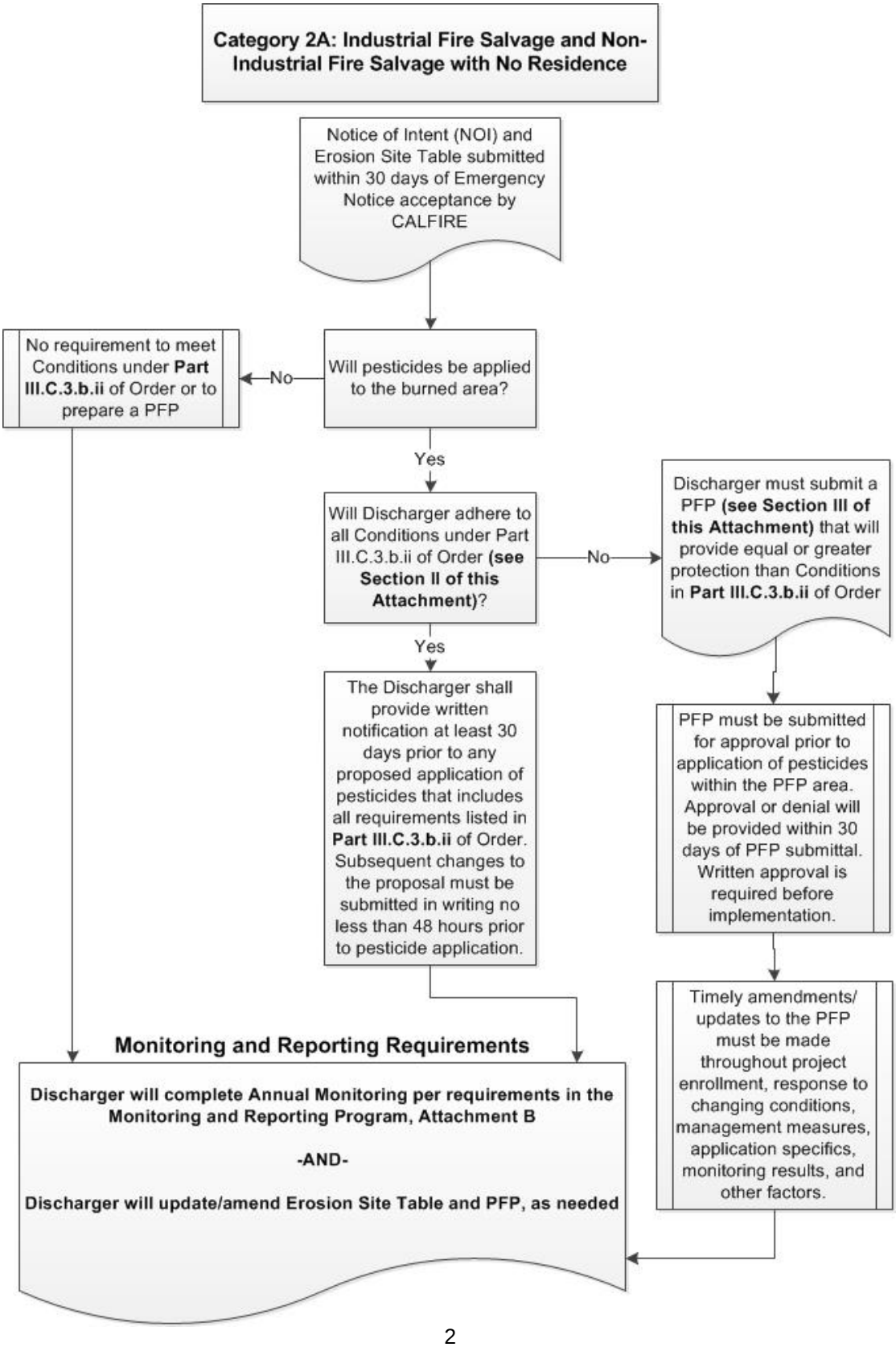
The purpose of Attachment C is to serve as a guidance document to help Dischargers understand the requirements of Categories 2A and 5A and to give a detailed explanation of the technical standard requirements. Attachment C is organized into three Sections as follows: 1) Flow Charts for Category 2A and 5A that guide the Discharger through a series of questions about pesticide application and the subsequent required steps for document submittal and reporting; 2) Pesticide Buffer and Effective Ground Cover Requirements, which provides detailed information on pesticide buffers and photographic examples of 50% ground cover; and 3) Contents of a PFP.

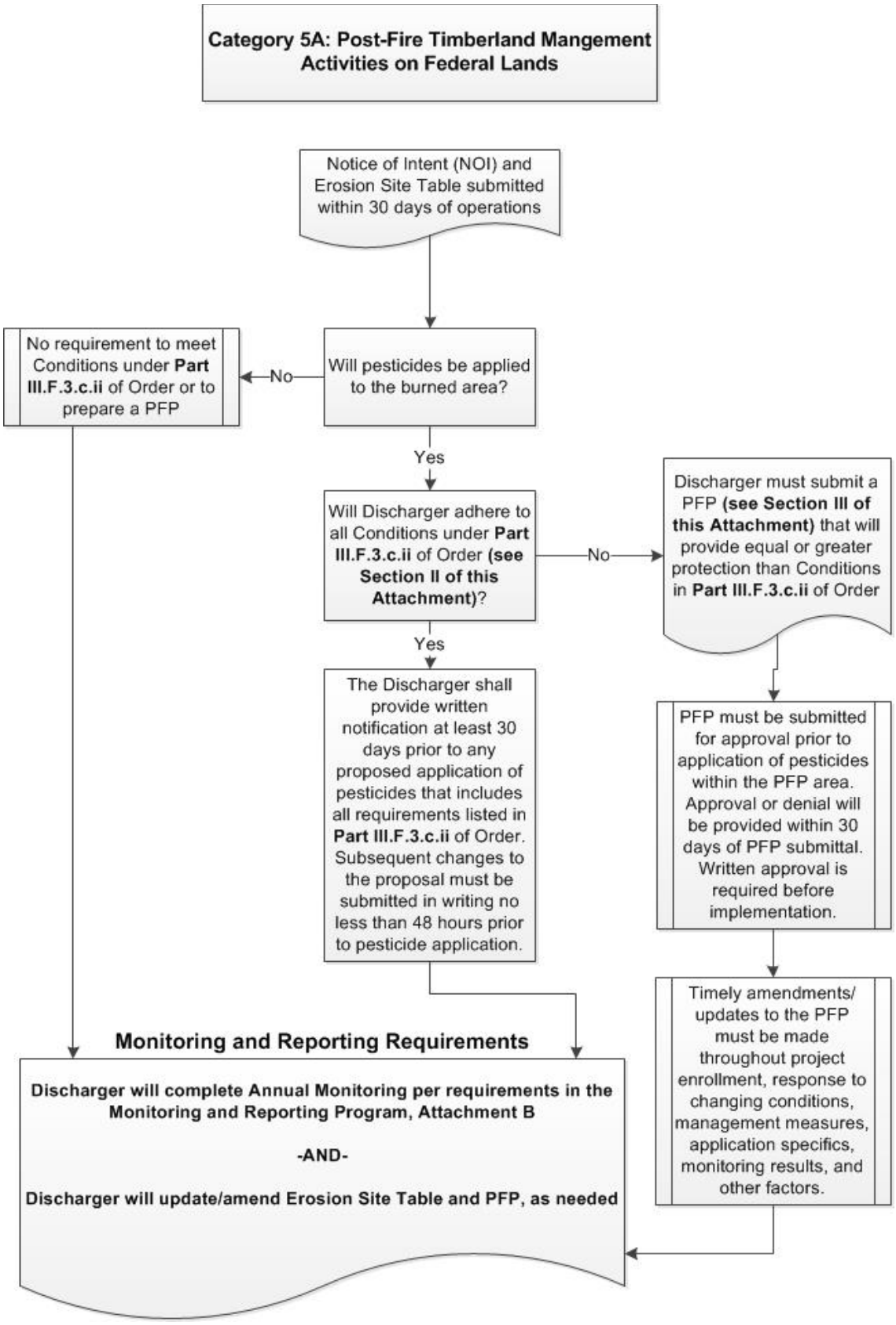
A PFP is required for all pesticide applications for: 1) for Emergency Notices enrolled in Category 2A where the Discharger elects to not meet the specific watercourse buffers or ground cover requirements as stated in Part III.C.3.b.ii of the Order; and 2) for Projects enrolled in Category 5A where the Discharger elects to not meet the specific watercourse buffers or ground cover requirements as stated in Part III.F.3.c.ii of the Order. The purpose of the PFP is to allow the Discharger flexibility in applying specific management practices across the fire salvage area that consider all aspects of the timing of the fire salvage, site-preparation, and other management objectives associated with reforestation; provide for site specificity in terms of topography, soils, climate, hydrology, and burn severity; and consider all sources of potential negative water quality impacts from those activities (i.e. sediment and pesticides).

A PFP must contain, at a minimum, all of the elements listed under “Contents of a PFP” (Section III of this Attachment); the portions of the PFP that are related directly to pesticide applications must be prepared by, or under the reasonable charge of, a Registered Professional Forester, Pest Control Advisor, and/or other qualified professional. **The Discharger shall submit the PFP to the Central Valley Regional Water Quality Control Board for approval prior to application of pesticides within the post-fire management and reforestation plan area; approval or denial of the PFP shall be provided to the Discharger within 30 days of PFP submittal**. Additionally, **the PFP must be updated/amended** in response to changing conditions, management measures, and application specifics; addition of fire salvage areas (i.e. Emergency Notices or Projects) or application areas; monitoring results; and other factors throughout Project enrollment.

For Category 5A pesticide applications on fire salvaged federal lands, if a Project has been prepared under the National Environmental Policy Act (NEPA) for reforestation activities, the NEPA document(s) may be submitted in-lieu of the PFP if it includes all required information detailed under “Contents of a PFP. If the NEPA document(s) does not cover all elements of the “Contents of a PFP”, then the U.S. Forest Service may submit supplemental information along with the NEPA document(s).

I. Flow Charts for Category 2A and 5A




Category 5A: Post-Fire Timberland Mangement Activities on Federal Lands
Notice of Intent (NOI) and Erosion Site Table submitted within 30 days of operations
Will pesticides be applied to the burned area?
No
No requirement to meet Conditions under Part III.F.3.c.ii of Order or to prepare a PFP
Yes
Will Discharger adhere to all Conditions under Part III.F.3.c.ii of Order (see Section II of this Attachment)?
No
Discharger must submit a PFP (see Section III of this Attachment) that will provide equal or greater protection than Conditions in Part III.F.3.c.ii of Order
Yes
The Discharger shall provide written notification at least 30 days prior to any proposed application of pesticides that includes all requirements listed in Part III.F.3.c.ii of Order. Subsequent changes to the proposal must be submitted in writing no less than 48 hours prior to pesticide application.
PFP must be submitted for approval prior to application of pesticides within the PFP area. Approval or denial will be provided within 30 days of PFP submittal. Written approval is required before implementation.
Timely amendments/ updates to the PFP must be made throughout project enrollment, response to changing conditions, management measures, application specifics, monitoring results, and other factors.
Monitoring and Reporting Requirements
Discharger will complete Annual Monitoring per requirements in the Monitoring and Reporting Program, Attachment B
-AND-
Discharger will update/amend Erosion Site Table and PFP, as needed

II. Pesticide Buffer and Effective Ground Cover Requirements

For Category 2A Fire Salvage Projects, all industrial and non-industrial with no residence (see Part III.C.1. criteria in the Order), where pesticides will be applied, the Discharger shall submit a PFP or meet the conditions in Part III.C.3.b.ii of the Order, which are *abbreviated* below:

- The Discharger must **comply with the following pesticide no-spray buffers** (unless more stringent buffers are dictated by application labels/guidance, statute, or regulation):
    - For Class I and II watercourses, the applicable WLPZ widths specified in the California Code of Regulations, title 14, section 936.5; http://calfire.ca.gov/resource_mgt/resource_mgt_forestpractice
    - For Class III and IV watercourses, a minimum of 25 feet where sideslope steepness is less than 30%, and a minimum of 50 feet where sideslope steepness is 30% or greater.
- Where management activities are planned on a burned area with **slopes greater than 30%, a minimum of 50% average effective groundcover is required to be documented prior to pesticide application**. Documentation shall be provided to the Central Valley Water Board in the pesticide notification **30 days prior to application**.
- The Discharger shall **notify** the Central Valley Water Board **in writing at least 30 days prior to any proposed application of pesticides**.

For Category 5A Post-Fire Projects (see Part III.F.1. criteria in the Order), where pesticides will be applied, the Discharger shall submit a PFP or meet the conditions in Part III.F.3.c.ii of the Order, which are *abbreviated* below:

- The Discharger must **comply with the following pesticide no-spray buffers** (unless more stringent buffers are dictated by application labels/guidance, statute, or regulation):
    a) Perennial or intermittent watercourses which have: (1) surface domestic water use from and/or within 100 feet downstream of operations area and/or (2) fish always or seasonally present onsite, includes habitat to sustain fish migration and spawning, shall utilize the appropriate **Class I WLPZ width(s)** specified in the California Code of Regulations, title 14, section 936.5. http://calfire.ca.gov/resource_mgt/resource_mgt_forestpractice

    b) Perennial or intermittent watercourses which have: (1) fish always or seasonally present off-site within 1000 feet downstream (excludes intermittent or ephemeral watercourses with no aquatic life that are tributary to watercourses described under (a) above) and/or (2) aquatic habitat for nonfish aquatic species (aquatic insects and/or other physical habitat indicators such as riparian and aquatic vegetation, watercourse debris, and potential for small pool formation), shall utilize the appropriate **Class II WLPZ width(s)** specified in the California Code of Regulations, title 14, section 936.5. http://calfire.ca.gov/resource_mgt/resource_mgt_forestpractice

    c) Ephemeral or intermittent watercourses with no aquatic life present, watercourse shows evidence of being capable of sediment transport to watercourses described under (a) and

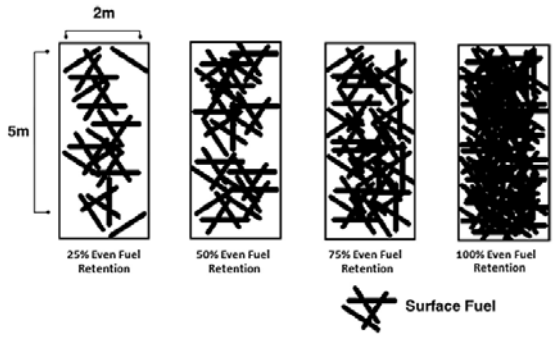
(b) above, shall utilize a minimum of **25 feet** where sideslope steepness is **less than 30%,** and a minimum of **50 feet** where sideslope steepness is **30% or greater**.

- Where management activities are planned on a burned area with **slopes greater than 30%, a minimum of 50% average effective groundcover is required to be documented prior to pesticide application**. Documentation shall be provided to the Central Valley Water Board in the pesticide notification **30 days prior to application**.

- The Discharger shall **notify** the Central Valley Water Board **in writing at least 30 days prior to any proposed application of pesticides**.

- The Discharger shall adhere to the resource protection measures in the Chemical Use Management Activities as designated in the National Best Management Practices for Water Quality Management on National Forest System Lands (USDA April 2012).

"Effective Ground Cover", as defined in Attachment A, means any combination of slash (lopped and in close contact with the ground), mulch (large wood chips, wood shreds, wood strand blends, straw, bark, surface rock fragments larger than ¾ inch), plants, and plant litter. Large wood chips are a minimum of 2 inches in length and at least four (4) times longer than they are wide.



Fifty-percent ground cover documentation shall use standard methods including aerial photography analysis, point intercept, plot, or transect methods, or any combination thereof.

The Discharger shall provide documentation of ground cover sampling methodology, locations of any ground-based sampling points, and any ground-based verification points or plots for aerial photo estimates. The figure to the left, borrowed from Harrison et. al 2016, is a schematic that illustrates even distribution of 25, 50, 75, and 100% ground cover. Additionally, the photo in the bottom left corner, borrowed from the Natural Resource Conservation Service at https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ny/technical/ecoscience/agronomy/, provides a useful image of 50% ground cover.

For post-fire salvage activities, ground cover shall be estimated down to 20 acres if such a scale will change the estimated effective ground cover percentage of individual areas, and down to 10 acres for areas that either have been determined to have high or extreme EHR, or have experienced high to severe burn severity as a result of wildfire. Burn severity determination will be made based on available soil burn severity maps or through field determinations made by the RPF or qualified professional.

III. Contents of a Post-Fire Management and Reforestation Plan

The PFP shall include the following to demonstrate that the Discharger can mitigate, to the maximum extent feasible, any controllable and management related sources of sediment and pesticides that may impact waters of the state, and that proposed management measures and operations will provide equal to or better protection than the conditions under Part III.C.3.b.ii. or Part III.F.3.c.ii of the Order, Category 2A and Category 5A, respectively.

A. A list of Emergency Notices/Projects enrolled under the Order that will adhere to the PFP.

B. A list of any "other areas" in the burn area that will adhere to the PFP (if they are not included in an Emergency Notice or Project area), such as old plantations that burned over and will receive pesticide applications but did not have timber salvaged. For these "other areas", include a map that shows the location(s) by Township, Section, Range and the associated acreage.

C. Evaluation of Receiving Waters and Beneficial Uses

   a. Within and downstream of the Emergency Notice/Project area(s) and "other areas":

      i. List the beneficial uses for surface water bodies and downstream receiving waters as identified in the appropriate Basin Plan;
      ii. List any 303(d) listing(s);
      iii. Identify and describe other critical habitat and aquatic resources (e.g. salmonids, domestic water supply intakes, aquatic species (including listed species));

   b. Describe how the PFP will adequately protect/address the resources identified above.

D. Pesticide Application

   a. Describe the following:

      i. Pesticide Product(s) to be applied;
      ii. Application method(s);
      iii. Schedule for application (dates);
      iv. Location(s) of application (Emergency Notice number and/or Township/Section/Range);

      **Changes to any of the above (D.a.i-iv.) must be submitted in writing no less than 48 hours prior to pesticide application.

   b. An evaluation of how pesticide applications could impact: identified significant and existing potential erosion sites and/or unstable areas/swales/erosional features that could contribute sediment to downstream crossings and watercourses.

   c. Explain why site conditions are favorable for the proposed land management activities (e.g. EHR, burn severity, slopes, annual rainfall).

   d. Describe pesticide mitigation measures recommended by the PCA, RPF, or other qualified professional that will be employed.

E. Land Management Practices

a. Describe any management practices/ mitigation measures that will be utilized to mitigate soil erosion (e.g. slash packing, mulching, contour ripping, waterbar spacing, percent groundcover, falling logs on contour, watercourse buffers, vegetative buffer strips, leave trees, etc.). The description/maps shall indicate the location(s) where specified management practices will be applied.

F. Monitoring

a. If additional monitoring is proposed or required to evaluate management measures related to the PFP, include the following;

i. Type of monitoring proposed (i.e., visual, photo point, water column sampling, etc.);
ii. Location of monitoring;
iii. Frequency and schedule;
iv. Evaluation of monitoring results;
v. Report submittal.

ATTACHMENT D
INFORMATION SHEET IN SUPPORT OF

GENERAL ORDER OF WASTE DISCHARGE REQUIREMENTS FOR TIMBERLAND MANAGEMENT ACTIVITIES ON NON-FEDERAL AND FEDERAL LANDS IN THE CENTRAL VALLEY REGION
FOR
ORDER NO. R5-2017-0061

This Information Sheet sets forth the background, rationale and references used in the development of certain requirements for Waste Discharge Requirements related to Timberland Management Activities on Non-Federal and Federal Lands, Order No. R5-2017-0061 (hereinafter "Order") within the Central Valley Region. Specifically, the information included herein elaborates on findings in the General Order related to water quality impacts and timberland management activities in the post-fire environment, an evaluation of Significant Existing or Potential Erosion Sites (SEPES), and monitoring and reporting costs associated with Order compliance. The content of this Information Sheet includes: the best available scientific research and information in the area of fire ecology, erosion, forest hydrology and water quality impacts from pesticide[1] use in the post-fire environment; field observations by Central Valley Regional Water Quality Control Board (Central Valley Water Board) staff; clarification on the evaluation of SEPES; and a summary of the existing rules and policies that are currently in place in California that regulate post-fire salvage logging and subsequent post-fire management activities.

WATER QUALITY IMPACTS AND TIMBER HARVEST OPERATIONS IN THE POST-FIRE ENVIRONMENT

In the western United States historic forest management and fire suppression, in conjunction with a changing climate, have led to uncharacteristically large, severe wildfires (Flannigan et al. 2000, Littell et al. 2009, Westerling et al. 2006, Westerling and Bryant 2008). As a result of this general decline in active fuels management on both federal and non-federal lands, exacerbated by nearly a century of intense fire suppression, increased frequency and intensity of stand-replacing fire is occurring throughout the western United States. The remaining forests of central and northern California that have not recently burned at high severity have high fuel loads and are experiencing extended periods of above average seasonal temperatures. These factors are leading to both extended fire seasons as a result of drier fuel conditions, and increased incident of extreme fire behavior with stand-replacing wildfires. Climatology models and information gathered by leading fire ecologists predict that the future wildfire regime in California will result in increased spatial size, distribution, and occurrence of severe wildfires (Fried et al. 2004, Miller et al. 2009, Westerling and Bryant 2008, Westerling et al. 2011).

Fire is a natural disturbance that directly influences California ecosystems and ecological processes, plant species, animals, and entire watershed ecosystems in California that have evolved to be both tolerant and dependent on fire as a landscape scale physical disturbance. However, as fire regimes in California shift, so has the intensity of the physical disturbance caused by wildfire. Increases in wildfire frequency, magnitude, and severity due to climate change within the western United States may lead to detrimental sediment-related water quality issues within

[1] For the purposes of this Information Sheet and Order (Attachment A) "pesticide" means (1) any substance, or mixture of substances which is intended to be used for defoliating plants, regulating plant growth, or for preventing, destroying, repelling, or mitigating any pest, which may infest or be detrimental to vegetation, man, animals, or households, or be present in any agricultural or nonagricultural environment whatsoever, or (2) any spray adjuvant, or (3) any breakdown products of these material that threaten beneficial uses. This definition excludes aquatic pesticide discharges covered under Order No. 2013-0002-DWQ.

burned mountainous watersheds (Gould et al. 2016). There must be recognition that post-fire land use activities have the potential to exacerbate fire effects, and land owners, land managers, and resource agencies have a responsibility to understand what those potential impacts are and where there is opportunity to minimize those impacts through both adaptive management and strategic regulatory measures.

Water Quality Impacts Following Fire

Following severe wildfire in forested landscapes, increased soil water repellency and other changes to soil properties can reduce infiltration rates and increase the rate and frequency of runoff (Martin and Moody 2001, Robichaud 2000, Robichaud et al. 2016). Additionally, the loss of ground cover following severe wildfires is a dominant factor for increased soil erosion rates (Benavides-Solorio and MacDonald 2001, Delwiche 2009, Larsen et al. 2009, Robichaud et al. 2016). Increased soil erosion rates and sediment delivery to downstream channel networks can pose a significant threat to aquatic resources and beneficial uses, particularly after extensive high severity wildfires (Helvey 1980, Moody et al. 2013, Bladon et al. 2014, Chappel 2014).

Soil erosion at its most basic form involves the detachment, breakdown, transport, and deposition of sediment, which in the context of post-wildfire effects, is dependent on multiple factors, including: fire severity, watershed area, topography, geology, vegetation, and precipitation intensity. The greatest erosion events typically occur before vegetation regrowth and recovery and often coincide with episodic, short-duration, high intensity rain storms immediately after severe wildfire (Moody and Martin 2001). Accelerated erosion, potential hydrophobic soils, reduced water infiltration rates, overland runoff, and mass soil hillslope failures can also produce catastrophic debris flows in some environments (Doerr et al. 2009) which pose a direct threat to water quality, beneficial uses, and human health and safety (Cannon et al. 2010). Accelerated soil loss also affects site class and future tree growth.

On uncompacted, unburned hillslopes and areas with intact overstory canopy and ground cover, overland flow usually occurs only during very intense and short duration storm events. In high severity post-fire environments, where soil properties have been altered and effective ground cover is not present, significantly higher rates of runoff can be expected (e.g., Wagenbrenner et al. 2017). Compared to lower severity fires, high severity fires consume a higher proportion of the vegetation, forest litter, and other organic matter that provide effective ground cover. Reduced ground cover exposes more of the soil to precipitation and often increases erosion by several orders of magnitude. In studies conducted in the Sierra Nevada, rates of post-fire surface erosion have been reported to be 2-239 times greater than pre-burn rates (Ahlgren and Ahlgren 1960). The amount of erosion and sedimentation depends on severity of the fire and post fire storm events (number and intensity), especially the first two winters. The progressive decline in post-fire sediment yields over time is largely controlled by the regeneration of surface cover, primarily vegetation (MacDonald and Larsen 2009, Benavides-Solorio et al. 2001, Larsen et al. 2009). With the return of vegetative growth and stabilization of easily mobilized soil material, hillslope erosion rates generally attenuate with time after the wildfire and return to background rates within 2-3 years (Heede et al. 1988, Wohlgemuth et al. 1998) under natural conditions.

Only limited post-fire sediment monitoring has been undertaken in the Sierra Nevada and Cascade Ranges. Usually erosion and sediment data are not collected following a wildfire. Data collected to date show widely varying impacts, with very high hillslope erosion rates usually requiring one or more major hydrologic event the first two winters. In general, post-wildfire erosion is highly variable

and difficult to predict. The risk of elevated sediment yields generally is greatest the first few years after the fire until vegetation is reestablished (Wagenbrenner 2017).

As an extreme example of post fire erosion, the 2012 Bagley Fire (46,011 acres) in Shasta County produced an estimated total hillslope erosion of 5.23 million tons (114 tons per acre) during the first year post-fire. Two intense storms occurred a few months after the fire, with estimated return intervals of 25-50 years. Soil loss was estimated at 0.2 to 2.2 inches on virtually all hillslopes (USFS 2014). Measured sediment delivered to Squaw Creek during the first year post-fire resulted in sustained turbidity and significantly higher water temperatures, exceeding 70 degrees Fahrenheit; a temperature that can be lethal to cold water fish. Sediment produced during the first year post-fire and during subsequent years continue to be transported downstream to Lake Shasta, leading to reduced storage capacity and increased nutrient loads.

Other post-fire monitoring efforts in interior California have documented lower sediment yields at the plot or small catchment scales. These include the 2012 Ponderosa Fire - 15.5 t/ac (James 2014); 1999 Pendola Fire - 5 t/ac (MacDonald et al. 2004); 2007 Angora Fire - 0.01 t/ac (Wade and Kocker 2012), 1987 Stanislaus Complex - 20-50 t/ac (J. Frazier and A. Janicki, Stanislaus National Forest, pers. communication, cited in the California Fire Plan, BOF 1995); 1987 Hayfork District - Shasta Trinity National Forest Complex Fires - 10-40 cubic yds/ac (Miles et al. 1989); and the 2001 Star Fire - 1.2 t/ac, second winter (Chase 2004).

Following wildfire, sediment discharge can lead to changes in turbidity, temperature and stream chemistry. These changes may degrade water quality (i.e., taste, odor, color) and impair drinking-water treatment processes, along with negatively impacting aquatic life. Increases in sediment and turbidity can affect aquatic ecosystems by clogging streambed interstitial voids with fine sediments, reducing stream depth, increasing channel instability, altering stream temperatures, impairing fish feeding, and destabilizing stream channels (Goode et al. 2012). The growth and survival of aquatic plants, invertebrates, and fish are negatively affected by increases in sediment and turbidity (Wagner et al. 2014).

Wildfires such as the 2012 Bagley Fire can liberate accumulated metals, such as arsenic, aluminum, cadmium, iron, lead, and mercury. These metals have a strong affinity for ash and fine sediment, which are subsequently discharged to stream systems via elevated runoff and erosion (Bladon et al. 2014). Mercury's potential to bioaccumulate and biomagnify can result in health problems for consumers of fish. There are several streams, lakes, and reservoirs—including Lake Shasta—in the Central Valley Water Board region that are currently listed as 303(d) impaired by various metals, including mercury. Many of these waterbodies are located in watersheds subject to increased risk of large, severe wildfires.

Nutrients such as nitrogen and phosphorous are often mobilized by fire, which results in increased loading to streams (Bixby et al. 2015). In addition, significant increases in specific conductance and turbidity, along with corresponding decreases in dissolved oxygen are documented (Sherson et al. 2015). Nutrients can contribute to and exacerbate Cyanobacteria (blue-green algae) blooms, such as those experienced during the summer of 2015 throughout much of the Central Valley Water Board region, including Lake Shasta.

Timber Harvesting Policies and Regulations in California

Non-Federal Lands

Timber harvesting on non-federal lands in California is regulated by the Board of Forestry and Fire Protection (BOF) in accordance with the Forest Practice Act (FPA) through implementation of the California Forest Practice Rules (FPRs); a set of regulations that lay out administrative procedures and prescriptive best management practices to protect natural resources. Pursuant to the FPA and through the FPRs, the California Department for Forestry and Fire Protection (CAL FIRE), acting as the lead agency, the applicable Regional Water Board, California Department of Fish and Wildlife (CDFW), and California Geological Survey are responsible agencies for the review of timber harvesting plans (THPs) (Cal. Code of Regs., tit. 14, § 896). As a member of this interdisciplinary Review Team for green tree THPs, the Central Valley Water Board staff reviews proposed THPs, and has the opportunity to participate in pre-harvest inspections, and may provide input and recommendations on water quality-specific components to ensure water quality protection prior to CAL FIRE approval.

This multi-disciplinary review process for green tree THPs is considered to be functionally equivalent to the Environmental Impact Report (EIR) process under California Environmental Quality Act (CEQA) (*see* Cal. Code of Regs., tit. 14, § 896). The average THP consists of more than 120 pages of information related to the site, current conditions, proposed operations, cumulative impacts assessment, operational considerations, and proposed mitigations to address potential impacts to a variety of natural resources supported by forestlands.

Following wildfire, many large industrial forest landowners engage in salvage logging, whereby burned, damaged, and commercially valuable timber is removed through conventional timber harvesting techniques. Generally, the value of the commercial timber burned in a fire degrades within 1-2 years post-fire, resulting in harvesting operations that focus on removing burned timber quickly to recover as much economic value as possible. The FPA and FPRs allow for the rapid removal of trees from areas damaged by fires where such removal meets the definition of an emergency:

> *…those conditions that will cause appreciable financial loss to the timber owner that may be minimized by immediate harvesting of timber"* (Pub. Res. Code § 4592; *see also* Cal. Code of Regs., tit.14, § 895.1).

The Emergency Notice process requires minimal documentation (generally approximately 3 pages including a map) and does not provide opportunity for the interdisciplinary Review Team to address potential impacts to resources from post-fire salvage operations. As a non-discretionary action taken by CAL FIRE, timber operations associated with Emergency Notices can commence five working days after submittal without first preparing a THP, and are not subject to the interdisciplinary Review Team process or public review/comment. In fact, due to the accelerated timeline for Emergency Notices, it is generally only after a timber/timberland owner has submitted the Emergency Notice to CAL FIRE and then submitted an application for coverage under the Central Valley Water Board's current Waiver of Waste Discharge Requirements (Order No. R5-2014-0144) that staff becomes aware post-fire salvage operations have commenced and receive limited information about the location and timing of those operations.

Non-federal timber/timberland owners are required to retain a Registered Professional Forester (RPF) to prepare and submit an Emergency Notice. Timber operations conducted pursuant to a CAL FIRE-accepted Emergency Notice must comply with the rules and regulations of the BOF and

specifically with all operational provisions of the FPRs applicable to plans. The timber/timberland owner has one year to complete timber harvesting under the Emergency Notice from the date of CAL FIRE receipt, unless a discretionary THP is subsequently approved allowing for continued operations in the area.

There are also other differences between an Emergency Notice for post-fire salvage and a typical "green tree" THP. While there are no upper (or lower) limits for the total acreage allowed under a THP, individual even aged harvest unit size in a "green tree" THP is limited to 20 acres for tractor logging and 30 acres for cable/aerial logging with additional controls on the filing of contiguous harvesting plans. Post-fire salvage operations have no upper or lower limits for the total acreage harvested, as long as all operations can be concluded within the one-year time period. Therefore, harvest units under an Emergency Notice can be as large as the timber/timberland owner can operationally accommodate, effectively resulting in the potential for clear-cutting of multiple contiguous square miles (thousands of acres). In burned landscapes, large salvage logged units that exceed hundreds of acres in size can exacerbate runoff and erosion rates through removal of standing dead timber and timber that is damaged by the fire. Increased erosion and runoff can occur due to road and skid trail construction and use, and possible reduction in overstory canopy and removal of biomass that if left unharvested would provide ground cover (i.e., needle cast, tree limbs, and eventually snags and whole trees) to dissipate rainfall energy and concentrated flow along the hillslopes. Often, however, salvage logging increases short-term ground cover due to the logging slash and tree tops left on site (Poff 1989).

Another fundamental difference between an Emergency Notice for post-fire salvage and a typical "green tree" THP applies to the Watercourse and Lake Protection Zone (WLPZ)—also known as riparian buffer zones. WLPZ requirements apply to both standard green tree THPs as well as Emergency Notice operations; however, trees within the WLPZ that have fallen, or are damaged, dead, or dying can be removed under an Emergency Notice, regardless of the standard tree retention or restocking requirements of the FPRs for green tree THPs. This can result in the complete removal of all large timber from within these streamside zones during salvage logging operations, unless the watershed requires additional protection measures for anadromous salmonids.

In 2009, after the 2008 June lightning fire siege that occurred across the state, a proposal to extend Emergency Notices from 120 to 365 days was proposed by the timber industry to the BOF. The proposal included modification of California Code of Regulations, title14, section 1052(e) language that:

> *…intended to lengthen the effective period of an Emergency Notice such that preparation and approval of a succeeding THP may be assured prior to expiration of an Emergency Notice.*

At the time, Central Valley Regional Water Board staff argued that if the BOF's intent was to ensure harvesting operations in the post-fire environment would be started under an Emergency Notice and then analyzed with the THP Review Team process, then the rule language would need to clearly require a THP be submitted prior to the expiration of the applicable Emergency Notice.

In response to questions about possible significant adverse environmental effects, the BOF found that:

> *…[this] proposed regulation would not result in significant adverse environmental effects. The existing Forest Practice Rules for Emergency Notices and Timber Harvesting Plans already provide for comprehensive assessment and mitigation of potential adverse effects. This proposed regulation does not alter these existing provisions.*

Additional response was provided by Central Valley Water Board staff:

> *While Regional Water Board staff agrees that the FPRs provide for assessment and mitigation of potential adverse effects through the THP process, the information required in a THP is significantly more complex than that required by the Emergency Notice. It is inaccurate to state that the FPRs provide for a comprehensive assessment and mitigation of potential adverse effects through the Emergency Notice process. While there is a list of operational limitations that must be complied with for Emergency Notices in the FPRs, there are numerous concerns that are not addressed. And in fact, an argument could be made that allowing operations on lands that have been burned (and thus been made more sensitive than those normally reviewed under the THP process) through a non-discretionary process is not an environmentally responsible or defensible position.*
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> *If a burned area has unmaintained legacy roads and [watercourse] crossings that are undersized, the Emergency Notice allows for those roads to be used and does not require assessment and mitigation of any erosion problems from those roads and crossings.* [Central Valley] *Water Board staff acknowledges that there may not be a simple answer for the problem this rule is trying to address, but a simple extension of the time limits is only addressing a small portion of the problem.*
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> *The FPRs provide minimum operational standards, and those requirements are frequently supplemented with additional mitigations to address potential impacts to the resources through the interdisciplinary review team process* [for THPs]. *Due to the nature of the Emergency Notice process those same minimum operational standards* [additional mitigations] *provided in the FPRs are not applied. If Emergency Notices are allowed to proceed for 365 days, the likelihood of a succeeding THP ever being submitted and those additional environmental mitigation measures being developed declines dramatically.*
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> *There must be acknowledgement that fire is a natural process by which waters of the state (as well as other resources) are impacted, but it is critical to accept that it is our responsibility to ensure that the impacts from the fire are not further aggravated by anthropogenic activities.*

Since the lightning fire siege that occurred throughout the state in 2008, Central Valley Water Board Forest Activities Program staff has focused more effort on these post-fire salvage operations and have not observed THPs being prepared to continue salvage operations subsequent to the first year of harvesting conducted under Emergency Notices (on non-federal lands). Instead, staff has observed multiple Emergency Notices being submitted for 1-3 years after the fire.

Over the last several years CAL FIRE has processed, on average, approximately 175 Emergency Notices covering roughly 45,000 acres annually. This number is heavily dependent on annual fire season activity, but it provides a general idea of the recent scope of the issue.

During this time, Central Valley Water Board staff has observed extensive soil erosion and sediment discharge to receiving waters extending for several years following many large wildfire

events. These large fires include: the Bagley, Bully, Ponderosa, King, Chips, Moonlight, Valley, and Rim Fires. Post-fire salvage operations following these fires has resulted in direct impacts to water quality through accelerated erosion and sediment delivery from skid trails, roads, landings, and episodic events such as landslides and debris flows. Many of these sources of sediment discharge are largely attributed to and associated with post-fire salvage operations. Direct in-stream measurements of turbidity that exceeded Basin Plan objectives have been documented downstream of several fires (e.g., Ponderosa, Bagley, and Bully Fires). There are data to suggest that changes in turbidity in streams draining the 2012 Ponderosa Fire were caused by the fire, salvage harvesting, and associated road use (Lewis 2014). In addition, dozens of herbicide (pesticide) detections have been recorded in the post-fire environment that will be discussed in later sections of this document.

There is recognition among Central Valley Water Board staff that identifying cause and effect between post-fire salvage operations and water quality impacts is challenging. Non-point source water quality pollution can be complex and evaluating sediment discharge from post-fire salvage operations against natural or background delivery rates to watercourses is no different. However, the Central Valley Water Board has a responsibility and mandate under the Clean Water Act, California Water Code, Basin Plan, and Non-Point Source policy to identify potential non-point source discharges to waters of the state and address those discharges through prohibitions; or Waste Discharge Requirements (WDRs); conditional waivers of WDRs; or until a determination has been made that the threat of discharge and impact to water quality no longer exists.

Federal Lands

As the largest public land management agency in the Central Valley Region's forested zones, the U.S. Forest Service (USFS) experiences large catastrophic wildland fires, predominantly along the west slope of the Sierra Nevada and southern Cascade Ranges on National Forest System lands (NFS).

Immediately following a fire on federal lands, there is a rapid assessment by a Burned Area Emergency Resource (BAER) team staffed by specially trained professionals for fires greater than 300 acres, generally including hydrologists, soil scientists, engineers, biologists, vegetation specialists, archeologists, GIS specialists, and others, who rapidly evaluate the burned area and prescribe emergency stabilization treatments for Forest Service lands. The BAER program is designed to address these emergency situations through its key goals of protecting values at risk (VARs), including life, property, and critical natural and cultural resources. Water quality and aquatic habitat are not specifically included in the list of VARs evaluated through the BAER process. In most cases, only a small portion of the burned area is treated based on the outcome of the BAER process, due to the high cost of effective treatments (e.g., mulching; hydro-mulching). Some of the information that is gathered during these assessments, however, can be utilized for development of future project proposals and in support of environmental documents for those projects.

The percent of federal lands salvage logged is much lower than that which occurs on private industrial timberland in California. Post-fire salvage logging on federal lands seldom occurs in the first year of the fire due to the time involved in preparing environmental documents in conformance with the National Environmental Policy Act (NEPA). Depending on the scope of proposed actions and the level of impact on the environment, the USFS may choose to prepare a Categorical Exclusion (CE), Environmental Assessment (EA), or Environmental Impact Statement (EIS). In general, the USFS will only utilize a CE for very small proposed post-fire salvage operations or roadside hazard tree removal through areas that have experienced wildfire. The preparation of this

document and final decision can be relatively fast and a final decision can be made within a few months. The scope of an EA is generally broader and incorporates multiple resource objectives (e.g., reduce public safety hazard along NFS roads, recover economic value of fire-killed trees, reduce fuel loading, implement reforestation, and manage road infrastructure). These documents take longer to develop utilizing a multi-disciplinary team of specialists, and there is a much more involved public scoping process which can often lead to delays and litigation. The most robust NEPA document is the EIS. These documents can be very broad in scope and include evaluation of a multitude of resource objectives and goals. Preparation of these documents can be lengthy and if post-fire salvage operations are a component of the proposed actions, it is often unlikely that the decision approving the NEPA document will be prepared before the fire-killed commercial species of trees have lost all economic value.

There is a growing trend within the federal agency to prepare larger environmental documents (i.e., EA and EIS) in an effort to conduct multi-phased and longer term watershed-scale projects with multiple resource goals and objectives. There are many reasons why the USFS pursues this type of approach to their land management; however, a consequence of this approach is that post-fire salvage projects can take much longer to receive approval, and as a result, the trees quickly lose economic value before they can be harvested. This can lead to the timber sale/salvage component of these projects being removed from the project or Timber Sales are not purchased by private contractors and the trees are left unharvested. Either way, standing dead and dying trees are often left behind on the landscape. Reforestation efforts are greatly compromised, leading to reduced long term carbon storage in California forestlands (CARB 2017). Despite broad agreement on reforesting lands burned, lack of funding and staff have made reforestation very difficult.

The Central Valley Water Board's review process for post-fire salvage projects on federal lands is significantly different compared to non-federal projects. Following a wildfire on NFS lands, Central Valley Water Board staff review the Schedule of Proposed Actions (SOPA) list for each National Forest to see what projects and associated environmental documents will be proposed. Staff review and respond to the proposed action during the regular public scoping period. Once a USFS decision has been made on the NEPA document, the USFS submits a NOI for the proposed project, and Central Valley Water Board staff review the submitted project documents, enrolling the project under the appropriate permit category. Staff often conducts inspections of the post-fire salvage operations and provides recommendations for additional erosion mitigations where necessary to protect water quality. However, unlike the THP process for non-federal lands, it is sometimes difficult to incorporate substantial recommendations (e.g., new or reconstructed watercourse crossings or significant modification to road shape and drainage) without modifying the original environmental documents (i.e., CE, EA, or EIS). These documents are often written in very general, non-prescriptive terms that make evaluations for potential water quality impacts prior to commencement of project activities challenging. The lack of site specificity in the project documents provided by the USFS has been an on-going issue for Central Valley Water Board staff, not only for post-fire salvage projects, but for all non-point source projects enrolled under Water Board permits.

Post-Fire Timber Harvest

Numerous studies have been conducted on post-fire erosion response to logging (Ice and Beschta 1999). Some studies indicate that there are potential benefits to logging after wildfire—increasing ground cover through logging slash, removing sources of high intensity water droplets from standing dead trees, reduction of fuel loading and risk of high intensity fires, and by breaking up

hydrophobic soil layers (Poff 1989, James 2014). The application of these ground-based treatments, however, are often limited to slopes that are less than 35 percent where erosion rates are generally lower due to lower erosive energy and runoff velocity. Conversely, there is documentation from other studies reporting that salvage logging increases the risk of sedimentation and that specific best management practices are needed to mitigate the hydrologic impacts of post-fire logging (Beschta et al. 1995, Peterson et al. 2009, Wagenbrenner et al. 2015, Wagenbrenner et al. 2016b, Lewis 2014).

At the small catchment scale, impacts of salvage logging on sediment yields are variable. One recent study has shown a net decrease in sediment yields after salvage logging and subsequent herbicide (pesticide) applications (James 2014), two studies have shown no detectable change in sediment yields because of salvage logging (Wagenbrenner et al. 2015)—Hayman and Kraft Springs Fires; Olsen, 2016), and one study has documented an increase in sediment yields because of salvage logging (Wagenbrenner et al. 2015—Red Eagle Fire) (Wagenbrenner 2017).

Non-Federal Lands

Large non-federal industrial landowners generally remove all the trees within an Emergency Notice harvest unit, including those only partially burned or scorched. This can result in post-fire harvest units which have no size limitations and are almost completely devoid of trees. Based on the fact that burned areas produce additional stormwater runoff and sediment, both the existing road network and any new logging road construction should be designed, utilized for heavy equipment and log hauling, and maintained to minimize delivery of sediment to streams. Post-fire logging generally requires the installation and use of numerous skid trails, used when heavy equipment transports the cut logs within the logging unit to a landing, where the tree is then processed and loaded onto log trucks for transport to the mill. As with new logging road construction, post-fire skid trails present a heightened potential for erosion and sediment transport. With the urgency to remove burned trees and maximize the economic value of the rapidly degrading wood product, there are usually compressed timelines within which to evaluate, design, and implement logging operations, including road construction, before the first winter period following the fire. Central Valley Water Board staff has observed that standard coefficients and input values (e.g., runoff coefficients, time of concentration calculations, headwater/depth ratios for culverts, etc.) used in technical guidance documents for design of stream crossing structures (as noted in Cafferata et al. 2004) may be inadequate in the post-fire environment.

Federal Lands

Unlike non-federal landowners, USFS salvage operations remove only a fraction of the burned trees and generally leave most partially burned and scorched trees for wildlife values and possible recovery. This limited and selective harvesting, by its very nature, may provide immediate ground cover in the form of needle cast, as well as dead trees, green trees (foliage), and some logging slash.

Riparian buffers mandated by various USFS BMPs, regulations and policies, are wider than those required of non-federal landowners in the FPRs, providing extra protection for aquatic resources and water quality.

Post-Fire Pesticide Use

Non-Federal Lands

While post-fire salvage operations conducted under an Emergency Notice are not required to restock (i.e., replant conifers), most non-federal industrial timberland owners in California choose to

reforest their lands. Replanting conifers is frequently accompanied by pesticide applications to ensure seedling survival and establish conifer plantations as quickly as possible (DiTornaso et al. 1997, Webster and Fredrickson 2005, Zhang et al. 2008). In some cases, pre-emergent pesticides are applied in the late fall or early spring immediately after the fire to prevent competing vegetation from germinating. In other cases, post-emergent pesticides are used to kill newly sprouting vegetation before and/or after planting new conifers. There are two common methods in which pesticides are applied within the forested landscape to facilitate regeneration of conifer seedlings: spot applications, where an applicator uses a hand-sprayer to apply pesticides in a small circle around an individual conifer seedling; and aerial applications, where pesticides are sprayed from an aircraft over larger areas. In many cases, especially with the size and extent of recent spatially extensive wildfires, applications of pesticides by non-federal landowners are accomplished via aerial spraying (e.g., helicopters).

Pre-emergents [pesticides] are very effective at preventing new ground cover establishment for several years in the post-fire landscape, which reduces competition for nutrients, light, and water, increasing the success rate of conifer seedling survival (Webster and Fredrickson 2005). From a reforestation perspective, the use of pre-emergents [pesticides] achieves the objective of reducing competition between recently established commercial tree species seedlings and non-desirable species such as hardwoods, brush, and grasses. This practice, however, can come at a cost by delaying natural recovery of the burned landscape and the establishment of effective ground cover to reduce surface erosion (DiTornaso et al. 1997).

Very little information is available regarding the impacts of post-fire management on runoff and erosion (Wagenbrenner 2017). Most post fire research has focused attention on the physical effects of ground-based salvage logging on runoff and erosion, while little attention has focused on post-logging vegetation management. It is currently unknown whether post-fire vegetation management using pesticide treatments has a larger effect on post-fire hydrogeomorphic processes than salvage logging due to alterations in post-fire recovery processes (i.e., revegetation and associated ground cover increases). Clearly there are trade-offs associated with limited pesticide application (e.g., poorer seedling survival, slower establishment of tree cover).

Numerous studies have shown that the percent of ground cover is the primary and dominant control of erosion and sediment yield in the post-fire environment (Benavides-Solorio and Macdonald 2001, Benavides-Solorio et al. 2005, Goldman et al. 1986, Larsen et al. 2009, Lavee et al. 1995, Robichaud et al. 2010, Wagenbrenner et al. 2015, Slesak et al. 2015, Delwiche 2009).

Federal Lands

The USFS typically utilizes pesticides on a very limited basis in post-fire environments. In most cases where pesticides are used on NFS lands, spot spraying is used to control invasive weeds and to help re-establish conifers. Unlike non-federal industrial landowners, these limited applications generally occur a year or more after the fire when vegetative recovery and ground cover has been significantly re-established, thereby, providing the cover necessary to reduce erosion and limit offsite movement of sediment.

For the pesticides commonly used by the USFS in its management activities, Human Health and Ecological Risk Assessments (HERAs) are prepared. In these documents, the process of risk assessment is used to quantitatively evaluate the probability that pesticide use might pose harm to humans or other species in the environment. When evaluating risks from the use of pesticides proposed in a NEPA planning document, the USFS has determined that reliance on the U.S. Environmental Protection Agency's (U.S. EPA) pesticide registration process as the sole

demonstration of safety is insufficient. The USFS and Bureau of Land Management (BLM) were involved in court cases in the early 1980's that specifically addressed this question (principally Save Our Ecosystems v. Clark, 747 F.2d 1240, 1248 (9th Circuit, 1984) and Southern Oregon Citizens v. Clark, 720 F. 2d 1475, 1480 (9th Cir. 1983)). These court decisions and others affirmed that although the USFS can use U.S. EPA toxicology data, it is still required to do an independent assessment of the safety of pesticides rather than relying on the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) registration alone. The Courts have also found that FIFRA does not require the same examination of impacts that the USFS is required to undertake under NEPA. Further, USFS assessments consider data collected from both published scientific literature and data submitted to U.S. EPA to support FIFRA product registration, whereas U.S. EPA utilizes the latter data only. The U.S. EPA also considers many forestry pesticides uses to be minor. Thus, the project-specific application rates, spectrum of target and non-target organisms, and specialized exposure scenarios evaluated by the USFS are frequently not evaluated by U.S. EPA in its generalized registration assessments.

Post-Fire Pesticide Application and Regulations

Post-fire applications of pesticides follow the same pesticide labeling rules as used in 'green tree' forestry pesticide applications (as shown on the individual pesticide label), regardless of the severity of the fire and the amount of vegetation cover removed by the fire or the risk of erosion.

All pesticide label requirements, including those related to aquatic buffers are initially approved by the U.S. EPA based on evaluation of pesticide registrant submitted data used to support proposed label uses. In order for pesticide products to be used in California, the Department of Pesticide Regulation (DPR) reviews all U.S. EPA pesticide label components. State specific modifications to address necessary additional restrictions may be incorporated in coordination with registrant and EPA. Each pesticide label has general use instructions with specific state requirements. A Pest Control Advisor (PCA) is a trained, licensed individual that provides site specific pesticide recommendations. Most commonly used forestry pesticides have no aquatic buffers listed on the label, as indicated in Table 1 below.

Table 1 – Pesticide aquatic buffer widths as provided in current labels*

Active Ingredient	Formulation Name	Aquatic Buffer (feet)	Label Toxicity Warnings	Additional Labeling
Aminopyralid	Milestone	0		
Clopyralid	Transline	0		
Glyphosate	Accord XRT II	0		
Hexazinone	Velpar L	0		
Imazapyr	Polaris	0		
	Arsenal	0		
	Chopper	0		
	Stalker	0		
	Rotary 2 SL	0		
Oxfluorfen	Pindar GT	25 ***Vegetated* buffer strip	*This product is toxic to aquatic invertebrates and wildlife*	*Runoff from treated areas may be hazardous to aquatic organisms in neighboring areas*
	Cleantraxx	25 ***Vegetated* buffer strip	*This product is toxic to aquatic invertebrates and wildlife*	*Runoff from treated areas may be hazardous to aquatic organisms in*

Active Ingredient	Formulation Name	Aquatic Buffer (feet)	Label Toxicity Warnings	Additional Labeling
				neighboring areas.
Sulfometuron methyl	Oust XP	0		
Triclopyr	Garlon 4	0	*This pesticide is toxic to fish.*	*The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.*
	Element 4	0	*This pesticide is toxic to fish.*	*The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.*
	Forestry Garlon XRT	0	*This pesticide is toxic to fish.*	*The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.*
***** 2,4-D**	Weedone LV6 EC	0	*This pesticide is toxic to fish.*	*The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.*
	Weedone LV4	0	*This pesticide is toxic to fish.*	*The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.*

** This table provides a summary of current label requirements and is subject to change. The most up to date requirements for individual pesticides are listed on the label and should take precedent.*

*** Vegetated buffer: Note that in many wildfires with high burn severity there is no vegetation remaining to provide an aquatic buffer.*

**** 2,4-D is a Restricted Material: Restricted Materials are designated by DPR, based on hazards to public health, applicators, farm workers, domestic animals, honeybees, the environment, wildlife, or crops other than those being treated.*

Pesticide Application Monitoring (DPR/County Ag)

For non-restricted materials, licensed pesticide applicators are required to report pesticide use to the respective county agricultural commissioner (CAC) within seven days of the completion of the application. Restricted material pesticides (e.g., 2,4-D and strychnine) have to report to the CAC 24 hours in advance of application. Restricted Materials are designated by DPR, based on hazards to public health, applicators, farm workers, domestic animals, honeybees, the environment, wildlife, or crops other than those being treated. There is no evidence that any monitoring of forestry pesticide applications is conducted by CAC staff (Central Valley Water Board staff personal communication with CAC staff and RPFs, May 2016).

Post-Fire Pesticide Detections

Following the 2012 Ponderosa Fire in the Battle Creek watershed located in Shasta and Tehama counties, salvage operations were conducted throughout the watershed on non-federal lands. During 2013 and early 2014, approximately 12,000 pounds of Hexazinone (Active Ingredient – A.I.) 1395 pounds of Imazapyr, 115 pounds of Triclopyr, and 30 pounds of 2,4-D were applied in the Battle Creek watershed, most of it associated with post-fire conifer plantation establishment. . Through a contract agreement with the Central Valley Water Board, a water sampling and analysis pilot study was conducted by the California Department of Fish and Wildlife (CDFW) between November 2013 and March 2014. Hexazinone, 2, 4-D, Triclopyr, and Imazapyr were detected. Hexazinone was detected in all 26 samples. The primary purpose of the pilot study was to test the utility of the Continuous Low Level Aquatic Monitoring (CLAM) collection devices for detecting pesticides downstream of forestry operations. This study did not quantify concentrations of specific chemicals; however, pesticide chemicals were present and detectable. While detections were indicated, significant issues with regard to the equipment reliability of the CLAM sampling devices, testing protocols, and verification standards indicate that further study is needed. Until further study can be conducted, the General Order establishes specific requirements in Parts III.C.3.b.ii. and III.F.3.c.ii. to provide reasonable protection measures to address potential threat to water quality from pesticides in forestry application.

Post-Fire Mitigations for Protecting Water Quality

The previous sections have summarized the naturally occurring and anthropogenic sources of accelerated erosion and sediment delivery that can occur following a major wildfire, including: the mechanics of increased runoff rates, hydrophobicity, surface soil erosion, and the inability of burned landscapes to buffer increased erosion. In unmanaged landscapes where no salvage logging operations will occur, these processes will occur naturally and play a vital role in ecosystem dynamics and landscape scale erosional processes. In managed landscapes where salvage logging will occur, BMPs and mitigations are needed to reduce management-related sediment sources to watercourses within the burned area. The most widely used and most cost-effective management measures and BMPs used to mitigate erosion and sediment delivery are erosion barrier treatments, mulch treatments, chemical soil surface treatments, and natural reestablishment of vegetative cover.

Erosion barrier treatments are designed to slow runoff, and trap and store eroded sediment. Common post-fire hillslope erosion barriers include contour-felled logs, straw wattles, contour trenches or ‘contour ripping’ (hand or machine dug), and straw bales (Napper 2006). Erosion barriers, and contour-felled logs in particular, may reduce runoff and sediment yields for low intensity rain events, but they are unlikely to have a significant effect for high intensity rain events and can concentrate flow, creating erosion if implemented incorrectly (Robichaud et al. 2010). Contour ripping has been used by some landowners and land managers as cost-effective erosion mitigation in post-fire environments (James 2014). Contour ripping can be implemented generally on slopes 35% or less, where erosion is lower than on steeper slopes, and is not restricted by natural barriers, such as rocky terrain. The contours created by this practice must be deep enough to penetrate the hydrophobic layer created by high intensity fire and be constructed “on-contour”, perpendicular to slope, to reduce flow pathways and concentration of runoff that could result in rilling and gullying. A study conducted by a large industrial landowner in the Ponderosa Fire footprint indicates that contour ripping reduces post-fire surface erosion (James 2014).

Mulch treatments can be an effective post-fire mitigation for reducing surface erosion and involves the spread of material over the exposed soil surface to protect it from rain drop impact, overland flow, and erosion. Mulching is a quick way to immediately increase ground cover in areas that are at high risk of erosion and can be an effective post-fire mitigation. Mulches include wet mulches, such as hydromulches, which are mixed with water and sprayed over the soil surface. Dry mulches include straw, wood chips, wood shreds, and wood strands. Large wood chippers and masticators have proven to be very effective at generating wood chips and wood sheds using on-site fuels and logging slash. A limiting factor with dry mulches is that they are generally applied only on slopes from 20 to 60 percent, or where chippers can broadcast chipped materials on to the hillslope. "Straw bombing" or heli-mulching is another technique that has been utilized most frequently on federal post-fire landscapes by dropping cut hay bales from helicopters. This method can be effective, however, the operational cost of helicopters to "bomb" the hillside is often cost prohibitive (usually over $1500 per acre), and can result in less than two percent of the landscape being successfully treated.

Tackifiers—also known as soil binding agents—are another form of erosion treatment that is applied directly to the soil surface, forming a thin web of polymer designed to hold soil particles together. The soil binder polyacrylamide (PAM), a soil particle flocculant, is designed to connect small particles, thus increasing their size and mass. PAM is the only soil binder that has been used as a post-fire hillslope stabilization treatment. Post-fire treatment effectiveness studies that include PAM have generally been inconclusive or have shown no treatment effect.

For landscape-scale fires, many of the mitigations mentioned above are costly, with varying degrees of effectiveness (Robichaud et al. 2010, Wagenbrenner et al. 2006). The natural re-establishment of ground cover has shown to be the most feasible and cost-effective method to reduce erosion and sediment production (MacDonald and Larsen 2009, Benavides-Solorio et al. 2001). For many non-federal industrial timberland owners, however, allowing burned forestlands to regenerate naturally is not a viable economic option for maximizing commercial tree species production. For these landowners, herbicide (pesticide) use has been proven to be an effective measure for delaying the re-establishment of natural vegetative cover and increasing the rate of survival for replanted conifer seedlings. As discussed in previous sections of this document, the application of pesticides in the post-fire environment can have both a direct and indirect effect on rates of soil erosion, and the potential discharge of residual chemicals directly into surface waters.

Ground cover and riparian buffers can reduce pesticide discharge into streams by providing dissipation, filtration, chemical sequestration, and chemical degradation/biodegradation (Wenger 1999, Larson et al. 1997). Ground cover has been shown through numerous studies to be effective at reducing erosion and sediment transport. Research consistently indicates that 50% ground cover functions as the threshold where erosion and sediment production is significantly reduced (Benavides-Solorio et al. 2005, Foltz and Wagenbrenner 2010, Golman et al. 1986, Harrison et al. 2016, MacDonald and Robichaud 2008, Prats et al. 2012, Robichaud et al. 2012, Wagenbrenner et al. 2006, Yanosek et al. 2006).

Riparian buffers are shown to protect water quality, habitat, and biota in *non-burned* landscapes (Sweeney and Newbold 2014, Wenger 1999, U. S. Army Corps of Engineers 1991). Unburned or stream buffers burned with low severity are critical to protect water quality and other beneficial uses in post-fire environments because of the increased sediment production due to runoff after wildfires. Appropriate sized stream buffers (generally ≥30 meters or 100 feet) have been shown to mitigate stream impacts from *green tree* logging activities, while small buffers (≤10 meters) do not significantly protect a stream from logging impacts (Davies and Nelson 1994). Areas with high

resource value—such as wetlands and fish bearings streams—benefit from buffers that are a minimum of 15 meters, or approximately 50 feet (Castelle et al. 1994).
Studies on herbicide fate and transport show that average buffer widths of 38 m and 50 m, in restored and managed riparian forests respectively, reduced herbicide concentrations to at or below detection limits (Lowrance et al. 1997, Vellidis et al. 2002). A review of pesticide buffers found that cases of high pesticide concentrations only occurred when no buffer was used and that generally, bufferstrips of 15 m or larger are effective in minimizing pesticide contamination in streams (Neary et al. 1993).

This General Order requires the implementation of buffers based upon the information provided above. While slightly larger than research indicates necessary, required buffers are the same as those required in the FPRs to address large variations in soil, topography, resource sensitivity, etc. This General Order also allows the discharger to propose an optional plan (Attachment C) should they wish to test out emerging or alternate methods, technology, or pesticide use within the buffer(s) or on the slopes above.

Development of effective post-fire mitigations and BMPs to reduce impacts from erosion and sediment delivery to streams is an area of research and development that is being explored by many leading fire scientists, soil scientists, watershed scientists, foresters, and many state and federal resource agencies throughout the western U.S., including California. In an effort to provide more site-specific research into the effects of post-fire salvage logging in California, and to support an adaptive management framework where new science and research is used to support or promulgate existing and new rules and regulations, the Central Valley Water Board is funding a study through the AB 1492 Timber Regulation and Forest Restoration Fund (TRFRF) on Boggs Mountain Demonstration Forest (BMDSF), managed by CAL FIRE. BMDSF burned in 2015 during the Valley Fire and has provided a valuable opportunity to explore the effects of post-fire management on water quality by assessing the responses of runoff and sediment to logging and reforestation activities, and to demonstrate effective logging BMPs to landowners and land managers that are well suited for post-fire landscapes to mitigate potential water quality impacts. The project has three primary purposes: (1) to quantify the effects of post-fire salvage logging and common post-salvage site preparation techniques including mechanical and herbicide (pesticide)-assisted reforestation on soil properties controlling runoff, hillslope erosion rates, and vegetative recovery; (2) to understand processes occurring at small-catchment scales so that small-plot results can be extrapolated to sizes of specific interest to land managers and watershed stakeholders; and (3) to develop and demonstrate alternative BMPs used to reduce runoff and erosion from post-fire salvage logging. This study is currently underway and is expected to be completed by 2019. Initial study results are presented in Wagenbrenner et al. (2016a) and Olsen (2016).

Evaluation of Significant Existing or Potential Erosion Sites (SEPES)

The BOF, through a lengthy stakeholder process, developed and adopted a section in the FPRs referred to as the Road Rules, 2013, Rule Package. This rule package was intended to clarify, streamline and organize all of the FPRs where roads were included. The development process resulted in some additions as well, including the new definition of “Significant Existing or Potential Erosion Site (SEPES)” (Cal. Code of Regs., title 14, § 895.1) based upon a need to address such sites for water quality protection. The FPRs now include the following definition:

> “*Significant Existing or Potential Erosion Site means a location where soil is currently, or there are visible physical conditions to indicate soil erosion may be in the future, discharged*

> *to watercourses or lakes in quantities that violate Water Quality Requirements or result in significant individual or cumulative adverse impacts to the beneficial uses of water."*

The Road Rules, 2013, Rule Package became effective on January 1, 2015. Central Valley Water Board staff has been reviewing and commenting on the application of this definition for the past two years through the THP process and noting inconsistent interpretations. In Attachment A of the Order, an expanded definition has been provided that embeds the definition of Water Quality Requirements (also provided California Code of Regulations, title 14, section 895.1):

> *"Significant Existing or Potential Erosion Sites (SEPES)" means a location where soil erosion is currently, or there are visible physical conditions to indicate soil erosion may be in the future, discharged to watercourses or lakes in quantities that violate a water quality objective (narrative or numeric), prohibition, Total Maximum Daily Load (TMDL) implementation plan, policy, or other requirement contained in a water quality control plan adopted by the Central Valley Water Board and approved by the State Water Central Valley Water Board, or a location where soil erosion may result in significant individual or cumulative adverse impacts to the beneficial uses of water"* (emphasis added).

The intent in combining the two definitions in Attachment A of the Order is to emphasize that level of significance relative to existing and potential erosion sites is ultimately determined by, and is the responsibility of the Central Valley Water Board, who have a legal mandate and the authority to determine the significance of any discharge to waters of the state, and to ensure permitted discharges are in conformance with the appropriate Basin Plan, permit, policy, or other requirement (see Finding 18 of the Order).

Indicators of SEPES on the Existing Road Network

As noted in California Code of Regulations, title 14, Technical Rule Addendum No. 5: Guidance on Hydrologic Disconnection, Road Drainage, Minimization of Diversion Potential, and High Risk Crossings (1st Edition), section B, indicators of SEPES with the existing road drainage systems include:

- *Evidence of direct sediment entry into a watercourse or a flood prone area from road surfaces or drainage structures and facilities (e.g., ponded sediment, sediment deposits, delivery of turbid runoff from drainage structures during rainfall events).*
- *Ditch scour or downcutting resulting from excessively long undrained ditches with infrequent ditch drain (relief) culverts or other outlet structures or facilities. This condition can also result from design inadequacies (e.g., spacing not altered for steep ditch gradient), inadequate erosion prevention practices (e.g., lack of armoring), or ditches located in areas of erodible soils.*
- *Gullies or other evidence of erosion on road surfaces or below the outlets of road drainage facilities or structures, including ditch drain (relief) culverts, with transport or a high likelihood of transport to a watercourse.*

Additionally, if a road and/or ditch runoff is hydrologically connected to a watercourse, the following factors elevate the risk of sediment delivery to a watercourse:

- *Existing or high potential for cutbank sloughing or erosion into inside ditches.*
- *Native-surfaced road exhibiting erosion.*
- *Native-surfaced road composed of erodible soil types (e.g., granitic soils).*

- *Rilled, gullied, or rutted road approaches to crossings.*
- *Existing ditch drain (relief) culverts or other road drainage structures with significant plugging from sediment and/or small woody debris.*
- *Existing ditch drain (relief) culverts or other road drainage structures with decreased capacity due to damage or impairment (e.g., crushed or bent inlets, flattened dips due to road grading).*
- *Decreased structural integrity of ditch drain (relief) culverts, waterbreaks, or other road drainage structures (e.g., excessive culvert corrosion, breached waterbreaks, or rutted road segments).*

Under the FPRs, a standard 'green tree' THP must include an analysis of all SEPES and a schedule for addressing such sites within the project area as a part of the CEQA EIR equivalent process. However, post-fire salvage operations conducted under an Emergency Notice are exempt from the requirement to disclose and address SEPES. Previous sections of this Information Sheet have described the concerns that Central Valley Water Board staff have with salvage logging operations conducted under an Emergency Notice, and to address these concerns, the Order contains requirements for SEPES disclosure as a condition for enrollment of post-fire salvage operations.

SEPES in the Post-Fire Environment

For post-fire salvage areas (Category 2A and 5A), and areas not salvage logged but proposed for reforestation with pesticide applications, the Discharger shall evaluate SEPES considering the factors listed below that elevate the risk of sediment delivery to watercourses. The intent of this expanded SEPES evaluation is to identify existing or the potential for upslope erosional features (e.g., landslides, debris flows, significant gully networks, channel initiation and other mass wasting features) within the burned/logged area that have the potential to significantly influence the downslope road network. Documentation of hillslope level SEPES is only required where there is, or there is the potential for, an interaction of that feature with the below road network that will result in significant erosion and sediment delivery to a watercourse.

- Increased runoff and associated sediment/debris in high/moderate burn severity areas originating at mid to upper, convergent slope within the fire salvage area; or in areas outside the salvage area that contribute increased runoff to watercourse crossings and drainage structures within the fire salvage area or to appurtenant roads.
- Rilling and gullying along existing or proposed skid trails and water bars within the fire salvage area that have potential for sediment delivery to a watercourse;
- Existing watercourse crossings, particularly those with a structure (i.e. culvert, bridge), that are now undersized and at an elevated risk of failure due to any of the bulleted items listed above.

How Information is Used in the General Order

This Information Sheet sets forth the background and rationale used in the development of certain requirements in Order No. R5-2017-0061. Many of these requirements are new and represent significant changes between Order No. R5-2014-0144 (Timber "Waiver") and Order R5-2017-0061, specifically creation of Category 2A and Category 5A for post-fire salvage operations on non-federal and federal lands, respectively. The following requirements and the rationale for these requirements will be summarized in this section: 50% Effective Ground Cover and Minimum

Watercourse Pesticide Buffers (Parts III.C.3.b.ii. and III.F.3.c.ii. of the General Order); Table 1. Erosion Site Table for Significant Existing or Potential Erosion Sites (SEPES) and New Watercourse Crossings (Category 2A and 5A NOI); and the Post-Fire Management and Reforestation Plan (Attachment C).

50% Effective Ground Cover

Based on thorough research and review of dozens of peer reviewed studies, technical guidance documents, and handbooks on post-fire effects, and the mechanisms that are driving both increased rates of erosion and sediment delivery on managed and un-managed post-fire landscapes, the rationale for selecting 50% effective ground cover as a requirement for Category 2A and 5A in the Order (see Parts III.C.3.b.ii. and III.F.3.c.ii.) is based four primary factors:

- The dominant factor for controlling soil erosion rates post-fire is ground cover;
- Fifty-percent effective ground cover is the value most often referred to the reviewed literature (e.g., U.S. Forest Service 2012, Benavides-Solorio et al. 2001, 2005, Berg and Azuma 2010, Doerr et al. 2009, Goldman et al. 1986, Harrison et al. 2016, Hyde et al. 2007, 2014, and 2015, Johansen et al. 2001, Stubblefield et al. 2016);
- Fifty-percent effective ground cover is a value that is most easily assessed and verified from visual estimations; and
- Ground cover is shown to be the most feasible and cost-effective method to reduce erosion and sediment production.

Watercourse Pesticide Buffers

The rationale behind the requirement for standard watercourse riparian buffers (see Parts III.C.3.b.ii. and III.F.3.c.ii. of the Order) in Category 2A and 5A in the Order is based on four primary factors:

- Extensive literature review indicates that ground cover and aquatic buffers can reduce pesticide discharge into streams by providing dissipation, filtration, chemical sequestration, chemical degradation/biodegradation (Brosofske et al. 1997, Reeves et al. 2006, Davies and Nelson 1994, Sweeney and Newbold 2014, Richardson et al. 2012, Wenger 1999, ACOE 1991, MacDonald 2011, Lindenmayer and Noss 2006, Minshall 2003);
- Studies on herbicide fate and transport show that average buffer widths of 38 m and 50 m, in restored and managed riparian forests respectiviely, reduced herbicide concentrations to at or below detection limits (Lowrance et al. 1997, Vellidis et al. 2002).
- A review of pesticide buffers found that cases of high pesticide concentrations only occurred when no buffer was used and that generally, bufferstrips of 15 m or larger are effective in minimizing pesticide contamination in streams (Neary et al. 1993).
- Buffers widths for pesticide applied in the post-fire landscape are limited or non-existent (see Table 1);
- Post-fire pesticide sampling by CDFW in 2014 indicates that label instructions and applications were ineffective at preventing discharge of specific chemicals (Hexazinone, 2, 4-D, Triclopyr, and Imazapyr) to surface waters; and
- The buffer requirements that are in the Order (see Parts III.C.3.b.ii. and III.F.3.c.ii.) are existing buffer widths for WLPZs as specified in California Code of Regulations, title 14, section 936.5 for ‘green tree’ timber harvesting activities, have been proven to be effective at reducing transport of waste to surface waters, and are widths that are familiar to RPFs. For federal projects, these same buffer widths are specified around perennial, intermittent, and ephemeral streams.

Erosion Site Table for Significant Existing or Potential Erosion Sites (SEPES) and New Watercourse Crossings

The rationale behind the requirement to disclose road and crossing-related SEPES within project areas enrolling in Category 2A and 5A NOI is based on five primary factors:

- Decades of research in post-fire hydrologic response and erosional processes indicate that roads and associated watercourse crossings are particularly susceptible to accelerated rates of erosion due to increased runoff rates and transport of associated sediment and debris;
- SEPES and new/reconstructed watercourse crossings in the post-fire environmental necessitate additional evaluation and review, as normal input values for calculating stream flow to determine the appropriate size and capacity of stream crossing structures (e.g., culverts) may need modification (Cafferata et al. 2017);
- Emergency Notices pursuant to California Code of Regulations, title 14, §§ 1052.1 et seq., for fire salvage do not provide adequate information to properly assess whether a project has SEPES and whether those sites will be mitigated to a level that is less than significant (for enrollment in Category 2A);
- Following wildfires on federal lands, values at risk assessed through BAER teams do not directly consider or prioritize water quality and aquatic habitat for immediate resource protection; and
- Requirement of an Erosion Site Table for Category 2A and 5A allows for better treatment prioritization and implementation tracking.

Post-fire Management and Reforestation Plan (PFP)

The rationale behind the Order requirement for Category 2A and 5A to provide a PFP (Attachment C) in-lieu of complying with the watercourse buffers and ground cover standards, is based on four primary factors:

- A PFP provides the Discharger flexibility in applying specific management practices across the fire salvage area that consider all aspects of the timing of the fire salvage, site-preparation, and other activities associated with reforestation; provides for site specificity in terms of topography, soils, climate, hydrology, and soil burn severity; and consider all sources of potential negative water quality impacts from those activities (i.e., sediment and pesticide applications);
- Allows the Discharger the option to address multiple Emergency Notice areas (non-federal), and fire salvage areas (federal projects), under one comprehensive post-fire plan;
- Provides the Discharger the option and flexibility in applying post-fire management practices and mitigations other than those identified in Parts III.C.3.b.ii. and III.F.3.c.ii. of the Order, including experimental practices; and
- Ensures an appropriate monitoring plan will be developed for a PFP.

COST OF MONITORING FOR NON-FEDERAL PROJECTS

Water Code section 13267(b)(1) states that "the burden, including costs, of these [required monitoring and] reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports." Based upon information provided by timber industry representatives, staff estimates an annual cost of required visual monitoring and reporting, depending on project type and enrollment category, to range from $100 to $2,800 per enrolled project once operations have been initiated. Table 2 provides an estimate for a 'green-tree' THP on non-federal lands with a maximum operational lifespan of 7 years enrolled under Category 3A and for a post-fire salvage Emergency Notice project with a maximum operational lifespan of 1 year enrolled in Category 2A. Projects can remain enrolled in the General Order beyond the maximum operational lifespan if risks to water quality are identified and additional management measures, monitoring and reporting are necessary to protect the beneficial uses.

Table 2. Example Monitoring Cost Estimate for 7 Year THP and 1 Year Post-Fire Salvage Emergency Notice (EM).

MRP Activity	THP (3A) Cost Range	EM (2A) Cost Range
Inspection Plan Development (1 time cost per project)	$200-$500	$200-$500
Erosion Site Inventory Table	NA	$500-$700
Implementation Monitoring**	$500-$700	$500-$700
Forensic Monitoring**	$500-$700	$500-$700
Effectiveness Monitoring	$500-$700	$500-$700
Reporting (annual and NOV)	$100-$200	$100-$200
1st Year Cost Estimate*	$1,800-$2,800	$2,300-$3,500
Total Cost Estimate for 7 years of enrollment	$11,200-$16,100	NA
Total Cost Estimate for 2 years of enrollment	NA	$4,200-$6,000

** Mileage not included, extreme variability in distance to monitored sites exists.*
*** Implementation and forensic monitoring required by the FPRs for THPs.*

The visual monitoring required for 'green tree' projects (THPs) on non-federal lands has, since 2005 under the Timber Waiver, included two rounds of forensic monitoring during the winter period once operations have commenced. Eleven years of enrolled project monitoring has resulted in staff proposing to reduce this type of monitoring from twice per winter to once per winter under the General Order, comprising a modest annual cost savings to the timber/timberland owner of these projects.

It must also be noted that implementation monitoring is a requirement of the FPRs, as is forensic monitoring. The FPRs specify that the Regional Water Board's monitoring and reporting requirements may be used in the evaluation of the road rule requirements. California Code of Regulations, title 14, section 943.7(k)(2) under Maintenance and Monitoring of Logging Roads and Landings specifies: "*Inspections conducted pursuant to California Regional Water Quality Control Board requirements may be used to satisfy the inspection requirement of this section."* While the FPRs require visual implementation inspections prior to the winter period, and inspections during the winter period (essentially "forensic" monitoring), no formal reporting is required. So, even should the Central Valley Water Board determine that no additional monitoring or reporting will be required of projects enrolled in the Order, implementation and forensic inspections are still required by the FPRs (even for projects eligible to file an Notice of Non-Applicability under the General Order), though no reporting occurs. Thus, requiring development of an inspection plan,

effectiveness monitoring, Notice of Violation (NOV) reporting and annual reporting are additional costs to non-federal Dischargers not required by the Forest Practice Rules.

The Central Valley Water Board concludes that the cost of monitoring and reporting required by the General Order represent a reasonable cost of conducting permitted operations that pose a threat to water quality. Benefits inherent in the proposed monitoring and reporting are many and include: increased awareness on the part of the landowner/land manager of sensitive water quality resources; potential impacts and effectiveness of management measures; increased potential for identifying threats before they impact water quality and the beneficial uses; increased data available to aid in future risk analyses; lessons learned regarding specific threats and effective mitigations that can be presented to the BOF for consideration in developing rule revisions or used in the furtherance of best management practice development.

REFERENCES

Ahlgren, I.F., & Alhlgren, C.E. (1960). *Ecological effects of forest fires*. Botanical Review 26:483-533

USFS. (2014). *Bagley Fire Erosion and Sedimentation Investigation* – Final Report, USDA Forest Service, July 30, 2014. xx p.

Benavides-Solorio, J., & MacDonald, L. H. (2001). *Post-fire runoff and erosion from simulated rainfall on small plots, Colorado Front Range*. Hydrological Processes, 15(15), 2931–2952. http://doi.org/10.1002/hyp.383

Benavides-Solorio, J., & MacDonald, L. H. (2005). *Measurement and prediction of post-fire erosion at the hillslope scale, Colorado Front Range*. International Journal of Wildland Fire, 2005, 14, 1-18.

Beschta, R.L., C.A. Frissell, R. Gresswell, R. Hauer, J.R. Karr, W. Minshall, D.A. Perry, and J.J. Rhodes. (1995). Wildfire and salvage logging: recommendations for ecologically sound post-fire salvage logging and other post-fire treatments on federal lands in the west. Report requested by the Pacific Rivers Council, submitted to John Lowe, Regional Forester, USDA For. Serv., Pacific Northwest Region 6. 14 p.

Bladon, K. D., Emelko, M. B., Silins, U., & Stone, M. (2014). *Wildfire and the future of water supply.* Environmental Science & Technology, 48(16), 8936–8943. http://doi.org/10.1021/es500130g

BOF (Board of Forestry and Fire Protection). (1995). California fire plan. Sacramento, CA. 104 p.

Cafferata P., Spittler T., Wopat M., Bundros G., Flanagan S. (2004). *Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment*. California Department of Forestry & Fire Protection, California Forestry Report No. 1

Cafferata P., Lindsay, D., Spittler T., Wopat M., Bundros G., Flanagan S., Coe, D., Short, W. (2017). Draft *Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment* (revised 2017). California Department of Forestry & Fire Protection, California Forestry Report No. 1, Sacramento, CA. 116 p.

Cannon SH, Gartner JE, Rupert MG, Michael JA, Rea AH, Parrett C (2010) Predicting the probability and volume of postwildfire debris flows in the intermountain western United States. Geol Soc Am Bull 122(1–2):127–144.

CARB (California Air Resources Board). (2017). California forest carbon plan: managing our forest landscapes in a changing climate. Public review draft. Sacramento, CA. 230 p.

Castelle, A. J., A. W. Johnson, and C. Conolly. (1994). *Wet- land and stream buffer size requirements-a review.* Journal of Environmental Quality 23:878-882

Chappel, M. (2014). A review of local studies on fire-related sediment accumulation in large reservoirs of the Sierra Nevada. Report prepared for the Sierra Nevada Conservancy. 10 p.

Chase, E.H. (2004). Effects of a wildfire and salvage logging on site conditions and hillslope sediment production: Placer County, California. Master of Science Thesis. Colorado State University, Fort Collins, CO.

Davies, P.E., Nelson, M. (1994). *Relationships between Riparian Buffer Widths and the Effects of Logging on Stream Habitat, Invertebrate Community Composition and Fish Abundance*. Aust. J. Mar. Freshwater Res., 1994, **45**, 1289-305

Delwiche, J., (2009). *Post-fire Soil Erosion and how to Manage It*. JFSP Briefs. Paper 59. http://digitalcommons.unl.edu/jfspbriefs/59

DITOMASO, J.M., D.B. MARCUM, M.S. RASMUSSEN, E.A.HEALY, AND G.B. KYSER. (1997). Postfire herbicide sprays enhance native plant diversity. Calif. Agric. 51:6 –11.

Doerr, S.H., Shakesby, R.A., Walsh, R.P.D. (2000). *Soil water repellency: its cause, characteristics and hydo-geomorphological significance*. Earth-Science Reviews 51:33-65

Flannigan, M.D., Stocks, B.J., Wotton, B.M. (2000). *Climate change and forest fires*. Science of The Total Environment, 262(3), 221–229. http://doi.org/10.1016/S0048-9697(00)00524-6

Fried, J. S., Torn, M. S., Mills, E. (2004). *The impact of climate change on wildfire severity: A regional forecast for northern California*. Climatic Change, 64(1/2), 169–191. http://doi.org/10.1023/B:CLIM.0000024667.89579.ed

Goode, J. R., Luce, C. H.; Buffington, J. M. (2012). *Enhanced sediment delivery in a changing climate in semi-arid mountain basins: Implications for water resource management and aquatic habitat in the northern Rocky Mountains*. Geomorphology 2012, 139, 1−15

Goldman, S.J., Jackson, K, Bursztynsky, T.A. (1986). *Erosion & Sediment Control Handbook*

Gould, G. K., Liu, M., Barber, M. E., Cherkauer, K. A., Robichaud, P. R., Adam, J. C. (2016). *The effects of climate change and extreme wildfire events on runoff erosion over a mountain watershed*. Journal of Hydrology, 536, 74–91. http://doi.org/10.1016/j.jhydrol.2016.02.025

Heed, B.H., Harvey, M.D., Laird J.R. (1988). *Sediment delivery linkages in a chaparral watershed following a wildfire*. Environmental Management 12:349-358

Helvey, J. D. (1980). *Effects of a north central Washington wildfire on runoff and sediment production*. Journal of the American Water Resources Association, 16(4), 627– 634. http://doi.org/10.1111/j.1752-1688.1980.tb02441.x

Ice, G. and R. Beschta. (1999). Should salvage logging be prohibited following wildfire. National Council for Air and Stream Improvement, Inc. (NCASI). Proceeding of the 1999 NCASI West Coast Regional Meeting, vol. II, Pgs 452-460. Research Triangle Park, NC.

James, C. (2014). Post-wildfire salvage logging, soil erosion, and sediment delivery—Ponderosa Fire, Battle Creek watershed, northern California. Sierra Pacific Industries. Redding, CA. 19 p.

Larsen, I. J., MacDonald, L. H., Brown, E., Rough, D., Welsh, M. J., Pietraszek, J. H., Libohova, Z., Benavides-Solorio, J., Schaffrath, K. (2009). *Causes of post-fire runoff and erosion: water repellency, cover, or soil sealing?* Soil Science Society of America Journal, 73(4), 1393. http://doi.org/10.2136/sssaj2007.0432

Lavee, H., Kutiel, P., Segev, M., Benyamini, Y. (1995). *Effect of surface roughness on runoff and erosion in a Mediteranean ecosystem: the role of fire.* Geomorphology 11 (1995) 227-234

Lewis (2014). An analysis of turbidity in relation to timber harvesting in the Battle Creek Watershed, northern California. Report prepared for the Battle Creek Alliance, Manton, CA. Arcata, CA. 25 p.

Littell, J. S., Mckenzie, D., Peterson, D. L., Westerling, A. L. (2009). *Climate and wildfire area burned in western U.S. ecoprovinces.* Ecological Applications, 19(4), 1003–1021. http://doi.org/10.1890/07-1183.1

Lowrance, R., G. Vellidis, R. D. Wauchope, P. Gay, and D. D. Bosch. 1997. Herbicide transport in a managed riparian forest buffer system. *Trans. ASAE* 40(4): 1047–1057.

MacDonald, L.H., Larsen, I.J. (2009). *Runoff and erosion from wildfires and roads: Effects and mitigation*. In Land Restoration to Combat Desertification: Innovative Approaches, Quality Control, and Project Evaluation

MacDonald, L. H., D.B. Coe, and S.E. Litschert, (2004). Assessing cumulative watershed effects in the Central Sierra Nevada: hillslope measurements and catchment-scale modeling, pp 149-157. IN Murphy, D. D. and P. A. Stine Editors. 2004. **Proceedings of the Sierra Nevada Science Symposium**; 2002 October 7-10; Kings Beach, CA; Gen. Tech. Rep. PSW_GTR-193. Albany, CA. Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 287 p.

Miles, S.R. et al. (1989). Emergency burn rehabilitation: cost, risk, effectiveness. Proceedings of the Symposium on Fire and Watershed Management. October 26-28, 1988. Sacramento, CA. General Technical Report PSW-109, USDA Forest Service, p. 97-102.

Miller, J. D., Safford, H. D., Crimmins, M., & Thode, A. E. (2009). Quantitative evidence for increasing forest fire severity in the Sierra Nevada and southern Cascade Mountains, California and Nevada, USA. Ecosystems, 12(1), 16–32. http://doi.org/10.1007/s10021-008-9201-9

Martin, D. A., Moody, J. A. (2001). *Comparison of soil infiltration rates in burned and unburned mountainous watersheds.* Hydrological Processes, 15(15), 2893–2903. http://doi.org/10.1002/hyp.380

Moody, J. A., Shakesby, R. A., Robichaud, P. R., Cannon, S. H., Martin, D. A. (2013). *Current research issues related to post-wildfire runoff and erosion processes*. Earth-Science Reviews, 122, 10–37. http://doi.org/10.1016/j.earscirev.2013.03.004

Neary, D.G., Bush, P.B., Michael, J.L. (1993). Fate, dissipation and environmental effects of pesticides in southern forests: A review of a decade of research progress. *Environmental Toxicology and Chemistry* 12: 411-428

Napper, C. (2006). The burned area emergency response treatment catalog (BAERCAT). Tech. Rep. 0625 1801-SDTDC. Washington D.C.: U.S. Department of Agriculture, Forest Service, National Technology & Development Program, Watershed, Soil, Air Management. 253 p.

Olsen, W. EFFECTS OF WILDFIRE AND POST-FIRE SALVAGE LOGGING ON RILL NETWORKS AND SEDIMENT DELIVERY IN CALIFORNIA FORESTS", Open Access Master's Thesis, Michigan Technological University, 2016. http://digitalcommons.mtu.edu/etdr/287

Peterson, D.L., Agee, J.K., Aplet, G.H., Dykstra, D.P., Graham, R.T., Lehmkuhl, J.F., Pilliod, D.S., Potts, D.F., Powers, R.F., Stuart, J.D. (2009). *Effects of Timber Harvest Following Wildfire in Western North America*. USDA, Forest Service, General Technical Report, PNW-GTR-776

Poff, R.J. (1989). *Compatibility of Timber Salvage Operations with Watershed Values.* USDA Forest Service Gen. Tech. Rep. PSW-109

Robichaud, P. R. (2000). *Fire effects on infiltration rates after prescribed fire in northern Rocky Mountain forests.* USA. Journal of Hydrology, 231-232, 220–229. http://doi.org/10.1016/S0022-1694(00)00196-7

Robichaud, P.R., Wagenbrenner, J.W., Brown, R.E. (2010). *Rill erosion in natural and disturbed forests: 1. Measurements*. Water Resources Research, Vol. 46

Robichaud, P.R., Ashmun, L.E., Sims, B.D. (2010). *Post-Fire Treatment Effectiveness for Hillslope Stabilization*. USDA, Forest Service, Rocky Mountain Research Station, RMRS-GTR-240

Robichaud, P. R., Wagenbrenner, J. W., Pierson, F. B., Spaeth, K. E., Ashmun, L. E., Moffet, C. A. (2016). *Infiltration and interrill erosion rates after a wildfire in western Montana, USA*. Catena, 142, 77–88. http://doi.org/10.1016/j.catena.2016.01.027

Slesak, R. A., Schoenholtz S. H., Evans, D (2015). *Hillslope erosion two and three years after wildfire, skyline salvage logging, and site preparation in southern Oregon, USA*

Sweeney, B. W., Newbold, J.D. (2014). *STREAMSIDE FOREST BUFFER WIDTH NEEDED TO PROTECT STREAM WATER QUALITY, HABITAT, AND ORGANISMS: A LITERATURE REVIEW*. Journal of the American Water Resources Association, Vol. 50, No.3

U.S. Army Corps of Enginners (1991). *Buffer Strips for Riparian Zone Management*.

Vellidis, G., Lowrance, R., Gay, P., Wauchope, R.D. (2002). Herbicide Transport in a Restored Riparian Forest Buffer System. American Society of Agricultural Engineers, Vol. 45(1): 89-97

Wade, D. and S. Kocher. (2012). Restoring Conservancy Lands Following the Angora Fire – a Preliminary Assessment. A report to the California Tahoe Conservancy.: 58.

Wagenbrenner J.W., MacDonald, L. H., Rough, D. (2006). *Effectiveness of three post-fire rehabilitation treatments in the Colorado Front Range.*

Wagenbrenner, J. W., MacDonald, L. H., Coats, R. N., Robichaud, P. R., & Brown, R. E. (2015). *Effects of post-fire salvage logging and a skid trail treatment on ground cover, soils, and sediment production in the interior western United States*. Forest Ecology and Management, 335, 176–193. http://doi.org/10.1016/j.foreco.2014.09.016

Wagenbrenner, J., D. Coe, and D. Lindsay. (2016a). Runoff response to rainfall in small catchments burned by the 2015 Valley Fire. Poster. American Geophysical Union Meeting, December, 2016. San Francisco, CA.

Wagenbrenner, J. W., Robichaud, P. R., & Brown, R. E. (2016b). *Rill erosion in burned and salvage logged western montane forests: Effects of logging equipment type, traffic level, and slash treatment*. Journal of Hydrology. http://doi.org/10.1016/j.jhydrol.2016.07.049

Wagenbrenner, J. (2017). Draft study plan: assessing impact of site-preparation operations on post-fire sediment delivery and recovery. USFS Pacific Southwest Research Station, Arcata, CA. 6 p.

Wagner, M. J., Bladon, K. D., Silins, U., Williams, C. H. S., Martens, A. M., Boon, S., MacDonald, R. J., Stone, M., Emelko, M. B., Anderson, A (2014). *Catchment-scale stream temperature response to land disturbance by wildfire governed by surface−subsurface energy exchange and atmospheric controls*. J. Hydrol. 2014, 517, 328−338

Webster, J., and E. Fredrickson. (2005). Lessons learned on 50,000 acres of plantation in northern California. P. 267–281 in Proc. of the symp. on ponderosa pine: Issues, trends, and management. Klamath Falls, OR, compiled by Ritchie, M.W., D.A. Maguire, and A.Youngblood. US For. Serv. Gen. Tech. Rep. PSWGTR-198.

Wenger, S. (1999). *A REVIEW OF THE SCIENTIFIC LITERATURE ON RIPARIAN BUFFER WIDTH, EXTENT AND VEGETATION 1999*

Westerling, A. L., Hidalgo, H.G, Cayan, D.R., Swetnam, T. W. (2006). *Warming and earlier spring increase western U.S. forest wildfire activity*. Science, 313(5789), 940–943. http://doi.org/10.1126/science.1128834

Westerling, A. L., & Bryant, B. P. (2008). *Climate change and wildfire in California*. Climatic Change, 87(S1), 231–249. http://doi.org/10.1007/s10584-007-9363-z

Westerling, A. L., Bryant, B. P., Preisler, H. K., Holmes, T. P., Hidalgo, H. G., Das, T., Shrestha, S. R. (2011). *Climate change and growth scenarios for California wildfire*. Climatic Change, 109(S1), 445–463. http://doi.org/10.1007/s10584-011-0329-9

Wohlgemuth, P.M., Beyers J.L., Wakeman C.D., Conard S.G. (1998). *Effects of fire and grass seeding on soil erosion in southern California chaparral*. P. 41-51 in S. Gray (chair) Proceedings of the 19th forest vegetation management conference, January 20-22, 1998, Redding, CA.

Zhang, J. et al., (2008). Reforestation after the fountain fire in Northern California: an untold success story. Journal of Forestry 106, 425–430.

F2. Shadow Flicker Analysis

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memorandum

To:	Henry Woltag ConnectGen LLC	**EDR Project No:**	19255
From:	Jacob Runner		
Date:	May 6, 2020		
Reference:	Fountain Wind Farm Shadow Flicker Analysis		

Comments:

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 72 Vestas V162 wind turbines on a 125-meter tower. The shadow flicker impact was evaluated at 69 receptors within 10 rotor diameters (1,620 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 1,620 meters based on the largest turbine model proposed for the Project [V162]) 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 (1,620 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 72 Vestas V162 turbines, each with a rotor diameter of 162 meters and a hub height of 125 meters (Figure 2).

WindPRO 3.3 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 72 proposed wind turbine sites (provided by the Applicant).
- The latitude and longitude coordinates for 69 potential receptors located within the 10-rotor diameter Study Area (provided by the Applicant).
- USGS 1:24,000 topographic mapping and USGS digital elevation model (DEM) data.
- The rotor diameter (162 meters) and hub height (125 meters) for the V162 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
46	Stand of Mixed Trees	NW	12 x 19 x 7	0.3
51	Large Stand of Mixed Trees	W	12 x 44 x 50	0.3
12	Large Stand of Mixed Trees	W	12 x 67 x 45	0.3
15	Large Stand of Mixed Trees	W	12 x 43 x 71	0.3
11	Large Stand of Mixed Trees	NNW	12 x 67 x 45	0.3
	Large Stand of Mixed Trees	WSW	12 x 35 x 22	0.3
47	Large Stand of Mixed Trees	W	12 x 36 x 51	0.3
48	Large Stand of Mixed Trees	WNW	12 x 21 x 21	0.3
52	Large Stand of Mixed Trees	W	12 x 67 x 45	0.3
3	Large Stand of Mixed Trees	W	12 x 30 x 41	0.3
	Large Stand of Mixed Trees	WSW	12 x 20 x 74	0.3
50	Large Stand of Mixed Trees	W	12 x 30 x 41	0.3
	Large Stand of Mixed Trees	WSW	12 x 20 x 74	0.3
5	Large Stand of Mixed Trees	NNE	12 x 35 x 22	0.3
	Large Stand of Mixed Trees	W	12 x 20 x 14	0.3
	Stand of Evergreen Trees	WNW	12 x 36 x 71	0.2
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
49	Large Stand of Mixed Trees	NW	12 x 19 x 7	0.3
7	Stand of Evergreen Trees	W	12 x 36 x 71	0.2
	Large Stand of Mixed Trees	SE	12 x 20 x 14	0.3
6	Large Stand of Mixed Trees	NW	12 x 36 x 71	0.2
	Large Stand of Mixed Trees	W	12 x 41 x 18	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

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)

[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.

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). 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 and potential transitory cognitive and physical health effects" (Ellenbogen et al., 2012).

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 69 receptors in the Study Area is presented below:

- 13 (19%) of the receptors may be affected 0-1 hour/year,
- 19 (28%) of the receptors may be affected 1-10 hours/year,
- 19 (28%) of the receptors may be affected 10-20 hours/year,
- 16 (23%) of the receptors may be affected 20-30 hours/year,
- 2 (3%) of the receptors may be affected for more than 30 hours/year.

As these results indicate, 97% of the receptors are predicted to receive less than 30 hours of shadow flicker per year, with 47% of the receptors 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 1 hour and 14 minutes (at receptor 2, see Attachment B).

Table 2 provides the results of the predicted shadow flicker at the two receptors calculated to experience more than 30 hours of shadow flicker per year. Figure 4 shows the results of the predicted shadow flicker with obstacles in place at non-participating receptors originally predicted over 30-hours of shadow flicker per year. 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 at Receptors Predicted to Exceed 30 Hours

Receptor ID	Project Status	Predicted Annual Shadow Flicker (hh:mm)	Predicted Max Daily Shadow Flicker (hh:mm)	Predicted Shadow Flicker (days/year)
2	Non-Participating	50:20	1:14	119
58	Participating	51:41	0:57	230

Details regarding shadow flicker effects predicted at the two receptors predicted to receive over 30 hours of shadow flicker are presented in Table 3 below and in Attachment B.

Table 3. Daily Effect to Receptors Predicted to Exceed 30 Hours of Shadow Flicker

Receptor ID	Project Status	Predicted Annual Shadow Flicker (hh:mm)	Turbines Contributing to Shadow Flicker	Approximate Times of Day Receptor Potentially Affected by Flicker[1]
2	Non-Participating	50:20	D04, D05	6:45 PM – 8:15 PM
58	Participating	51:41	N02, M08, M10	6:45 AM – 7:30 AM 8:00 AM – 8:45 AM 4:15 PM – 5:45 PM 7:15 PM – 8:30 PM

[1] The times of day represent the range of times during which each receptor could potentially experience shadow flicker throughout the year; however, no receptors will experience shadow flicker every day during all of these hours. See Attachment B for detailed calendars that illustrate the specific time of year and day that each receptor may experience shadow flicker.

Conclusion

In summary, as a result of modeling the proposed Vestas V162 turbine model, *WindPRO* predicted that two receptors will receive more than 30 hours of shadow flicker per year. 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). One of the receptors predicted to receive over 30 hours of shadow flicker per year is a Project participant.

Depending on the final turbine layout and model selected, there may be no non-participating receptors that are predicted to receive more than 30 hours/year of shadow flicker, the proposed threshold for which mitigation will be performed as discussed below. Therefore, following final turbine model selection the Applicant will prepare an updated receptor-specific shadow flicker analysis for non-participating residences. This analysis will take into account any screening by existing yard trees, buildings, or proximity to stands of trees and the number and/or orientation of windows in residential receptors. Additionally, this analysis will also use project specific met data to account for wind being below or above generation speeds.

Many of the modeled shadow flicker hours are expected to be of low intensity, as they will occur during the early morning or late afternoon hours when the sun is low in the sky. When the sun sinks low on the horizon, more of its light is scattered by the atmosphere, which has the effect of dampening its brightness and therefore reducing its ability to cast dark shadows. Following the final shadow flicker analysis for non-participating residences, if shadow flicker is modeled to exceed 30 hours per year at a non-participating residence, the following mitigation options are available: work with the landowner to become a Project participant or planting of trees or installation of window blinds to block the shadow flicker. These mitigation options can be easily implemented even after the Facility has been constructed.

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. Accessed April 2019.

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 (Accessed March 2018).

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 (Accessed April 2019).

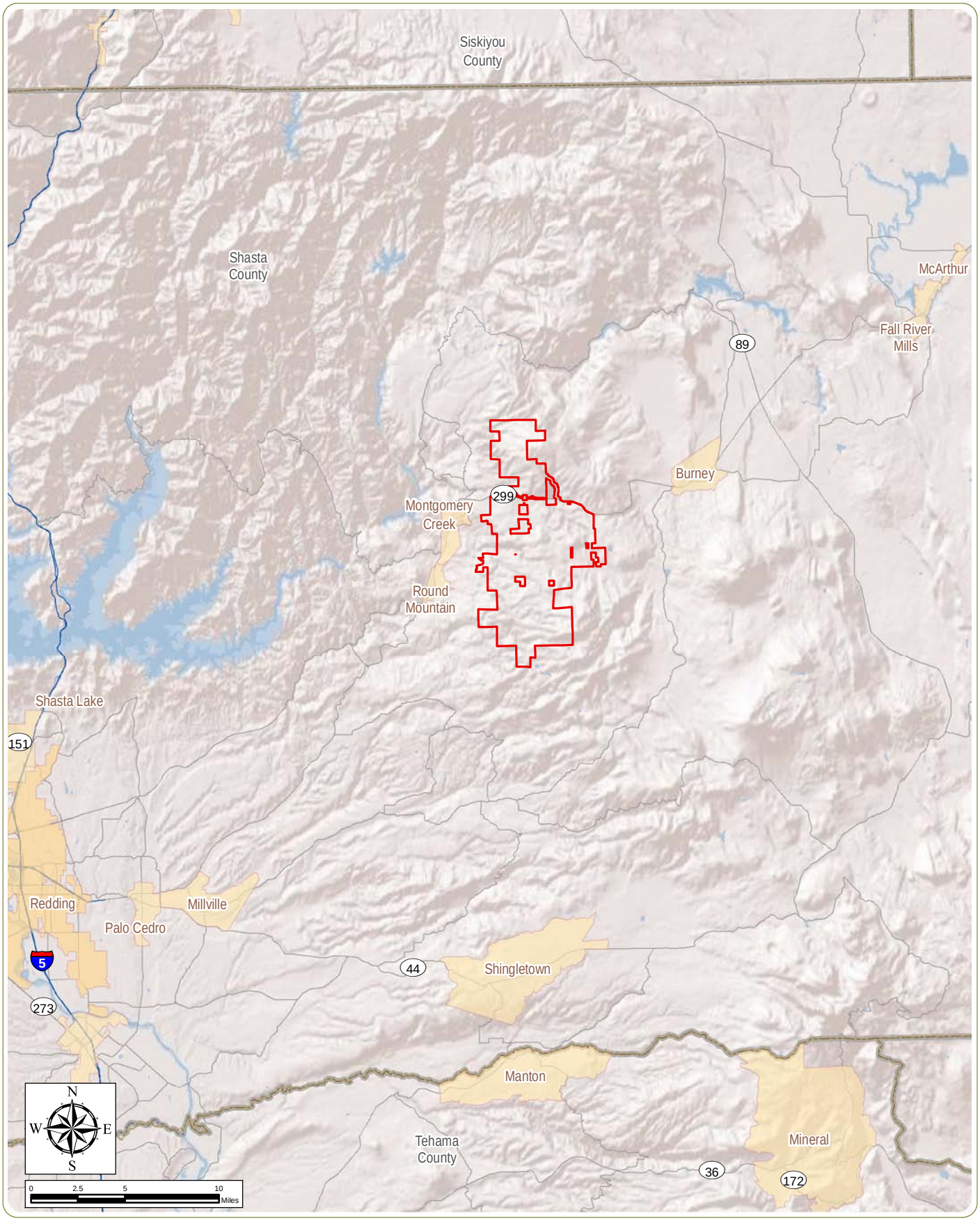
Michaud et. al. 2016. Estimating Annoyance to Calculated Wind Turbine Shadow Flicker is Improved when Variables Associated with Wind Turbine Noise Exposure are considered. Journal of the Acoustical Society of America 139, 1480.

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



Fountain Wind Farm

Shasta County, California

Figure 1. Regional Project Location

Project Area

Notes: 1. Basemap: ESRI ArcGIS Online "World Shaded Relief" Map Service and ESRI StreetMap North America, 2008. 2. This map was generated in ArcMap on April 29, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

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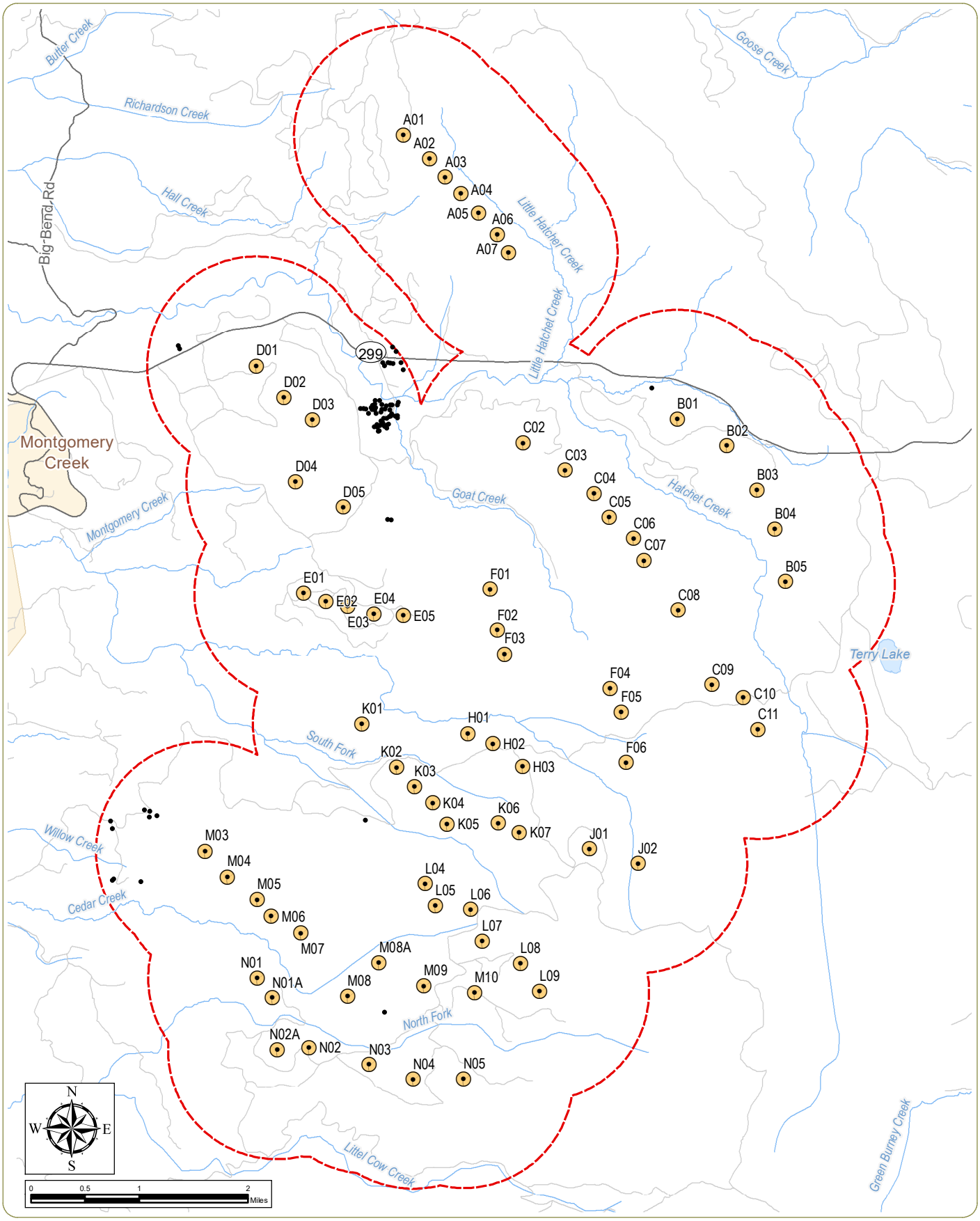

Fountain Wind Farm

Shasta County, California

Figure 2. Proposed Turbine Layout

Notes: 1. Basemap: ESRI StreetMap North America, 2008. **2.** This map was generated in ArcMap on April 28, 2020. **3.** This is a color graphic. Reproduction in grayscale may misrepresent the data.

- Receptor
- Wind Turbine
- 1620-meter Study Area

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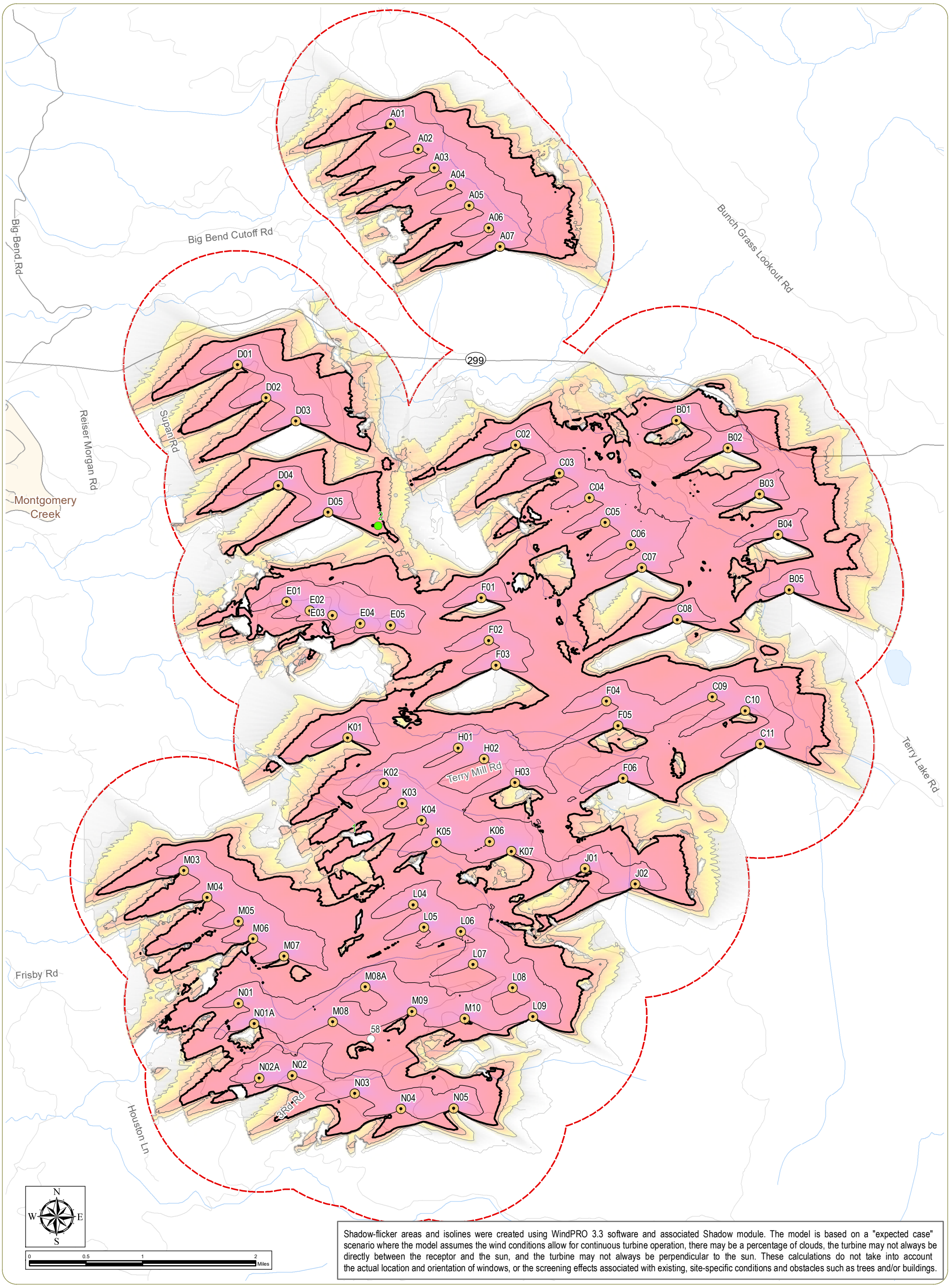

Shadow-flicker areas and isolines were created using WindPRO 3.3 software and associated Shadow module. The model is based on a "expected case" scenario where the model assumes the wind conditions allow for continuous turbine operation, there may be a percentage of clouds, the turbine may not always be directly between the receptor and the sun, and the turbine may not always be perpendicular to the sun. These calculations do not take into account the actual location and orientation of windows, or the screening effects associated with existing, site-specific conditions and obstacles such as trees and/or buildings.

Fountain Wind Farm

Shasta County, California

Figure 3. Projected Shadow Flicker

- Non-Participating Receptor > 30 hours/year
- Participating Receptor > 30 hours/year
- Receptor < 30 hours/year
- Wind Turbine
- 1620-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

Notes: 1. Basemap: ESRI StreetMap North America, 2008. **2.** This map was generated in ArcMap on May 6, 2020. **3.** This is a color graphic. Reproduction in grayscale may misrepresent the data.

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Shadow-flicker areas and isolines were created using WindPRO 3.3 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 Farm

Shasta County, California

Figure 4. Projected Shadow Flicker with Obstacles
Sheet 1 of 2

Non-Participating Receptor Analyzed
Wind Turbine
1620-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

Notes: 1. Basemap: ESRI StreetMap North America, 2008. 2. This map was generated in ArcMap on April 29, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

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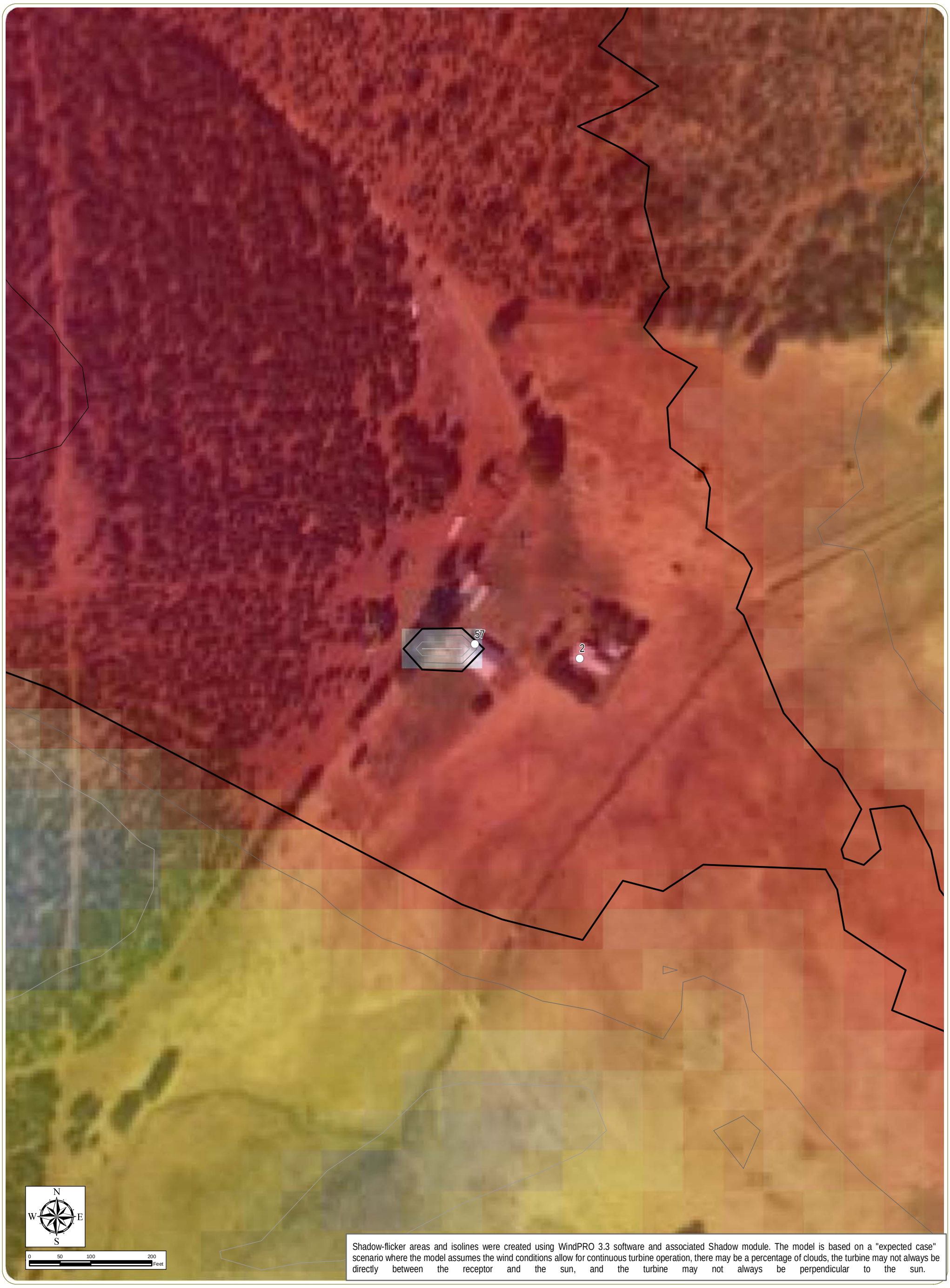

Fountain Wind Farm

Shasta County, California

Figure 4. Projected Shadow Flicker with Obstacles
Sheet 2 of 2

Non-Participating Receptor Analyzed
Wind Turbine
1620-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

Notes: 1. Basemap: ESRI StreetMap North America, 2008. 2. This map was generated in ArcMap on April 29, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

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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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Main Result

Assumptions for shadow calculations

Maximum distance for influence	1,620	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]
A01	597,318	4,527,808	1,492.6	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
A02	597,712	4,527,454	1,504.3	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
A03	597,941	4,527,184	1,490.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
A04	598,171	4,526,937	1,500.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
A05	598,437	4,526,648	1,484.1	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
A06	598,714	4,526,329	1,457.7	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
A07	598,875	4,526,063	1,438.8	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
B01	601,381	4,523,596	1,279.3	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
B02	602,116	4,523,200	1,331.9	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
B03	602,564	4,522,544	1,353.9	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
B04	602,827	4,521,967	1,380.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
B05	602,987	4,521,187	1,420.6	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
C02	599,095	4,523,244	1,363.3	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
C03	599,718	4,522,840	1,375.5	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
C04	600,146	4,522,492	1,399.1	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
C05	600,369	4,522,141	1,388.6	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
C06	600,735	4,521,827	1,440.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
C07	600,890	4,521,500	1,448.6	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
C08	601,395	4,520,764	1,527.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
C09	601,895	4,519,661	1,405.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
C10	602,363	4,519,468	1,403.6	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
C11	602,575	4,518,991	1,389.5	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
D01	595,140	4,524,387	1,139.1	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
D02	595,549	4,523,917	1,186.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
D03	595,971	4,523,583	1,191.8	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
D04	595,721	4,522,668	1,191.3	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
D05	596,430	4,522,287	1,204.4	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
E01	595,841	4,521,015	1,265.5	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
E02	596,170	4,520,891	1,248.2	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
E03	596,491	4,520,821	1,285.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
E04	596,885	4,520,706	1,258.5	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
E05	597,317	4,520,684	1,244.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
F01	598,610	4,521,072	1,433.8	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
F02	598,715	4,520,467	1,415.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
F03	598,817	4,520,112	1,404.3	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0

To be continued on next page...

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Calculated:
4/27/2020 10:38 PM/3.3.274

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]
F04	600,387	4,519,601	1,437.8	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
F05	600,551	4,519,255	1,413.7	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
F06	600,625	4,518,503	1,415.1	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
H01	598,278	4,518,936	1,379.9	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
H02	598,647	4,518,781	1,411.9	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
H03	599,088	4,518,444	1,441.3	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
J01	600,083	4,517,222	1,548.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
J02	600,797	4,517,003	1,573.2	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
K01	596,707	4,519,080	1,307.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
K02	597,221	4,518,435	1,358.8	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
K03	597,481	4,518,149	1,380.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
K04	597,756	4,517,907	1,383.6	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
K05	597,970	4,517,594	1,374.2	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
K06	598,727	4,517,605	1,468.1	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
K07	599,039	4,517,466	1,508.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
L04	597,642	4,516,708	1,461.3	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
L05	597,794	4,516,383	1,448.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
L06	598,318	4,516,326	1,446.5	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
L07	598,491	4,515,859	1,498.7	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
L08	599,056	4,515,524	1,579.7	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
L09	599,342	4,515,113	1,621.2	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
M03	594,381	4,517,194	1,211.5	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
M04	594,709	4,516,810	1,268.3	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
M05	595,156	4,516,473	1,310.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
M06	595,360	4,516,223	1,316.1	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
M07	595,801	4,515,977	1,343.6	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
M08	596,496	4,515,042	1,365.6	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
M08A	596,959	4,515,539	1,388.3	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
M09	597,622	4,515,191	1,421.9	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
M10	598,374	4,515,088	1,510.2	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
N01	595,155	4,515,306	1,343.6	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
N01A	595,379	4,515,016	1,291.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
N02	595,918	4,514,280	1,372.9	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
N02A	595,449	4,514,243	1,403.7	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
N03	596,809	4,514,026	1,393.1	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
N04	597,468	4,513,805	1,445.4	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0
N05	598,214	4,513,815	1,526.0	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m...	Yes	VESTAS	V162-5,600	5,600	162.0	125.0	0.0

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
3	596,965	4,523,417	1,160.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
4	597,077	4,523,458	1,160.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
5	596,936	4,523,472	1,156.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
6	596,892	4,523,480	1,154.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
7	596,927	4,523,510	1,153.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
8	597,040	4,523,485	1,158.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
9	597,075	4,523,502	1,157.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
10	597,102	4,523,517	1,154.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
11	596,977	4,523,500	1,155.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
12	596,994	4,523,518	1,154.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
13	597,018	4,523,541	1,152.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
14	597,077	4,523,604	1,143.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
15	596,914	4,523,677	1,141.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
16	596,992	4,523,699	1,137.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
17	597,199	4,523,634	1,137.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
18	597,049	4,523,741	1,133.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
19	596,900	4,523,731	1,140.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
20	596,860	4,523,737	1,143.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0

To be continued on next page...

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SHADOW - Main Result

...continued from previous page

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]
21	596,907	4,523,763	1,139.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
22	596,842	4,523,763	1,143.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
23	596,865	4,523,793	1,141.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
24	596,900	4,523,815	1,139.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
25	597,003	4,523,811	1,135.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
26	597,072	4,523,791	1,132.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
28	597,152	4,523,804	1,130.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
29	597,130	4,523,806	1,129.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
30	596,902	4,523,866	1,139.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
31	596,973	4,523,866	1,136.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
32	597,246	4,523,843	1,135.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
33	597,237	4,523,800	1,135.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
34	597,016	4,524,431	1,138.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
35	597,096	4,524,432	1,139.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
36	597,128	4,524,422	1,140.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
37	597,169	4,524,418	1,140.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
38	597,284	4,524,428	1,142.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
39	597,044	4,524,382	1,137.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
40	597,320	4,524,323	1,135.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
41	597,161	4,524,663	1,147.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
42	597,211	4,524,594	1,146.7	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
44	594,004	4,524,632	1,054.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
45	593,985	4,524,684	1,054.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
46	596,765	4,523,743	1,146.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
47	596,801	4,523,680	1,147.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
48	596,728	4,523,747	1,148.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
49	596,687	4,523,749	1,149.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
50	596,950	4,523,415	1,160.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
51	597,031	4,523,606	1,146.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
52	596,991	4,523,563	1,150.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
53	597,117	4,523,632	1,135.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
54	597,136	4,523,639	1,134.0	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
59	593,426	4,516,733	1,005.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
60	593,029	4,516,772	950.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
61	593,007	4,516,752	950.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
62	593,479	4,517,798	991.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
63	593,554	4,517,692	994.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
64	593,668	4,517,712	1,007.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
65	593,563	4,517,780	997.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
66	592,979	4,517,635	948.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
67	593,003	4,517,524	948.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
68	597,234	4,523,612	1,145.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
69	597,150	4,523,668	1,132.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
70	597,235	4,523,642	1,147.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
71	597,122	4,523,729	1,130.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
72	597,005	4,523,739	1,135.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

Calculation Results

Shadow receptor

No.	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow, expected values Shadow hours per year [h/year]
1	21:55	52	0:30	3:52
2	103:12	119	1:14	50:20
3	46:49	99	0:42	23:19
4	48:02	130	0:34	25:22
5	21:26	64	0:27	9:49
6	0:00	0	0:00	0:00
7	0:00	0	0:00	0:00

To be continued on next page...

Licensed user:
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Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Main Result

...continued from previous page

	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]
8	52:01	139	0:35	27:35
9	48:21	135	0:34	25:47
10	30:59	82	0:33	16:29
11	0:00	0	0:00	0:00
12	0:00	0	0:00	0:00
13	0:00	0	0:00	0:00
14	19:15	44	0:34	11:12
15	0:00	0	0:00	0:00
16	34:09	84	0:36	19:34
17	15:23	38	0:30	8:59
18	30:20	77	0:34	17:39
19	39:46	90	0:39	23:11
20	47:13	116	0:41	27:10
21	44:10	114	0:38	25:25
22	43:31	93	0:41	25:45
23	41:05	91	0:40	24:37
24	37:59	87	0:38	22:54
25	31:54	79	0:35	19:04
26	28:35	75	0:33	16:54
28	25:17	71	0:31	14:58
29	25:52	71	0:31	15:20
30	37:16	85	0:38	22:38
31	33:02	81	0:36	20:01
32	13:28	36	0:29	8:15
33	13:44	36	0:29	8:23
34	41:11	102	0:30	19:43
35	30:33	76	0:29	13:22
36	28:56	80	0:28	12:46
37	23:26	71	0:27	10:33
38	16:46	52	0:25	7:54
39	42:50	114	0:30	20:41
40	13:26	41	0:26	7:01
41	6:53	30	0:17	2:52
42	19:44	54	0:26	8:20
43	0:00	0	0:00	0:00
44	16:32	40	0:32	7:15
45	15:58	40	0:31	6:42
46	0:00	0	0:00	0:00
47	7:45	30	0:19	3:14
48	0:00	0	0:00	0:00
49	0:00	0	0:00	0:00
50	49:02	101	0:43	24:20
51	0:00	0	0:00	0:00
52	0:00	0	0:00	0:00
53	28:44	77	0:33	15:55
54	27:45	76	0:32	15:25
57	0:00	0	0:00	0:00
58	119:16	230	0:57	51:41
59	15:19	42	0:28	9:33
60	28:47	72	0:27	21:51
61	27:28	70	0:27	20:56
62	32:24	82	0:33	8:07
63	36:20	86	0:37	10:06
64	44:28	96	0:40	11:13
65	36:48	87	0:36	9:05
66	9:49	32	0:25	4:01
67	10:29	33	0:25	4:39
68	14:39	38	0:30	8:28
69	26:50	74	0:31	15:05
70	14:25	37	0:30	8:24
71	27:14	75	0:32	15:44
72	32:35	81	0:35	18:58

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SHADOW - Main Result

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

No.	Name	Worst case [h/year]	Expected [h/year]
A01	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (68)	0:00	0:00
A02	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (69)	0:00	0:00
A03	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (70)	0:00	0:00
A04	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (71)	0:00	0:00
A05	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (72)	0:00	0:00
A06	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (73)	0:00	0:00
A07	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (74)	0:00	0:00
B01	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (109)	0:00	0:00
B02	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (111)	0:00	0:00
B03	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (112)	0:00	0:00
B04	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (116)	0:00	0:00
B05	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (118)	0:00	0:00
C02	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (79)	0:00	0:00
C03	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (80)	0:00	0:00
C04	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (110)	0:00	0:00
C05	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (113)	0:00	0:00
C06	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (114)	0:00	0:00
C07	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (115)	0:00	0:00
C08	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (117)	0:00	0:00
C09	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (121)	0:00	0:00
C10	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (122)	0:00	0:00
C11	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (123)	0:00	0:00
D01	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (75)	22:04	9:28
D02	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (76)	78:20	40:42
D03	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (77)	182:46	97:01
D04	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (78)	56:14	25:43
D05	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (82)	84:51	41:58
E01	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (81)	0:00	0:00
E02	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (83)	0:00	0:00
E03	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (84)	0:00	0:00
E04	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (85)	0:00	0:00
E05	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (139)	0:00	0:00
F01	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (86)	0:00	0:00
F02	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (87)	0:00	0:00
F03	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (88)	0:00	0:00
F04	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (119)	0:00	0:00
F05	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (120)	0:00	0:00
F06	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (124)	0:00	0:00
H01	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (90)	0:00	0:00
H02	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (95)	0:00	0:00
H03	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (96)	0:00	0:00
J01	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (125)	0:00	0:00
J02	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (126)	0:00	0:00
K01	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (89)	0:00	0:00
K02	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (91)	0:00	0:00
K03	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (92)	0:00	0:00
K04	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (93)	0:00	0:00
K05	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (94)	0:00	0:00
K06	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (97)	0:00	0:00
K07	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (104)	0:00	0:00
L04	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (102)	21:55	3:52
L05	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (103)	0:00	0:00
L06	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (106)	0:00	0:00
L07	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (107)	0:00	0:00
L08	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (108)	0:00	0:00
L09	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (131)	0:00	0:00
M03	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (138)	95:10	44:12
M04	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (137)	43:53	15:50
M05	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (98)	0:00	0:00
M06	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (99)	0:00	0:00
M07	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (100)	0:00	0:00
M08	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (128)	68:41	30:14
M08A	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (136)	0:00	0:00
M09	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (105)	0:00	0:00
M10	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (130)	16:06	11:13

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]
N01	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (101)	0:00	0:00
N01A	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (134)	0:00	0:00
N02	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (127)	11:20	6:19
N02A	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (135)	0:00	0:00
N03	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (129)	0:00	0:00
N04	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (132)	0:00	0:00
N05	VESTAS V162 5600 162.0 !O! hub: 125.0 m (TOT: 206.0 m) (133)	23:09	4:15

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:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 1 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (76)

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		08:50 (L04)	07:19	06:43	06:53	06:07	05:39	05:40	06:04	06:34	07:04	06:38			07:12		08:39 (L04)
	16:50	28	09:18 (L04)	17:24	17:57	19:31	20:03	20:32	20:43	20:25	19:43	18:53	18:06			16:41	21	09:00 (L04)
2	07:32		08:50 (L04)	07:18	06:41	06:51	06:06	05:39	05:40	06:05	06:35	07:05	06:39			07:13		08:38 (L04)
	16:51	29	09:19 (L04)	17:25	17:59	19:32	20:04	20:33	20:43	20:24	19:41	18:51	17:05			16:41	23	09:01 (L04)
3	07:33		08:51 (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	28	09:19 (L04)	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04			16:41	24	09:02 (L04)
4	07:33		08:51 (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	28	09:19 (L04)	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02			16:41	25	09:03 (L04)
5	07:33		08:52 (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	27	09:19 (L04)	17:28	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01			16:40	26	09:04 (L04)
6	07:33		08:52 (L04)	07:14	06:35	06:44	06:01	05:37	05:43	06:09	06:39	07:09	06:44			07:17		08:38 (L04)
	16:54	27	09:19 (L04)	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00			16:40	27	09:05 (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		08:38 (L04)
	16:55	26	09:19 (L04)	17:31	18:04	19:37	20:09	20:36	20:42	20:19	19:33	18:43	16:59			16:40	27	09:05 (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		08:39 (L04)
	16:56	25	09:19 (L04)	17:32	19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58			16:40	27	09:06 (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		08:39 (L04)
	16:57	24	09:19 (L04)	17:33	19:06	19:40	20:11	20:37	20:42	20:16	19:30	18:40	16:57			16:40	28	09:07 (L04)
10	07:32		08:56 (L04)	07:09	07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13	06:48			07:21		08:39 (L04)
	16:58	23	09:19 (L04)	17:35	19:08	19:41	20:12	20:38	20:41	20:15	19:28	18:38	16:56			16:40	29	09:08 (L04)
11	07:32		08:57 (L04)	07:08	07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14	06:50			07:22		08:40 (L04)
	16:59	21	09:18 (L04)	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55			16:40	28	09:08 (L04)
12	07:31		08:58 (L04)	07:07	07:26	06:35	05:54	05:36	05:47	06:14	06:45	07:15	06:51			07:22		08:40 (L04)
	17:00	20	09:18 (L04)	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54			16:40	29	09:09 (L04)
13	07:31		09:00 (L04)	07:05	07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52			07:23		08:40 (L04)
	17:01	18	09:18 (L04)	17:38	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53			16:40	29	09:09 (L04)
14	07:31		09:00 (L04)	07:04	07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53			07:24		08:40 (L04)
	17:02	16	09:16 (L04)	17:40	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52			16:41	30	09:10 (L04)
15	07:30		09:03 (L04)	07:03	07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19	06:54			07:25		08:41 (L04)
	17:03	13	09:16 (L04)	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51			16:41	30	09:11 (L04)
16	07:30		09:05 (L04)	07:02	07:19	06:29	05:50	05:36	05:50	06:18	06:49	07:20	06:55			07:25		08:42 (L04)
	17:04	9	09:14 (L04)	17:42	19:14	19:47	20:18	20:41	20:38	20:07	19:18	18:29	16:50			16:41	29	09:11 (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		08:41 (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	30	09:11 (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		08:42 (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	30	09:12 (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		08:42 (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	30	09:12 (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		08:43 (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	30	09:13 (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		08:44 (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	30	09:14 (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		08:44 (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	30	09:14 (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		08:44 (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	30	09:14 (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		08:45 (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	30	09:15 (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		08:45 (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	30	09:15 (L04)
26	07:24			06:47	07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07		08:44 (L04)	07:31		08:46 (L04)
	17:16			17:54	19:25	19:57	20:27	20:43	20:31	19:52	19:01	18:14	16:43	8	08:52 (L04)	16:45	30	09:16 (L04)
27	07:23			06:46	07:01	06:13	05:42	05:38	05:59	06:29	07:00	07:32	07:08		08:42 (L04)	07:31		08:47 (L04)
	17:17			17:55	19:26	19:58	20:28	20:43	20:30	19:51	18:59	18:13	16:43	13	08:55 (L04)	16:46	29	09:16 (L04)
28	07:22			06:44	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09		08:41 (L04)	07:31		08:47 (L04)
	17:19			17:56	19:27	19:59	20:29	20:44	20:29	19:49	18:58	18:11	16:43	15	08:56 (L04)	16:47	30	09:17 (L04)
29	07:22				06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10		08:40 (L04)	07:32		08:47 (L04)
	17:20				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	18	08:58 (L04)	16:47	30	09:17 (L04)
30	07:21				06:56	06:09	05:40	05:39	06:02	06:32	07:03	07:35	07:11		08:39 (L04)	07:32		08:48 (L04)
	17:21				19:29	20:02	20:30	20:43	20:27	19:46	18:54	18:09	16:42	20	08:59 (L04)	16:48	29	09:17 (L04)
31	07:20				06:54		05:39		06:03	06:33		07:37				07:32		08:49 (L04)
	17:22				19:30		20:31		20:26	19:44		18:07				16:49	29	09:18 (L04)
Potential sun hours	298			297	369	398	448	451	458	428	375	346	299			288		
Total, worst case		362												74			879	
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		61												17			155	

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:
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217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688
Jacob Runner / jrunner@edrdpc.com

Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 2 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (77)

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	18:52 (D05)	05:39	18:52 (D05)	05:40	19:02 (D05)	06:04	18:57 (D05)	06:34	07:04	06:38	07:12
	16:50	17:23	17:57	19:31	20:03 43	19:35 (D05) 20:32 64	20:01 (D04) 20:44 37	19:39 (D05) 20:25 62	20:01 (D04) 19:43	18:53	18:06	16:41
2	07:33	07:18	06:41	06:51	06:06	18:52 (D05) 05:38	18:53 (D05) 05:40	19:02 (D05) 06:05	18:57 (D05) 06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04 44	19:36 (D05) 20:33 62	20:01 (D04) 20:43 42	20:00 (D04) 20:24 60	20:00 (D04) 19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	18:50 (D05) 05:38	18:54 (D05) 05:41	19:02 (D05) 06:06	18:57 (D05) 06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05 46	19:36 (D05) 20:34 60	20:01 (D04) 20:43 46	20:02 (D04) 20:23 58	19:59 (D04) 19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	18:50 (D05) 05:38	18:54 (D05) 05:41	19:02 (D05) 06:06	18:57 (D05) 06:37	07:07	06:41	07:15
	16:52	17:27	18:01	19:34	20:06 47	19:37 (D05) 20:34 58	20:00 (D04) 20:43 49	20:04 (D04) 20:22 54	19:58 (D04) 19:38	18:48	17:02	16:41
5	07:33	07:15	06:37	06:46	06:02	18:49 (D05) 05:37	18:55 (D05) 05:42	19:02 (D05) 06:07	18:58 (D05) 06:38	07:08	06:43	07:16
	16:53	17:28	18:02	19:35	20:07 48	19:37 (D05) 20:35 56	20:00 (D04) 20:43 50	20:04 (D04) 20:21 50	19:48 (D05) 19:36	18:46	17:01	16:40
6	07:33	07:14	06:35	06:44	06:01	18:49 (D05) 05:37	18:56 (D05) 05:42	19:02 (D05) 06:08	18:58 (D05) 06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08 49	19:38 (D05) 20:36 54	20:00 (D04) 20:43 54	20:06 (D04) 20:20 50	19:48 (D05) 19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	18:48 (D05) 05:37	18:55 (D05) 05:43	19:01 (D05) 06:09	18:58 (D05) 06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09 50	19:38 (D05) 20:36 52	19:58 (D04) 20:42 56	20:06 (D04) 20:19 49	19:47 (D05) 19:33	18:43	16:59	16:40
8	07:32	07:11	07:32	06:41	05:59	18:48 (D05) 05:36	18:56 (D05) 05:44	19:01 (D05) 06:10	18:59 (D05) 06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:38	20:10 51	19:39 (D05) 20:37 50	19:58 (D04) 20:42 58	20:07 (D04) 20:17 48	19:47 (D05) 19:31	18:41	16:58	16:40
9	07:32	07:10	07:30	06:39	05:57	18:48 (D05) 05:36	18:57 (D05) 05:44	19:01 (D05) 06:11	18:59 (D05) 06:42	07:12	06:47	07:20
	16:57	17:33	19:06	19:40	20:11 55	19:49 (D04) 20:38 46	19:57 (D04) 20:42 60	20:08 (D04) 20:16 47	19:46 (D05) 19:30	18:39	16:57	16:40
10	07:32	07:09	07:29	06:38	05:56	18:47 (D05) 05:36	18:57 (D05) 05:45	19:01 (D05) 06:12	19:00 (D05) 06:43	07:13	06:48	07:21
	16:58	17:35	19:07	19:41	20:12 58	19:49 (D04) 20:38 45	19:57 (D04) 20:41 61	20:08 (D04) 20:15 45	19:45 (D05) 19:28	18:38	16:56	16:40
11	07:32	07:08	07:27	06:36	05:55	18:46 (D05) 05:36	18:58 (D05) 05:46	19:01 (D05) 06:13	19:01 (D05) 06:44	07:14	06:50	07:22
	16:59	17:36	19:09	19:42	20:13 61	19:50 (D04) 20:39 40	19:55 (D04) 20:41 63	20:09 (D04) 20:14 43	19:44 (D05) 19:26	18:36	16:55	16:40
12	07:32	07:07	07:26	06:35	05:54	18:46 (D05) 05:36	18:59 (D05) 05:46	19:01 (D05) 06:14	19:01 (D05) 06:45	07:15	06:51	07:23
	17:00	17:37	19:10	19:43	20:14 64	19:51 (D04) 20:39 36	19:35 (D05) 20:41 64	20:10 (D04) 20:12 42	19:43 (D05) 19:25	18:35	16:54	16:40
13	07:31	07:05	07:24	06:33	05:53	18:46 (D05) 05:36	18:59 (D05) 05:47	19:00 (D05) 06:15	19:01 (D05) 06:46	07:16	06:52	07:23
	17:01	17:38	19:11	19:44	20:15 65	19:51 (D04) 20:40 36	19:35 (D05) 20:40 66	20:10 (D04) 20:11 40	19:41 (D05) 19:23	18:33	16:53	16:40
14	07:31	07:04	07:22	06:32	05:52	18:47 (D05) 05:36	19:00 (D05) 05:48	19:00 (D05) 06:16	19:02 (D05) 06:47	07:17	06:53	07:24
	17:02	17:40	19:12	19:45	20:16 66	19:53 (D04) 20:40 35	19:35 (D05) 20:40 68	20:11 (D04) 20:10 38	19:40 (D05) 19:21	18:32	16:52	16:40
15	07:31	07:03	07:21	06:30	05:51	18:47 (D05) 05:36	19:00 (D05) 05:49	19:00 (D05) 06:17	19:04 (D05) 06:48	07:19	06:54	07:25
	17:03	17:41	19:13	19:46	20:17 67	19:54 (D04) 20:41 35	19:35 (D05) 20:39 70	20:12 (D04) 20:08 34	19:38 (D05) 19:20	18:30	16:51	16:41
16	07:30	07:02	07:19	06:28	05:50	18:47 (D05) 05:36	19:00 (D05) 05:49	19:00 (D05) 06:18	19:05 (D05) 06:49	07:20	06:56	07:26
	17:04	17:42	19:14	19:47	20:18 68	19:55 (D04) 20:41 35	19:35 (D05) 20:39 70	20:12 (D04) 20:07 32	19:37 (D05) 19:18	18:28	16:50	16:41
17	07:30	07:00	07:17	06:27	05:49	18:47 (D05) 05:36	19:01 (D05) 05:50	18:59 (D05) 06:19	19:07 (D05) 06:50	07:21	06:57	07:26
	17:05	17:43	19:15	19:48	20:19 69	19:56 (D04) 20:41 34	19:35 (D05) 20:38 72	20:12 (D04) 20:06 28	19:35 (D05) 19:16	18:27	16:49	16:41
18	07:29	06:59	07:16	06:25	05:48	18:47 (D05) 05:36	19:01 (D05) 05:51	18:59 (D05) 06:20	19:09 (D05) 06:51	07:22	06:58	07:27
	17:07	17:44	19:16	19:49	20:20 70	19:57 (D04) 20:42 34	19:35 (D05) 20:37 72	20:12 (D04) 20:04 23	19:32 (D05) 19:15	18:25	16:49	16:41
19	07:29	06:58	07:14	06:24	05:47	18:47 (D05) 05:36	19:01 (D05) 05:52	18:59 (D05) 06:21	19:12 (D05) 06:52	07:23	06:59	07:27
	17:08	17:46	19:17	19:50	20:21 70	19:57 (D04) 20:42 34	19:35 (D05) 20:37 73	20:12 (D04) 20:03 17	19:29 (D05) 19:13	18:24	16:48	16:42
20	07:28	06:56	07:12	06:22	05:47	18:47 (D05) 05:36	19:01 (D05) 05:53	18:59 (D05) 06:22	06:53	07:24	07:00	07:28
	17:09	17:47	19:18	19:51	20:22 71	19:58 (D04) 20:42 34	19:35 (D05) 20:36 72	20:11 (D04) 20:01	19:11	18:22	16:47	16:42
21	07:28	06:55	07:11	06:21	05:46	18:48 (D05) 05:36	19:01 (D05) 05:54	18:59 (D05) 06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23 71	19:59 (D04) 20:43 34	19:35 (D05) 20:35 72	20:11 (D04) 20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:20	05:45	18:48 (D05) 05:36	19:02 (D05) 05:54	18:58 (D05) 06:24	06:55	07:26	07:03	07:29
	17:11	17:49	19:21	19:53	20:24 72	20:00 (D04) 20:43 34	19:36 (D05) 20:35 71	20:09 (D04) 19:58	19:08	18:20	16:46	16:43
23	07:26	06:52	07:07	06:18 19:11 (D05)	05:44	18:48 (D05) 05:37	19:02 (D05) 05:55	18:58 (D05) 06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54 7 19:18 (D05)	20:25 73	20:01 (D04) 20:43 34	19:36 (D05) 20:34 71	20:09 (D04) 19:57	19:06	18:18	16:45	16:43
24	07:26	06:50	07:06	06:17 19:06 (D05)	05:43	18:49 (D05) 05:37	19:02 (D05) 05:56	18:58 (D05) 06:26	06:57	07:29	07:05	07:30
	17:14	17:51	19:23	19:55 18 19:24 (D05)	20:25 73	20:02 (D04) 20:43 34	19:36 (D05) 20:33 70	20:08 (D04) 19:55	19:04	18:17	16:44	16:44
25	07:25	06:49	07:04	06:15 19:03 (D05)	05:43	18:49 (D05) 05:37	19:03 (D05) 05:57	18:58 (D05) 06:27	06:58	07:30	07:06	07:30
	17:15	17:53	19:24	19:56 24 19:27 (D05)	20:26 74	20:03 (D04) 20:43 34	19:37 (D05) 20:32 69	20:07 (D04) 19:54	19:03	18:15	16:44	16:45
26	07:24	06:48	07:02	06:14 19:00 (D05)	05:42	18:49 (D05) 05:38	19:02 (D05) 05:58	18:58 (D05) 06:28	06:59	07:31	07:07	07:31
	17:16	17:54	19:25	19:57 28 19:28 (D05)	20:27 74	20:03 (D04) 20:44 35	19:37 (D05) 20:31 69	20:07 (D04) 19:52	19:01	18:14	16:43	16:45
27	07:23	06:46	07:01	06:12 18:58 (D05)	05:41	18:50 (D05) 05:38	19:02 (D05) 05:59	18:58 (D05) 06:29	07:00	07:32	07:08	07:31
	17:17	17:55	19:26	19:58 32 19:30 (D05)	20:28 72	20:03 (D04) 20:44 35	19:37 (D05) 20:30 68	20:06 (D04) 19:51	18:59	18:13	16:43	16:46
28	07:22	06:44	06:59	06:11 18:57 (D05)	05:41	18:50 (D05) 05:38	19:03 (D05) 06:00	18:58 (D05) 06:30	07:01	07:33	07:09	07:31
	17:18	17:56	19:27	20:00 35 19:32 (D05)	20:29 70	20:02 (D04) 20:44 35	19:38 (D05) 20:29 67	20:05 (D04) 19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10 18:54 (D05)	05:40	18:51 (D05) 05:39	19:02 (D05) 06:01	18:58 (D05) 06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01 39 19:33 (D05)	20:30 70	20:03 (D04) 20:44 36	19:38 (D05) 20:28 66	20:04 (D04) 19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08 18:53 (D05)	05:40	18:51 (D05) 05:39	19:03 (D05) 06:02	18:57 (D05) 06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02 41 19:34 (D05)	20:31 68	20:02 (D04) 20:44 36	19:39 (D05) 20:27 66	20:03 (D04) 19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39	18:52 (D05)		06:03	18:57 (D05) 06:33		07:37		07:32
	17:22		19:30		20:31 66	20:02 (D04)		20:26 64	20:02 (D04) 19:44		18:07		16:49
Potential sun hours	298	297	369	398	448	451	458	428	375	346	298	288
Total, worst case				224	1945	1247	1956	820				
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.				0.53	0.52	0.52	0.51	0.52				
Total reduction				0.43	0.48	0.49	0.50	0.50				
Total, real				97	924	611	975	413				

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 3 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (78)

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	18:47 (D03)	05:39	05:40	06:04	19:37 (D02)	06:34	07:04	06:38	07:12
	16:50	17:23	17:57	19:31	20:03 35	19:22 (D03)	20:32	20:44	20:25 24	20:01 (D02)	19:43	18:53	18:06	16:41
2	07:33	07:18	06:41	06:51	06:06	18:48 (D03)	05:38	05:40	06:05	19:08 (D03)	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04 33	19:21 (D03)	20:33	20:44	20:24 33	20:00 (D02)	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	18:47 (D03)	05:38	05:41	06:05	19:06 (D03)	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05 33	19:20 (D03)	20:34	20:43	20:23 37	19:59 (D02)	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	18:48 (D03)	05:38	05:41	06:06	19:04 (D03)	06:37	07:07	06:41	07:15
	16:52	17:27	18:01	19:34	20:06 38	19:43 (D02)	20:34	20:43	20:22 39	19:58 (D02)	19:38	18:48	17:02	16:40
5	07:33	07:15	06:37	06:46	06:02	18:49 (D03)	05:37	05:42	06:07	19:02 (D03)	06:38	07:08	06:43	07:16
	16:53	17:28	18:02	19:35	20:07 40	19:44 (D02)	20:35	20:43	20:21 40	19:57 (D02)	19:36	18:46	17:01	16:40
6	07:33	07:14	06:35	06:44	06:01	18:50 (D03)	05:37	05:42	06:08	19:01 (D03)	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08 42	19:46 (D02)	20:36	20:43	20:20 40	19:56 (D02)	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	18:51 (D03)	05:37	05:43	06:09	19:00 (D03)	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09 41	19:47 (D02)	20:36	20:43	20:19 41	19:55 (D02)	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	18:53 (D03)	05:36	05:44	06:10	18:59 (D03)	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:38	20:10 40	19:48 (D02)	20:37	20:42	20:17 39	19:54 (D02)	19:31	18:41	16:58	16:40
9	07:32	07:10	07:30	06:39	05:57	18:55 (D03)	05:36	05:44	06:11	18:58 (D03)	06:42	07:12	06:47	07:20
	16:57	17:33	19:06	19:40	20:11 38	19:49 (D02)	20:38	20:42	20:16 36	19:52 (D02)	19:30	18:39	16:57	16:40
10	07:32	07:09	07:29	06:38	05:56	18:56 (D03)	05:36	05:45	06:12	18:57 (D03)	06:43	07:13	06:48	07:21
	16:58	17:35	19:07	19:41	20:12 36	19:49 (D02)	20:38	20:42	20:15 33	19:30 (D03)	19:28	18:38	16:56	16:40
11	07:32	07:08	07:27	06:36	05:55	18:59 (D03)	05:36	05:46	06:13	18:56 (D03)	06:44	07:14	06:50	07:22
	16:59	17:36	19:09	19:42	20:13 31	19:50 (D02)	20:39	20:41	20:14 34	19:30 (D03)	19:26	18:36	16:55	16:40
12	07:32	07:07	07:26	06:35	05:54	19:26 (D02)	05:36	05:46 19:47 (D02)	06:14	18:55 (D03)	06:45	07:15	06:51	07:23
	17:00	17:37	19:10	19:43	20:14 25	19:51 (D02)	20:39	20:41 4 19:51 (D02)	20:12 36	19:31 (D03)	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33 19:02 (D03)	05:53	19:26 (D02)	05:36	05:47 19:44 (D02)	06:15	18:54 (D03)	06:46	07:16	06:52	07:23
	17:01	17:38	19:11	19:44 11 19:13 (D03)	20:15 26	19:52 (D02)	20:40	20:40 9 19:53 (D02)	20:11 36	19:30 (D03)	19:23	18:33	16:53	16:40
14	07:31	07:04	07:22	06:32 18:59 (D03)	05:52	19:27 (D02)	05:36	05:48 19:43 (D02)	06:16	18:53 (D03)	06:47	07:17	06:53	07:24
	17:02	17:39	19:12	19:45 18 19:17 (D03)	20:16 26	19:53 (D02)	20:40	20:40 12 19:55 (D02)	20:10 37	19:30 (D03)	19:21	18:32	16:52	16:40
15	07:31	07:03	07:21	06:30 18:56 (D03)	05:51	19:27 (D02)	05:36	05:49 19:43 (D02)	06:17	18:53 (D03)	06:48	07:19	06:54	07:25
	17:03	17:41	19:13	19:46 22 19:18 (D03)	20:17 26	19:53 (D02)	20:41	20:39 14 19:57 (D02)	20:08 37	19:30 (D03)	19:20	18:30	16:51	16:41
16	07:30	07:02	07:19	06:28 18:54 (D03)	05:50	19:27 (D02)	05:36	05:49 19:42 (D02)	06:18	18:53 (D03)	06:49	07:20	06:56	07:26
	17:04	17:42	19:14	19:47 26 19:20 (D03)	20:18 26	19:53 (D02)	20:41	20:39 16 19:58 (D02)	20:07 37	19:30 (D03)	19:18	18:28	16:50	16:41
17	07:30	07:00	07:17	06:27 18:52 (D03)	05:49	19:27 (D02)	05:36	05:50 19:40 (D02)	06:19	18:53 (D03)	06:50	07:21	06:57	07:26
	17:05	17:43	19:15	19:48 29 19:21 (D03)	20:19 26	19:53 (D02)	20:41	20:38 18 19:58 (D02)	20:06 37	19:30 (D03)	19:16	18:27	16:49	16:41
18	07:29	06:59	07:16	06:25 18:51 (D03)	05:48	19:27 (D02)	05:36	05:51 19:40 (D02)	06:20	18:52 (D03)	06:51	07:22	06:58	07:27
	17:07	17:44	19:16	19:49 31 19:22 (D03)	20:20 25	19:52 (D02)	20:42	20:37 19 19:59 (D02)	20:04 38	19:30 (D03)	19:15	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24 18:50 (D03)	05:47	19:27 (D02)	05:36	05:52 19:40 (D02)	06:21	18:52 (D03)	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50 32 19:22 (D03)	20:21 25	19:52 (D02)	20:42	20:37 20 20:00 (D02)	20:03 37	19:29 (D03)	19:13	18:24	16:48	16:42
20	07:28	06:56	07:12	06:22 18:49 (D03)	05:47	19:27 (D02)	05:36	05:53 19:39 (D02)	06:22	18:52 (D03)	06:53	07:24	07:00	07:28
	17:09	17:47	19:18	19:51 34 19:23 (D03)	20:22 25	19:52 (D02)	20:42	20:36 22 20:01 (D02)	20:01 37	19:29 (D03)	19:11	18:22	16:47	16:42
21	07:28	06:55	07:11	06:21 18:48 (D03)	05:46	19:28 (D02)	05:36	05:54 19:39 (D02)	06:23	18:52 (D03)	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52 35 19:23 (D03)	20:23 24	19:52 (D02)	20:43	20:35 23 20:02 (D02)	20:00 37	19:29 (D03)	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19 18:48 (D03)	05:45	19:28 (D02)	05:36	05:54 19:38 (D02)	06:24	18:53 (D03)	06:55	07:26	07:03	07:29
	17:11	17:49	19:21	19:53 36 19:24 (D03)	20:24 23	19:51 (D02)	20:43	20:35 23 20:01 (D02)	19:58 35	19:28 (D03)	19:08	18:20	16:46	16:43
23	07:26	06:52	07:07	06:18 18:47 (D03)	05:44	19:29 (D02)	05:37	05:55 19:38 (D02)	06:25	18:53 (D03)	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54 36 19:23 (D03)	20:25 22	19:51 (D02)	20:43	20:34 24 20:02 (D02)	19:57 34	19:27 (D03)	19:06	18:18	16:45	16:43
24	07:26	06:50	07:06	06:17 18:47 (D03)	05:43	19:30 (D02)	05:37	05:56 19:37 (D02)	06:26	18:54 (D03)	06:57	07:29	07:05	07:30
	17:14	17:51	19:23	19:55 37 19:24 (D03)	20:26 21	19:51 (D02)	20:43	20:33 25 20:02 (D02)	19:55 32	19:26 (D03)	19:04	18:17	16:44	16:44
25	07:25	06:49	07:04	06:15 18:47 (D03)	05:43	19:30 (D02)	05:37	05:57 19:37 (D02)	06:27	18:54 (D03)	06:58	07:30	07:06	07:31
	17:15	17:53	19:24	19:56 37 19:24 (D03)	20:26 20	19:50 (D02)	20:43	20:32 26 20:03 (D02)	19:54 31	19:25 (D03)	19:03	18:15	16:44	16:45
26	07:24	06:48	07:02	06:14 18:46 (D03)	05:42	19:31 (D02)	05:38	05:58 19:37 (D02)	06:28	18:55 (D03)	06:59	07:31	07:07	07:31
	17:16	17:54	19:25	19:57 37 19:23 (D03)	20:27 18	19:49 (D02)	20:44	20:31 26 20:03 (D02)	19:52 29	19:24 (D03)	19:01	18:14	16:43	16:45
27	07:23	06:46	07:01	06:12 18:46 (D03)	05:41	19:32 (D02)	05:38	05:59 19:37 (D02)	06:29	18:56 (D03)	07:00	07:32	07:08	07:31
	17:17	17:55	19:26	19:59 37 19:23 (D03)	20:28 17	19:49 (D02)	20:44	20:30 26 20:03 (D02)	19:51 26	19:22 (D03)	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11 18:46 (D03)	05:41	19:33 (D02)	05:38	06:00 19:37 (D02)	06:30	18:58 (D03)	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00 37 19:23 (D03)	20:29 15	19:48 (D02)	20:44	20:29 27 20:04 (D02)	19:49 22	19:20 (D03)	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10 18:46 (D03)	05:40	19:34 (D02)	05:39	06:01 19:36 (D02)	06:31	19:00 (D03)	07:02	07:34	07:10	07:32
	17:20		19:28	20:01 36 19:22 (D03)	20:30 13	19:47 (D02)	20:44	20:28 27 20:03 (D02)	19:48 17	19:17 (D03)	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08 18:46 (D03)	05:40	19:35 (D02)	05:39	06:02 19:37 (D02)	06:32	19:03 (D03)	07:03	07:35	07:11	07:32
	17:21		19:29	20:02 36 19:22 (D03)	20:31 11	19:46 (D02)	20:44	20:27 26 20:03 (D02)	19:46 11	19:14 (D03)	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39	19:38 (D02)		06:03 19:37 (D02)	06:33			07:37		07:32
	17:22		19:30		20:31 7	19:45 (D02)		20:26 25 20:02 (D02)	19:45			18:07		16:49
Potential sun hours	298	297	369	398	448	452	458	428	375	346	298	288
Total, worst case				567	828		412	1002				
Sun reduction				0.82	0.92		0.97	0.96				
Oper. time red.				1.00	1.00		1.00	1.00				
Wind dir. red.				0.57	0.52		0.50	0.56				
Total reduction				0.47	0.48		0.48	0.54				
Total, real				264	398		200	537				

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)

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Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 4 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (79)

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
1	07:32			07:19		16:30 (D04)	06:43	06:52			06:07		19:24 (D02)	05:39
	16:50			17:23	24	16:54 (D04)	17:57	19:31			20:03	17	19:41 (D02)	20:32
2	07:33			07:18		16:31 (D04)	06:41	06:51			06:06		19:23 (D02)	05:38
	16:50			17:25	23	16:54 (D04)	17:58	19:32			20:04	19	19:42 (D02)	20:33
3	07:33			07:17		16:31 (D04)	06:40	06:49			06:05		19:22 (D02)	05:38
	16:51			17:26	23	16:54 (D04)	18:00	19:33			20:05	20	19:42 (D02)	20:34
4	07:33			07:16		16:32 (D04)	06:38	06:48			06:03		19:22 (D02)	05:38
	16:52			17:27	21	16:53 (D04)	18:01	19:34			20:06	21	19:43 (D02)	20:34
5	07:33			07:15		16:33 (D04)	06:37	06:46			06:02		19:21 (D02)	05:37
	16:53			17:28	19	16:52 (D04)	18:02	19:35			20:07	23	19:44 (D02)	20:35
6	07:33			07:14		16:35 (D04)	06:35	06:44			06:01		19:21 (D02)	05:37
	16:54			17:30	16	16:51 (D04)	18:03	19:36			20:08	25	19:46 (D02)	20:36
7	07:33			07:13		16:37 (D04)	06:34	06:43		18:58 (D03)	06:00		19:21 (D02)	05:37
	16:55			17:31	13	16:50 (D04)	18:04	19:37	13	19:11 (D03)	20:09	25	19:46 (D02)	20:36
8	07:32			07:12		16:40 (D04)	07:32	06:41		18:54 (D03)	05:59		19:22 (D02)	05:36
	16:56			17:32	7	16:47 (D04)	19:05	19:38	19	19:13 (D03)	20:10	24	19:46 (D02)	20:37
9	07:32			07:10			07:30	06:39		18:52 (D03)	05:57		19:22 (D02)	05:36
	16:57			17:33			19:06	19:40	22	19:14 (D03)	20:11	24	19:46 (D02)	20:38
10	07:32			07:09			07:29	06:38		18:50 (D03)	05:56		19:21 (D02)	05:36
	16:58			17:35			19:07	19:41	26	19:16 (D03)	20:12	23	19:44 (D02)	20:38
11	07:32			07:08			07:27	06:36		18:49 (D03)	05:55		19:22 (D02)	05:36
	16:59			17:36			19:09	19:42	28	19:17 (D03)	20:13	22	19:44 (D02)	20:39
12	07:32			07:07			07:26	06:35		18:48 (D03)	05:54		19:22 (D02)	05:36
	17:00			17:37			19:10	19:43	30	19:18 (D03)	20:14	21	19:43 (D02)	20:39
13	07:31			07:05			07:24	06:33		18:47 (D03)	05:53		19:23 (D02)	05:36
	17:01			17:38			19:11	19:44	31	19:18 (D03)	20:15	20	19:43 (D02)	20:40
14	07:31			07:04			07:22	06:32		18:46 (D03)	05:52		19:24 (D02)	05:36
	17:02			17:39			19:12	19:45	33	19:19 (D03)	20:16	18	19:42 (D02)	20:40
15	07:31			07:03			07:21	06:30		18:45 (D03)	05:51		19:25 (D02)	05:36
	17:03			17:41			19:13	19:46	33	19:18 (D03)	20:17	17	19:42 (D02)	20:41
16	07:30			07:02			07:19	06:28		18:45 (D03)	05:50		19:27 (D02)	05:36
	17:04			17:42			19:14	19:47	34	19:19 (D03)	20:18	13	19:40 (D02)	20:41
17	07:30		16:36 (D04)	07:00			07:17	06:27		18:44 (D03)	05:49		19:28 (D02)	05:36
	17:05	5	16:41 (D04)	17:43			19:15	19:48	34	19:18 (D03)	20:19	10	19:38 (D02)	20:41
18	07:29		16:33 (D04)	06:59			07:16	06:25		18:45 (D03)	05:48		19:31 (D02)	05:36
	17:07	9	16:42 (D04)	17:44			19:16	19:49	33	19:18 (D03)	20:20	4	19:35 (D02)	20:42
19	07:29		16:33 (D04)	06:58			07:14	06:24		18:44 (D03)	05:47			05:36
	17:08	11	16:44 (D04)	17:46			19:17	19:50	33	19:17 (D03)	20:21			20:42
20	07:28		16:31 (D04)	06:56			07:12	06:22		18:45 (D03)	05:47			05:36
	17:09	14	16:45 (D04)	17:47			19:18	19:51	32	19:17 (D03)	20:22			20:42
21	07:28		16:31 (D04)	06:55			07:11	06:21		18:44 (D03)	05:46			05:36
	17:10	15	16:46 (D04)	17:48			19:19	19:52	32	19:16 (D03)	20:23			20:43
22	07:27		16:30 (D04)	06:53			07:09	06:19		18:45 (D03)	05:45			05:36
	17:11	17	16:47 (D04)	17:49			19:21	19:53	31	19:16 (D03)	20:24			20:43
23	07:26		16:30 (D04)	06:52			07:07	06:18		18:45 (D03)	05:44			05:37
	17:12	18	16:48 (D04)	17:50			19:22	19:54	30	19:15 (D03)	20:25			20:43
24	07:26		16:29 (D04)	06:50			07:06	06:17		18:46 (D03)	05:43			05:37
	17:14	20	16:49 (D04)	17:51			19:23	19:55	28	19:14 (D03)	20:26			20:43
25	07:25		16:30 (D04)	06:49			07:04	06:15		18:47 (D03)	05:43			05:37
	17:15	22	16:52 (D04)	17:53			19:24	19:56	26	19:13 (D03)	20:26			20:43
26	07:24		16:29 (D04)	06:48			07:02	06:14		18:47 (D03)	05:42			05:38
	17:16	24	16:53 (D04)	17:54			19:25	19:57	24	19:11 (D03)	20:27			20:44
27	07:23		16:29 (D04)	06:46			07:01	06:12		18:49 (D03)	05:41			05:38
	17:17	25	16:54 (D04)	17:55			19:26	19:58	26	19:37 (D02)	20:28			20:44
28	07:22		16:29 (D04)	06:45			06:59	06:11		18:51 (D03)	05:41			05:38
	17:18	25	16:54 (D04)	17:56			19:27	20:00	26	19:38 (D02)	20:29			20:44
29	07:22		16:29 (D04)				06:57	06:10		18:53 (D03)	05:40			05:39
	17:20	25	16:54 (D04)				19:28	20:01	24	19:38 (D02)	20:30			20:44
30	07:21		16:29 (D04)				06:56	06:08		19:25 (D02)	05:40			05:39
	17:21	25	16:54 (D04)				19:29	20:02	14	19:39 (D02)	20:31			20:44
31	07:20		16:30 (D04)				06:54				05:39			
	17:22	24	16:54 (D04)				19:30				20:31			
Potential sun hours	298			297			369	398			448			452
Total, worst case		279			146				662			346		
Sun reduction		0.45			0.62				0.82			0.92		
Oper. time red.		1.00			1.00				1.00			1.00		
Wind dir. red.		0.87			0.87				0.60			0.52		
Total reduction		0.41			0.56				0.51			0.50		
Total, real		114			82				338			172		

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 4 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (79)

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

	July			August			September			October	November			December
1	05:40			06:04		19:33 (D02)	06:34		18:48 (D03)	07:04	06:38			07:12
	20:44			20:25	21	19:54 (D02)	19:43	28	19:16 (D03)	18:53	18:06			16:41
2	05:40			06:05		19:32 (D02)	06:35		18:48 (D03)	07:05	06:39			07:13
	20:44			20:24	23	19:55 (D02)	19:41	26	19:14 (D03)	18:51	17:05			16:41
3	05:41			06:05		19:32 (D02)	06:36		18:50 (D03)	07:06	06:40		16:08 (D04)	07:14
	20:43			20:23	23	19:55 (D02)	19:40	22	19:12 (D03)	18:49	17:04	9	16:17 (D04)	16:41
4	05:41			06:06		19:31 (D02)	06:37		18:51 (D03)	07:07	06:41		16:06 (D04)	07:15
	20:43			20:22	24	19:55 (D02)	19:38	19	19:10 (D03)	18:48	17:02	14	16:20 (D04)	16:40
5	05:42			06:07		19:31 (D02)	06:38		18:54 (D03)	07:08	06:43		16:05 (D04)	07:16
	20:43			20:21	24	19:55 (D02)	19:36	13	19:07 (D03)	18:46	17:01	16	16:21 (D04)	16:40
6	05:42			06:08		19:31 (D02)	06:39			07:09	06:44		16:03 (D04)	07:17
	20:43			20:20	24	19:55 (D02)	19:35			18:44	17:00	19	16:22 (D04)	16:40
7	05:43			06:09		19:31 (D02)	06:40			07:10	06:45		16:02 (D04)	07:18
	20:43			20:19	24	19:55 (D02)	19:33			18:43	16:59	21	16:23 (D04)	16:40
8	05:44			06:10		19:31 (D02)	06:41			07:11	06:46		16:02 (D04)	07:19
	20:42			20:17	23	19:54 (D02)	19:31			18:41	16:58	22	16:24 (D04)	16:40
9	05:44			06:11		19:31 (D02)	06:42			07:12	06:47		16:01 (D04)	07:20
	20:42			20:16	22	19:53 (D02)	19:30			18:39	16:57	24	16:25 (D04)	16:40
10	05:45			06:12		19:32 (D02)	06:43			07:13	06:48		16:01 (D04)	07:21
	20:42			20:15	19	19:51 (D02)	19:28			18:38	16:56	24	16:25 (D04)	16:40
11	05:46			06:13		19:32 (D02)	06:44			07:14	06:50		16:01 (D04)	07:22
	20:41			20:14	18	19:50 (D02)	19:26			18:36	16:55	25	16:26 (D04)	16:40
12	05:46			06:14		19:33 (D02)	06:45			07:15	06:51		16:01 (D04)	07:23
	20:41			20:12	16	19:49 (D02)	19:25			18:35	16:54	25	16:26 (D04)	16:40
13	05:47			06:15		19:03 (D03)	06:46			07:16	06:52		16:01 (D04)	07:23
	20:40			20:11	21	19:47 (D02)	19:23			18:33	16:53	25	16:26 (D04)	16:40
14	05:48			06:16		19:00 (D03)	06:47			07:17	06:53		16:01 (D04)	07:24
	20:40			20:10	26	19:46 (D02)	19:21			18:32	16:52	25	16:26 (D04)	16:40
15	05:49			06:17		18:57 (D03)	06:48			07:19	06:54		16:02 (D04)	07:25
	20:39			20:08	27	19:44 (D02)	19:20			18:30	16:51	24	16:26 (D04)	16:41
16	05:49			06:18		18:55 (D03)	06:49			07:20	06:56		16:02 (D04)	07:26
	20:39			20:07	22	19:17 (D03)	19:18			18:28	16:50	24	16:26 (D04)	16:41
17	05:50			06:19		18:54 (D03)	06:50			07:21	06:57		16:03 (D04)	07:26
	20:38			20:06	24	19:18 (D03)	19:16			18:27	16:49	22	16:25 (D04)	16:41
18	05:51			06:20		18:53 (D03)	06:51			07:22	06:58		16:03 (D04)	07:27
	20:37			20:04	26	19:19 (D03)	19:15			18:25	16:48	20	16:23 (D04)	16:41
19	05:52			06:21		18:51 (D03)	06:52			07:23	06:59		16:05 (D04)	07:28
	20:37			20:03	29	19:20 (D03)	19:13			18:24	16:48	18	16:23 (D04)	16:42
20	05:53			06:22		18:50 (D03)	06:53			07:24	07:00		16:05 (D04)	07:28
	20:36			20:01	31	19:21 (D03)	19:11			18:22	16:47	17	16:22 (D04)	16:42
21	05:54			06:23		18:50 (D03)	06:54			07:25	07:01		16:06 (D04)	07:29
	20:35			20:00	31	19:21 (D03)	19:10			18:21	16:46	15	16:21 (D04)	16:43
22	05:54			06:24		18:49 (D03)	06:55			07:26	07:03		16:07 (D04)	07:29
	20:35			19:58	32	19:21 (D03)	19:08			18:20	16:46	14	16:21 (D04)	16:43
23	05:55			06:25		18:48 (D03)	06:56			07:27	07:04		16:09 (D04)	07:30
	20:34			19:57	33	19:21 (D03)	19:06			18:18	16:45	11	16:20 (D04)	16:43
24	05:56			06:26		18:48 (D03)	06:57			07:29	07:05		16:11 (D04)	07:30
	20:33			19:55	33	19:21 (D03)	19:04			18:17	16:44	9	16:20 (D04)	16:44
25	05:57			06:27		18:48 (D03)	06:58			07:30	07:06		16:14 (D04)	07:30
	20:32			19:54	33	19:21 (D03)	19:03			18:15	16:44	5	16:19 (D04)	16:45
26	05:58		19:40 (D02)	06:28		18:47 (D03)	06:59			07:31	07:07			07:31
	20:31	8	19:48 (D02)	19:52	34	19:21 (D03)	19:01			18:14	16:43			16:45
27	05:59		19:38 (D02)	06:29		18:47 (D03)	07:00			07:32	07:08			07:31
	20:30	12	19:50 (D02)	19:51	34	19:21 (D03)	18:59			18:13	16:43			16:46
28	06:00		19:37 (D02)	06:30		18:47 (D03)	07:01			07:33	07:09			07:32
	20:29	14	19:51 (D02)	19:49	33	19:20 (D03)	18:58			18:11	16:42			16:46
29	06:01		19:35 (D02)	06:31		18:47 (D03)	07:02			07:34	07:10			07:32
	20:28	17	19:52 (D02)	19:48	32	19:19 (D03)	18:56			18:10	16:42			16:47
30	06:02		19:34 (D02)	06:32		18:48 (D03)	07:03			07:35	07:11			07:32
	20:27	19	19:53 (D02)	19:46	31	19:19 (D03)	18:54			18:09	16:42			16:48
31	06:03		19:33 (D02)	06:33		18:48 (D03)				07:37				07:32
	20:26	20	19:53 (D02)	19:44	30	19:18 (D03)				18:07				16:49
Potential sun hours	458			428			375			346	298			288
Total, worst case		90			823			108				428		
Sun reduction		0.97			0.96			0.93				0.61		
Oper. time red.		1.00			1.00			1.00				1.00		
Wind dir. red.		0.52			0.57			0.60				0.87		
Total reduction		0.52			0.57			0.58				0.55		
Total, real		47			471			63				237		

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:
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217 Montgomery St., Suite 1000
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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 5 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (80)

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		16:22 (D04)	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38			07:12		15:57 (D04)
	16:50			17:23	16	16:38 (D04)	17:57	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06			16:41	20	16:17 (D04)
2	07:33			07:18		16:25 (D04)	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39			07:13		15:58 (D04)
	16:50			17:25	12	16:37 (D04)	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05			16:41	18	16:16 (D04)
3	07:33		16:20 (D04)	07:17		16:28 (D04)	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40			07:14		15:59 (D04)
	16:51	2	16:22 (D04)	17:26	5	16:33 (D04)	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04			16:41	17	16:16 (D04)
4	07:33		16:18 (D04)	07:16			06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07	06:41			07:15		16:00 (D04)
	16:52	7	16:25 (D04)	17:27			18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02			16:40	16	16:16 (D04)
5	07:33		16:17 (D04)	07:15			06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:43			07:16		16:01 (D04)
	16:53	10	16:27 (D04)	17:28			18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01			16:40	14	16:15 (D04)
6	07:33		16:17 (D04)	07:14			06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44			07:17		16:03 (D04)
	16:54	12	16:29 (D04)	17:30			18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00			16:40	12	16:15 (D04)
7	07:33		16:16 (D04)	07:13			06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45			07:18		16:04 (D04)
	16:55	14	16:30 (D04)	17:31			18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59			16:40	10	16:14 (D04)
8	07:32		16:15 (D04)	07:12			07:32	06:41	05:59	05:36	05:44	06:10	06:41	07:11	06:46		15:59 (D04)	07:19		16:05 (D04)
	16:56	16	16:31 (D04)	17:32			19:05	19:39	20:10	20:37	20:42	20:17	19:31	18:41	16:58	6	16:05 (D04)	16:40	7	16:12 (D04)
9	07:32		16:15 (D04)	07:10			07:30	06:39	05:57	05:36	05:44	06:11	06:42	07:12	06:47		15:55 (D04)	07:20		16:08 (D04)
	16:57	17	16:32 (D04)	17:33			19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:39	16:57	13	16:08 (D04)	16:40	3	16:11 (D04)
10	07:32		16:15 (D04)	07:09			07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13	06:48		15:53 (D04)	07:21		
	16:58	18	16:33 (D04)	17:35			19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16	16:09 (D04)	16:40		
11	07:32		16:15 (D04)	07:08			07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14	06:50		15:53 (D04)	07:22		
	16:59	20	16:35 (D04)	17:36			19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	19	16:12 (D04)	16:40		
12	07:32		16:14 (D04)	07:07			07:26	06:35	05:54	05:36	05:46	06:14	06:45	07:15	06:51		15:52 (D04)	07:23		
	17:00	21	16:35 (D04)	17:37			19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	21	16:13 (D04)	16:40		
13	07:31		16:14 (D04)	07:06			07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52		15:51 (D04)	07:23		
	17:01	22	16:36 (D04)	17:38			19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53	22	16:13 (D04)	16:40		
14	07:31		16:14 (D04)	07:04			07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53		15:50 (D04)	07:24		
	17:02	23	16:37 (D04)	17:39			19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52	24	16:14 (D04)	16:40		
15	07:31		16:14 (D04)	07:03			07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19	06:54		15:50 (D04)	07:25		
	17:03	24	16:38 (D04)	17:41			19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	25	16:15 (D04)	16:41		
16	07:30		16:13 (D04)	07:02			07:19	06:28	05:50	05:36	05:49	06:18	06:49	07:20	06:56		15:50 (D04)	07:26		
	17:04	25	16:38 (D04)	17:42			19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	25	16:15 (D04)	16:41		
17	07:30		16:14 (D04)	07:00			07:17	06:27	05:49	05:36	05:50	06:19	06:50	07:21	06:57		15:49 (D04)	07:26		
	17:05	26	16:40 (D04)	17:43			19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	16:49	27	16:16 (D04)	16:41		
18	07:29		16:14 (D04)	06:59			07:16	06:25	05:48	05:36	05:51	06:20	06:51	07:22	06:58		15:49 (D04)	07:27		
	17:07	26	16:40 (D04)	17:44			19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	27	16:16 (D04)	16:41		
19	07:29		16:14 (D04)	06:58			07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59		15:50 (D04)	07:28		
	17:08	27	16:41 (D04)	17:46			19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	27	16:17 (D04)	16:42		
20	07:28		16:14 (D04)	06:56			07:12	06:22	05:47	05:36	05:53	06:22	06:53	07:24	07:00		15:50 (D04)	07:28		
	17:09	27	16:41 (D04)	17:47			19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	27	16:17 (D04)	16:42		
21	07:28		16:15 (D04)	06:55			07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01		15:50 (D04)	07:29		
	17:10	27	16:42 (D04)	17:48			19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	27	16:17 (D04)	16:43		
22	07:27		16:15 (D04)	06:53			07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03		15:50 (D04)	07:29		
	17:11	27	16:42 (D04)	17:49			19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:20	16:46	27	16:17 (D04)	16:43		
23	07:26		16:15 (D04)	06:52			07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04		15:50 (D04)	07:30		
	17:12	27	16:42 (D04)	17:50			19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	27	16:17 (D04)	16:43		
24	07:26		16:15 (D04)	06:50			07:06	06:17	05:43	05:37	05:56	06:26	06:57	07:29	07:05		15:52 (D04)	07:30		
	17:14	27	16:42 (D04)	17:51			19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	16:44	26	16:18 (D04)	16:44		
25	07:25		16:16 (D04)	06:49			07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06		15:52 (D04)	07:31		
	17:15	27	16:43 (D04)	17:53			19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	26	16:18 (D04)	16:45		
26	07:24		16:17 (D04)	06:48			07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07		15:52 (D04)	07:31		
	17:16	25	16:42 (D04)	17:54			19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43	25	16:17 (D04)	16:45		
27	07:23		16:17 (D04)	06:46			07:01	06:12	05:41	05:38	05:59	06:29	07:00	07:32	07:08		15:53 (D04)	07:31		
	17:17	25	16:42 (D04)	17:55			19:26	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	24	16:17 (D04)	16:46		
28	07:22		16:18 (D04)	06:45			06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09		15:54 (D04)	07:32		
	17:18	24	16:42 (D04)	17:56			19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	23	16:17 (D04)	16:46		
29	07:22		16:19 (D04)				06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10		15:54 (D04)	07:32		
	17:20	22	16:41 (D04)				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	23	16:17 (D04)	16:47		
30	07:21		16:20 (D04)				06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11		15:55 (D04)	07:32		
	17:21	21	16:41 (D04)				19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	21	16:16 (D04)	16:48		
31	07:20		16:21 (D04)				06:54		05:39		06:03	06:33		07:37				07:32		
	17:22	19	16:40 (D04)				19:30		20:31		20:26	19:45		18:07				16:49		
Potential sun hours	298			297			369	398	448	452	458	428	375	346	298			288		
Total, worst case		608			33											528			117	
Sun reduction		0.45			0.62											0.61			0.47	
Oper. time red.		1.00			1.00											1.00			1.00	
Wind dir. red.		0.88			0.88											0.88			0.88	
Total reduction		0.40			0.54											0.54			0.41	
Total, real		240			18											283			48	

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)

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Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 6 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (81)

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	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	06:10	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:39	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	19:40	20:11	20:38	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	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40
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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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
	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	17:14	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	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	07:31
	17:15	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
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
	17:16	17:54	19:25	19:57	20:27	20:44	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	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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)

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Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 7 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (82)

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	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	06:10	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:39	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	19:40	20:11	20:38	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	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40
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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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
	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	17:14	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	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	07:31
	17:15	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
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
	17:16	17:54	19:25	19:57	20:27	20:44	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	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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:
EDR
217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 8 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (83)

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	
1	07:32			07:19		16:27 (D04)	06:43	06:52			06:07		19:21 (D02)	05:39	
	16:50			17:23	20	16:47 (D04)	17:57	19:31			20:03	20	19:41 (D02)	20:32	
2	07:33			07:18		16:28 (D04)	06:41	06:51			06:06		19:20 (D02)	05:38	
	16:50			17:25	19	16:47 (D04)	17:58	19:32			20:04	22	19:42 (D02)	20:33	
3	07:33			07:17		16:29 (D04)	06:40	06:49			06:05		19:19 (D02)	05:38	
	16:51			17:26	16	16:45 (D04)	18:00	19:33			20:05	23	19:42 (D02)	20:34	
4	07:33			07:16		16:31 (D04)	06:38	06:48		18:59 (D03)	06:03		19:19 (D02)	05:38	
	16:52			17:27	13	16:44 (D04)	18:01	19:34	5	19:04 (D03)	20:06	24	19:43 (D02)	20:34	
5	07:33			07:15		16:34 (D04)	06:37	06:46		18:53 (D03)	06:02		19:19 (D02)	05:37	
	16:53			17:28	7	16:41 (D04)	18:02	19:35	15	19:08 (D03)	20:07	25	19:44 (D02)	20:35	
6	07:33			07:14			06:35	06:44		18:50 (D03)	06:01		19:19 (D02)	05:37	
	16:54			17:30			18:03	19:36	20	19:10 (D03)	20:08	25	19:44 (D02)	20:36	
7	07:33			07:13			06:34	06:43		18:48 (D03)	06:00		19:19 (D02)	05:37	
	16:55			17:31			18:04	19:37	24	19:12 (D03)	20:09	25	19:44 (D02)	20:36	
8	07:32			07:12			07:32	06:41		18:46 (D03)	05:59		19:19 (D02)	05:36	
	16:56			17:32			19:05	19:38	27	19:13 (D03)	20:10	25	19:44 (D02)	20:37	
9	07:32			07:10			07:30	06:39		18:44 (D03)	05:57		19:20 (D02)	05:36	
	16:57			17:33			19:06	19:40	29	19:13 (D03)	20:11	23	19:43 (D02)	20:38	
10	07:32			07:09			07:29	06:38		18:44 (D03)	05:56		19:19 (D02)	05:36	
	16:58			17:35			19:07	19:41	30	19:14 (D03)	20:12	23	19:42 (D02)	20:38	
11	07:32			07:08			07:27	06:36		18:42 (D03)	05:55		19:20 (D02)	05:36	
	16:59			17:36			19:09	19:42	32	19:14 (D03)	20:13	21	19:41 (D02)	20:39	
12	07:32		16:27 (D04)	07:07			07:26	06:35		18:42 (D03)	05:54		19:20 (D02)	05:36	
	17:00	8	16:35 (D04)	17:37			19:10	19:43	33	19:15 (D03)	20:14	21	19:41 (D02)	20:39	
13	07:31		16:26 (D04)	07:05			07:24	06:33		18:41 (D03)	05:53		19:21 (D02)	05:36	
	17:01	10	16:36 (D04)	17:38			19:11	19:44	34	19:15 (D03)	20:15	19	19:40 (D02)	20:40	
14	07:31		16:25 (D04)	07:04			07:22	06:32		18:41 (D03)	05:52		19:22 (D02)	05:36	
	17:02	12	16:37 (D04)	17:39			19:12	19:45	34	19:15 (D03)	20:16	17	19:39 (D02)	20:40	
15	07:31		16:25 (D04)	07:03			07:21	06:30		18:40 (D03)	05:51		19:24 (D02)	05:36	
	17:03	14	16:39 (D04)	17:41			19:13	19:46	35	19:15 (D03)	20:17	14	19:38 (D02)	20:41	
16	07:30		16:24 (D04)	07:02			07:19	06:28		18:40 (D03)	05:50		19:26 (D02)	05:36	
	17:04	15	16:39 (D04)	17:42			19:14	19:47	35	19:15 (D03)	20:18	11	19:37 (D02)	20:41	
17	07:30		16:24 (D04)	07:00			07:17	06:27		18:40 (D03)	05:49		19:29 (D02)	05:36	
	17:05	17	16:41 (D04)	17:43			19:15	19:48	34	19:14 (D03)	20:19	5	19:34 (D02)	20:41	
18	07:29		16:23 (D04)	06:59			07:16	06:25		18:40 (D03)	05:48			05:36	
	17:07	19	16:42 (D04)	17:44			19:16	19:49	34	19:14 (D03)	20:20			20:42	
19	07:29		16:23 (D04)	06:58			07:14	06:24		18:40 (D03)	05:47			05:36	
	17:08	21	16:44 (D04)	17:46			19:17	19:50	33	19:13 (D03)	20:21			20:42	
20	07:28		16:23 (D04)	06:56			07:12	06:22		18:41 (D03)	05:47			05:36	
	17:09	22	16:45 (D04)	17:47			19:18	19:51	32	19:13 (D03)	20:22			20:42	
21	07:28		16:23 (D04)	06:55			07:11	06:21		18:40 (D03)	05:46			05:36	
	17:10	23	16:46 (D04)	17:48			19:19	19:52	32	19:12 (D03)	20:23			20:43	
22	07:27		16:23 (D04)	06:53			07:09	06:19		18:41 (D03)	05:45			05:36	
	17:11	24	16:47 (D04)	17:49			19:21	19:53	30	19:11 (D03)	20:24			20:43	
23	07:26		16:23 (D04)	06:52			07:07	06:18		18:42 (D03)	05:44			05:37	
	17:12	24	16:47 (D04)	17:50			19:22	19:54	27	19:09 (D03)	20:25			20:43	
24	07:26		16:22 (D04)	06:50			07:06	06:17		18:43 (D03)	05:43			05:37	
	17:14	26	16:48 (D04)	17:51			19:23	19:55	25	19:08 (D03)	20:26			20:43	
25	07:25		16:23 (D04)	06:49			07:04	06:15		18:45 (D03)	05:43			05:37	
	17:15	26	16:49 (D04)	17:53			19:24	19:56	22	19:07 (D03)	20:26			20:43	
26	07:24		16:24 (D04)	06:48			07:02	06:14		18:45 (D03)	05:42			05:38	
	17:16	25	16:49 (D04)	17:54			19:25	19:57	26	19:35 (D02)	20:27			20:44	
27	07:23		16:24 (D04)	06:46			07:01	06:12		18:48 (D03)	05:41			05:38	
	17:17	25	16:49 (D04)	17:55			19:26	19:58	26	19:37 (D02)	20:28			20:44	
28	07:22		16:24 (D04)	06:45			06:59	06:11		18:52 (D03)	05:41			05:38	
	17:18	25	16:49 (D04)	17:56			19:27	20:00	21	19:38 (D02)	20:29			20:44	
29	07:22		16:24 (D04)				06:57	06:10		19:22 (D02)	05:40			05:39	
	17:20	25	16:49 (D04)				19:28	20:01	16	19:38 (D02)	20:30			20:44	
30	07:21		16:25 (D04)				06:56	06:08		19:21 (D02)	05:40			05:39	
	17:21	23	16:48 (D04)				19:29	20:02	18	19:39 (D02)	20:31			20:44	
31	07:20		16:26 (D04)				06:54				05:39				
	17:22	22	16:48 (D04)				19:30				20:31				
Potential sun hours	298			297			369	398			448			452	
Total, worst case		406			75				729			343			
Sun reduction		0.45			0.62				0.82			0.92			
Oper. time red.		1.00			1.00				1.00			1.00			
Wind dir. red.		0.87			0.87				0.60			0.52			
Total reduction		0.41			0.57				0.52			0.50			
Total, real		167			43				378			172			

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)			

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4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 8 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (83)

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

	July			August			September			October	November			December		
1	05:40			06:04		19:31 (D02)	06:34		18:41 (D03)	07:04	06:38			07:12		16:13 (D04)
	20:44			20:25	21	19:52 (D02)	19:43	32	19:13 (D03)	18:53	18:06			16:41	2	16:15 (D04)
2	05:40			06:05		19:30 (D02)	06:35		18:42 (D03)	07:05	06:39			07:13		
	20:44			20:24	22	19:52 (D02)	19:41	30	19:12 (D03)	18:51	17:05			16:41		
3	05:41			06:05		19:30 (D02)	06:36		18:42 (D03)	07:06	06:40			07:14		
	20:43			20:23	23	19:53 (D02)	19:40	29	19:11 (D03)	18:49	17:04			16:41		
4	05:41			06:06		19:29 (D02)	06:37		18:43 (D03)	07:07	06:41			07:15		
	20:43			20:22	24	19:53 (D02)	19:38	27	19:10 (D03)	18:48	17:02			16:40		
5	05:42			06:07		19:29 (D02)	06:38		18:44 (D03)	07:08	06:43			07:16		
	20:43			20:21	24	19:53 (D02)	19:36	24	19:08 (D03)	18:46	17:01			16:40		
6	05:42			06:08		19:29 (D02)	06:39		18:46 (D03)	07:09	06:44		16:04 (D04)	07:17		
	20:43			20:20	25	19:54 (D02)	19:35	20	19:06 (D03)	18:44	17:00	8	16:12 (D04)	16:40		
7	05:43			06:09		19:29 (D02)	06:40		18:48 (D03)	07:10	06:45		16:01 (D04)	07:18		
	20:43			20:19	25	19:54 (D02)	19:33	15	19:03 (D03)	18:43	16:59	13	16:14 (D04)	16:40		
8	05:44			06:10		19:29 (D02)	06:41		18:52 (D03)	07:11	06:46		16:00 (D04)	07:19		
	20:42			20:17	24	19:53 (D02)	19:31	6	18:58 (D03)	18:41	16:58	16	16:16 (D04)	16:40		
9	05:44			06:11		19:29 (D02)	06:42			07:12	06:47		15:59 (D04)	07:20		
	20:42			20:16	24	19:53 (D02)	19:30			18:39	16:57	19	16:18 (D04)	16:40		
10	05:45			06:12		19:29 (D02)	06:43			07:13	06:48		15:57 (D04)	07:21		
	20:42			20:15	22	19:51 (D02)	19:28			18:38	16:56	21	16:18 (D04)	16:40		
11	05:46			06:13		19:29 (D02)	06:44			07:14	06:50		15:58 (D04)	07:22		
	20:41			20:14	21	19:50 (D02)	19:26			18:36	16:55	22	16:20 (D04)	16:40		
12	05:46			06:14		19:30 (D02)	06:45			07:15	06:51		15:57 (D04)	07:23		
	20:41			20:12	19	19:49 (D02)	19:25			18:35	16:54	23	16:20 (D04)	16:40		
13	05:47			06:15		19:29 (D02)	06:46			07:16	06:52		15:56 (D04)	07:23		
	20:40			20:11	18	19:47 (D02)	19:23			18:33	16:53	25	16:21 (D04)	16:40		
14	05:48			06:16		19:30 (D02)	06:47			07:17	06:53		15:56 (D04)	07:24		
	20:40			20:10	16	19:46 (D02)	19:21			18:32	16:52	25	16:21 (D04)	16:40		
15	05:49			06:17		18:57 (D03)	06:48			07:19	06:54		15:57 (D04)	07:25		
	20:39			20:08	23	19:44 (D02)	19:20			18:30	16:51	25	16:22 (D04)	16:41		
16	05:49			06:18		18:54 (D03)	06:49			07:20	06:56		15:56 (D04)	07:26		
	20:39			20:07	26	19:43 (D02)	19:18			18:28	16:50	26	16:22 (D04)	16:41		
17	05:50			06:19		18:52 (D03)	06:50			07:21	06:57		15:56 (D04)	07:26		
	20:38			20:06	24	19:41 (D02)	19:16			18:27	16:49	26	16:22 (D04)	16:41		
18	05:51			06:20		18:50 (D03)	06:51			07:22	06:58		15:56 (D04)	07:27		
	20:37			20:04	23	19:13 (D03)	19:15			18:25	16:48	26	16:22 (D04)	16:41		
19	05:52			06:21		18:49 (D03)	06:52			07:23	06:59		15:58 (D04)	07:28		
	20:37			20:03	25	19:14 (D03)	19:13			18:24	16:48	24	16:22 (D04)	16:42		
20	05:53			06:22		18:47 (D03)	06:53			07:24	07:00		15:58 (D04)	07:28		
	20:36			20:01	28	19:15 (D03)	19:11			18:22	16:47	24	16:22 (D04)	16:42		
21	05:54			06:23		18:46 (D03)	06:54			07:25	07:01		15:58 (D04)	07:29		
	20:35			20:00	30	19:16 (D03)	19:10			18:21	16:46	23	16:21 (D04)	16:43		
22	05:54			06:24		18:45 (D03)	06:55			07:26	07:03		15:59 (D04)	07:29		
	20:35			19:58	32	19:17 (D03)	19:08			18:20	16:46	22	16:21 (D04)	16:43		
23	05:55			06:25		18:44 (D03)	06:56			07:27	07:04		15:59 (D04)	07:30		
	20:34			19:57	33	19:17 (D03)	19:06			18:18	16:45	21	16:20 (D04)	16:43		
24	05:56			06:26		18:44 (D03)	06:57			07:29	07:05		16:01 (D04)	07:30		
	20:33			19:55	33	19:17 (D03)	19:04			18:17	16:44	19	16:20 (D04)	16:44		
25	05:57			06:27		18:43 (D03)	06:58			07:30	07:06		16:02 (D04)	07:31		
	20:32			19:54	34	19:17 (D03)	19:03			18:15	16:44	17	16:19 (D04)	16:45		
26	05:58			06:28		18:43 (D03)	06:59			07:31	07:07		16:03 (D04)	07:31		
	20:31			19:52	34	19:17 (D03)	19:01			18:14	16:43	15	16:18 (D04)	16:45		
27	05:59		19:38 (D02)	06:29		18:42 (D03)	07:00			07:32	07:08		16:04 (D04)	07:31		
	20:30	8	19:46 (D02)	19:51	35	19:17 (D03)	18:59			18:13	16:43	14	16:18 (D04)	16:46		
28	06:00		19:36 (D02)	06:30		18:42 (D03)	07:01			07:33	07:09		16:05 (D04)	07:32		
	20:29	12	19:48 (D02)	19:49	35	19:17 (D03)	18:58			18:11	16:42	12	16:17 (D04)	16:46		
29	06:01		19:33 (D02)	06:31		18:42 (D03)	07:02			07:34	07:10		16:06 (D04)	07:32		
	20:28	16	19:49 (D02)	19:48	34	19:16 (D03)	18:56			18:10	16:42	11	16:17 (D04)	16:47		
30	06:02		19:32 (D02)	06:32		18:42 (D03)	07:03			07:35	07:11		16:08 (D04)	07:32		
	20:27	18	19:50 (D02)	19:46	34	19:16 (D03)	18:54			18:09	16:42	8	16:16 (D04)	16:48		
31	06:03		19:31 (D02)	06:33		18:42 (D03)				07:37				07:32		
	20:26	20	19:51 (D02)	19:44	33	19:15 (D03)				18:07				16:49		
Potential sun hours	458			428			375			346	298			288		
Total, worst case		74			824			183				485			2	
Sun reduction		0.97			0.96			0.93				0.61			0.47	
Oper. time red.		1.00			1.00			1.00				1.00			1.00	
Wind dir. red.		0.52			0.58			0.61				0.87			0.87	
Total reduction		0.53			0.58			0.60				0.56			0.43	
Total, real		39			476			109				271			1	

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)

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Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 9 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (84)

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	
1	07:32			07:19		16:28 (D04)	06:43	06:52			06:07		19:18 (D02)	05:39	
	16:50			17:23	20	16:48 (D04)	17:57	19:31			20:03	23	19:41 (D02)	20:32	
2	07:33			07:18		16:29 (D04)	06:41	06:51		18:56 (D03)	06:06		19:17 (D02)	05:38	
	16:50			17:25	18	16:47 (D04)	17:58	19:32	6	19:02 (D03)	20:04	25	19:42 (D02)	20:33	
3	07:33			07:17		16:30 (D04)	06:40	06:49		18:51 (D03)	06:05		19:17 (D02)	05:38	
	16:51			17:26	16	16:46 (D04)	18:00	19:33	15	19:06 (D03)	20:05	24	19:41 (D02)	20:34	
4	07:33			07:16		16:32 (D04)	06:38	06:48		18:49 (D03)	06:03		19:17 (D02)	05:38	
	16:52			17:27	12	16:44 (D04)	18:01	19:34	20	19:09 (D03)	20:06	24	19:41 (D02)	20:34	
5	07:33			07:15		16:36 (D04)	06:37	06:46		18:46 (D03)	06:02		19:17 (D02)	05:37	
	16:53			17:28	5	16:41 (D04)	18:02	19:35	24	19:10 (D03)	20:07	24	19:41 (D02)	20:35	
6	07:33			07:14			06:35	06:44		18:44 (D03)	06:01		19:17 (D02)	05:37	
	16:54			17:30			18:03	19:36	27	19:11 (D03)	20:08	24	19:41 (D02)	20:36	
7	07:33			07:13			06:34	06:43		18:44 (D03)	06:00		19:18 (D02)	05:37	
	16:55			17:31			18:04	19:37	28	19:12 (D03)	20:09	22	19:40 (D02)	20:36	
8	07:32			07:12			07:32	06:41		18:42 (D03)	05:59		19:18 (D02)	05:36	
	16:56			17:32			19:05	19:38	30	19:12 (D03)	20:10	22	19:40 (D02)	20:37	
9	07:32			07:10			07:30	06:39		18:41 (D03)	05:57		19:19 (D02)	05:36	
	16:57			17:33			19:06	19:40	31	19:12 (D03)	20:11	20	19:39 (D02)	20:38	
10	07:32			07:09			07:29	06:38		18:41 (D03)	05:56		19:19 (D02)	05:36	
	16:58			17:35			19:07	19:41	32	19:13 (D03)	20:12	18	19:37 (D02)	20:38	
11	07:32			07:08			07:27	06:36		18:39 (D03)	05:55		19:20 (D02)	05:36	
	16:59			17:36			19:09	19:42	34	19:13 (D03)	20:13	16	19:36 (D02)	20:39	
12	07:32		16:30 (D04)	07:07			07:26	06:35		18:40 (D03)	05:54		19:22 (D02)	05:36	
	17:00	4	16:34 (D04)	17:37			19:10	19:43	33	19:13 (D03)	20:14	13	19:35 (D02)	20:39	
13	07:31		16:28 (D04)	07:05			07:24	06:33		18:39 (D03)	05:53		19:24 (D02)	05:36	
	17:01	8	16:36 (D04)	17:38			19:11	19:44	34	19:13 (D03)	20:15	9	19:33 (D02)	20:40	
14	07:31		16:26 (D04)	07:04			07:22	06:32		18:39 (D03)	05:52			05:36	
	17:02	11	16:37 (D04)	17:39			19:12	19:45	34	19:13 (D03)	20:16			20:40	
15	07:31		16:26 (D04)	07:03			07:21	06:30		18:39 (D03)	05:51			05:36	
	17:03	13	16:39 (D04)	17:41			19:13	19:46	33	19:12 (D03)	20:17			20:41	
16	07:30		16:25 (D04)	07:02			07:19	06:28		18:39 (D03)	05:50			05:36	
	17:04	14	16:39 (D04)	17:42			19:14	19:47	33	19:12 (D03)	20:18			20:41	
17	07:30		16:25 (D04)	07:00			07:17	06:27		18:39 (D03)	05:49			05:36	
	17:05	16	16:41 (D04)	17:43			19:15	19:48	32	19:11 (D03)	20:19			20:41	
18	07:29		16:24 (D04)	06:59			07:16	06:25		18:40 (D03)	05:48			05:36	
	17:07	18	16:42 (D04)	17:44			19:16	19:49	30	19:10 (D03)	20:20			20:42	
19	07:29		16:24 (D04)	06:58			07:14	06:24		18:40 (D03)	05:47			05:36	
	17:08	20	16:44 (D04)	17:46			19:17	19:50	29	19:09 (D03)	20:21			20:42	
20	07:28		16:24 (D04)	06:56			07:12	06:22		18:41 (D03)	05:47			05:36	
	17:09	21	16:45 (D04)	17:47			19:18	19:51	27	19:08 (D03)	20:22			20:42	
21	07:28		16:24 (D04)	06:55			07:11	06:21		18:41 (D03)	05:46			05:36	
	17:10	22	16:46 (D04)	17:48			19:19	19:52	25	19:06 (D03)	20:23			20:43	
22	07:27		16:24 (D04)	06:53			07:09	06:19		18:43 (D03)	05:45			05:36	
	17:11	23	16:47 (D04)	17:49			19:21	19:53	22	19:05 (D03)	20:24			20:43	
23	07:26		16:24 (D04)	06:52			07:07	06:18		18:44 (D03)	05:44			05:37	
	17:12	24	16:48 (D04)	17:50			19:22	19:54	18	19:02 (D03)	20:25			20:43	
24	07:26		16:23 (D04)	06:50			07:06	06:17		18:47 (D03)	05:43			05:37	
	17:14	25	16:48 (D04)	17:51			19:23	19:55	20	19:34 (D02)	20:26			20:43	
25	07:25		16:24 (D04)	06:49			07:04	06:15		18:52 (D03)	05:43			05:37	
	17:15	25	16:49 (D04)	17:53			19:24	19:56	14	19:35 (D02)	20:26			20:43	
26	07:24		16:24 (D04)	06:48			07:02	06:14		19:21 (D02)	05:42			05:38	
	17:16	25	16:49 (D04)	17:54			19:25	19:57	14	19:35 (D02)	20:27			20:44	
27	07:23		16:25 (D04)	06:46			07:01	06:12		19:20 (D02)	05:41			05:38	
	17:17	24	16:49 (D04)	17:55			19:26	19:58	17	19:37 (D02)	20:28			20:44	
28	07:22		16:25 (D04)	06:45			06:59	06:11		19:20 (D02)	05:41			05:38	
	17:18	24	16:49 (D04)	17:56			19:27	20:00	18	19:38 (D02)	20:29			20:44	
29	07:22		16:25 (D04)				06:57	06:10		19:18 (D02)	05:40			05:39	
	17:20	24	16:49 (D04)				19:28	20:01	20	19:38 (D02)	20:30			20:44	
30	07:21		16:26 (D04)				06:56	06:08		19:18 (D02)	05:40			05:39	
	17:21	23	16:49 (D04)				19:29	20:02	21	19:39 (D02)	20:31			20:44	
31	07:20		16:27 (D04)				06:54				05:39				
	17:22	21	16:48 (D04)				19:30				20:31				
Potential sun hours	298			297			369	398			448			452	
Total, worst case		385			71				721			264			
Sun reduction		0.45			0.62				0.82			0.92			
Oper. time red.		1.00			1.00				1.00			1.00			
Wind dir. red.		0.87			0.87				0.61			0.53			
Total reduction		0.41			0.57				0.52			0.51			
Total, real		158			40				376			133			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 9 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (84)

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

	July			August			September			October	November			December
1	05:40			06:04		19:32 (D02)	06:34		18:38 (D03)	07:04	06:38			07:12
	20:44			20:25	14	19:46 (D02)	19:43	34	19:12 (D03)	18:53	18:06			16:41
2	05:40			06:05		19:30 (D02)	06:35		18:38 (D03)	07:05	06:39			07:13
	20:44			20:24	17	19:47 (D02)	19:41	33	19:11 (D03)	18:51	17:05			16:41
3	05:41			06:05		19:29 (D02)	06:36		18:39 (D03)	07:06	06:40			07:14
	20:43			20:23	19	19:48 (D02)	19:40	31	19:10 (D03)	18:49	17:04			16:41
4	05:41			06:06		19:29 (D02)	06:37		18:39 (D03)	07:07	06:41			07:15
	20:43			20:22	20	19:49 (D02)	19:38	30	19:09 (D03)	18:48	17:02			16:40
5	05:42			06:07		19:28 (D02)	06:38		18:40 (D03)	07:08	06:43			07:16
	20:43			20:21	22	19:50 (D02)	19:36	28	19:08 (D03)	18:46	17:01			16:40
6	05:42			06:08		19:27 (D02)	06:39		18:40 (D03)	07:09	06:44		16:05 (D04)	07:17
	20:43			20:20	23	19:50 (D02)	19:35	27	19:07 (D03)	18:44	17:00	7	16:12 (D04)	16:40
7	05:43			06:09		19:27 (D02)	06:40		18:41 (D03)	07:10	06:45		16:02 (D04)	07:18
	20:43			20:19	23	19:50 (D02)	19:33	24	19:05 (D03)	18:43	16:59	12	16:14 (D04)	16:40
8	05:44			06:10		19:27 (D02)	06:41		18:43 (D03)	07:11	06:46		16:01 (D04)	07:19
	20:42			20:17	24	19:51 (D02)	19:31	20	19:03 (D03)	18:41	16:58	16	16:17 (D04)	16:40
9	05:44			06:11		19:26 (D02)	06:42		18:45 (D03)	07:12	06:47		16:00 (D04)	07:20
	20:42			20:16	25	19:51 (D02)	19:30	15	19:00 (D03)	18:39	16:57	18	16:18 (D04)	16:40
10	05:45			06:12		19:26 (D02)	06:43		18:49 (D03)	07:13	06:48		15:58 (D04)	07:21
	20:42			20:15	25	19:51 (D02)	19:28	7	18:56 (D03)	18:38	16:56	21	16:19 (D04)	16:40
11	05:46			06:13		19:26 (D02)	06:44			07:14	06:50		15:59 (D04)	07:22
	20:41			20:14	24	19:50 (D02)	19:26			18:36	16:55	21	16:20 (D04)	16:40
12	05:46			06:14		19:26 (D02)	06:45			07:15	06:51		15:58 (D04)	07:23
	20:41			20:12	23	19:49 (D02)	19:25			18:35	16:54	23	16:21 (D04)	16:40
13	05:47			06:15		19:26 (D02)	06:46			07:16	06:52		15:57 (D04)	07:23
	20:40			20:11	21	19:47 (D02)	19:23			18:33	16:53	24	16:21 (D04)	16:40
14	05:48			06:16		19:26 (D02)	06:47			07:17	06:53		15:57 (D04)	07:24
	20:40			20:10	20	19:46 (D02)	19:21			18:32	16:52	24	16:21 (D04)	16:40
15	05:49			06:17		19:27 (D02)	06:48			07:19	06:54		15:58 (D04)	07:25
	20:39			20:08	17	19:44 (D02)	19:20			18:30	16:51	24	16:22 (D04)	16:41
16	05:49			06:18		19:27 (D02)	06:49			07:20	06:56		15:57 (D04)	07:26
	20:39			20:07	16	19:43 (D02)	19:18			18:28	16:50	25	16:22 (D04)	16:41
17	05:50			06:19		19:29 (D02)	06:50			07:21	06:57		15:57 (D04)	07:26
	20:38			20:06	13	19:42 (D02)	19:16			18:27	16:49	25	16:22 (D04)	16:41
18	05:51			06:20		18:56 (D03)	06:51			07:22	06:58		15:57 (D04)	07:27
	20:37			20:04	17	19:40 (D02)	19:15			18:25	16:48	25	16:22 (D04)	16:41
19	05:52			06:21		18:52 (D03)	06:52			07:23	06:59		15:59 (D04)	07:28
	20:37			20:03	20	19:39 (D02)	19:13			18:24	16:48	24	16:23 (D04)	16:42
20	05:53			06:22		18:50 (D03)	06:53			07:24	07:00		15:59 (D04)	07:28
	20:36			20:01	19	19:09 (D03)	19:11			18:22	16:47	23	16:22 (D04)	16:42
21	05:54			06:23		18:48 (D03)	06:54			07:25	07:01		15:59 (D04)	07:29
	20:35			20:00	22	19:10 (D03)	19:10			18:21	16:46	22	16:21 (D04)	16:43
22	05:54			06:24		18:46 (D03)	06:55			07:26	07:03		16:00 (D04)	07:29
	20:35			19:58	25	19:11 (D03)	19:08			18:20	16:46	21	16:21 (D04)	16:43
23	05:55			06:25		18:45 (D03)	06:56			07:27	07:04		16:00 (D04)	07:30
	20:34			19:57	27	19:12 (D03)	19:06			18:18	16:45	20	16:20 (D04)	16:43
24	05:56			06:26		18:44 (D03)	06:57			07:29	07:05		16:02 (D04)	07:30
	20:33			19:55	29	19:13 (D03)	19:04			18:17	16:44	18	16:20 (D04)	16:44
25	05:57			06:27		18:43 (D03)	06:58			07:30	07:06		16:03 (D04)	07:31
	20:32			19:54	30	19:13 (D03)	19:03			18:15	16:44	16	16:19 (D04)	16:45
26	05:58			06:28		18:42 (D03)	06:59			07:31	07:07		16:04 (D04)	07:31
	20:31			19:52	32	19:14 (D03)	19:01			18:14	16:43	14	16:18 (D04)	16:45
27	05:59			06:29		18:41 (D03)	07:00			07:32	07:08		16:05 (D04)	07:31
	20:30			19:51	33	19:14 (D03)	18:59			18:13	16:43	13	16:18 (D04)	16:46
28	06:00			06:30		18:41 (D03)	07:01			07:33	07:09		16:06 (D04)	07:32
	20:29			19:49	33	19:14 (D03)	18:58			18:11	16:42	11	16:17 (D04)	16:46
29	06:01			06:31		18:40 (D03)	07:02			07:34	07:10		16:08 (D04)	07:32
	20:28			19:48	34	19:14 (D03)	18:56			18:10	16:42	9	16:17 (D04)	16:47
30	06:02		19:36 (D02)	06:32		18:40 (D03)	07:03			07:35	07:11		16:10 (D04)	07:32
	20:27	5	19:41 (D02)	19:46	33	19:13 (D03)	18:54			18:09	16:42	6	16:16 (D04)	16:48
31	06:03		19:33 (D02)	06:33		18:40 (D03)				07:37				07:32
	20:26	11	19:44 (D02)	19:44	33	19:13 (D03)				18:07				16:49
Potential sun hours	458			428			375			346	298			288
Total, worst case		16			733			249				462		
Sun reduction		0.97			0.96			0.93				0.61		
Oper. time red.		1.00			1.00			1.00				1.00		
Wind dir. red.		0.53			0.58			0.62				0.87		
Total reduction		0.53			0.58			0.61				0.56		
Total, real		9			423			151				257		

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 10 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (85)

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		18:52 (D03)	06:07	19:15 (D02)	05:39	05:40	06:04		06:34	18:37 (D03)	07:04	06:38	07:12
	16:50	17:23	17:57	19:31	12	19:04 (D03)	20:03	24 19:39 (D02)	20:32	20:44	20:25		19:43	33 19:10 (D03)	18:53	18:06	16:41
2	07:33	07:18	06:41	06:51		18:48 (D03)	06:06	19:16 (D02)	05:38	05:40	06:05	19:32 (D02)	06:35	18:36 (D03)	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	18	19:06 (D03)	20:04	24 19:40 (D02)	20:33	20:44	20:24	9 19:41 (D02)	19:41	33 19:09 (D03)	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49		18:46 (D03)	06:05	19:15 (D02)	05:38	05:41	06:05	19:30 (D02)	06:36	18:36 (D03)	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	22	19:08 (D03)	20:05	23 19:38 (D02)	20:34	20:43	20:23	13 19:43 (D02)	19:40	33 19:09 (D03)	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48		18:45 (D03)	06:03	19:15 (D02)	05:38	05:41	06:06	19:29 (D02)	06:37	18:36 (D03)	07:07	06:41	07:15
	16:52	17:27	18:01	19:34	24	19:09 (D03)	20:06	23 19:38 (D02)	20:34	20:43	20:22	16 19:45 (D02)	19:38	32 19:08 (D03)	18:48	17:02	16:40
5	07:33	07:15	06:37	06:46		18:43 (D03)	06:02	19:16 (D02)	05:37	05:42	06:07	19:28 (D02)	06:38	18:37 (D03)	07:08	06:43	07:16
	16:53	17:28	18:02	19:35	27	19:10 (D03)	20:07	22 19:38 (D02)	20:35	20:43	20:21	18 19:46 (D02)	19:36	30 19:07 (D03)	18:46	17:01	16:40
6	07:33	07:14	06:35	06:44		18:41 (D03)	06:01	19:17 (D02)	05:37	05:42	06:08	19:27 (D02)	06:39	18:37 (D03)	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	29	19:10 (D03)	20:08	20 19:37 (D02)	20:36	20:43	20:20	20 19:47 (D02)	19:35	29 19:06 (D03)	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43		18:41 (D03)	06:00	19:17 (D02)	05:37	05:43	06:09	19:26 (D02)	06:40	18:38 (D03)	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	30	19:11 (D03)	20:09	20 19:37 (D02)	20:36	20:43	20:19	21 19:47 (D02)	19:33	27 19:05 (D03)	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41		18:39 (D03)	05:59	19:18 (D02)	05:36	05:44	06:10	19:25 (D02)	06:41	18:39 (D03)	07:11	06:46	07:19
	16:56	17:32	19:05	19:38	32	19:11 (D03)	20:10	18 19:36 (D02)	20:37	20:42	20:17	23 19:48 (D02)	19:31	25 19:04 (D03)	18:41	16:58	16:40
9	07:32	07:10	07:30	06:39		18:38 (D03)	05:57	19:20 (D02)	05:36	05:44	06:11	19:25 (D02)	06:42	18:40 (D03)	07:12	06:47	07:20
	16:57	17:33	19:06	19:40	33	19:11 (D03)	20:11	14 19:34 (D02)	20:38	20:42	20:16	23 19:48 (D02)	19:30	22 19:02 (D03)	18:39	16:57	16:40
10	07:32	07:09	07:29	06:38		18:39 (D03)	05:56	19:20 (D02)	05:36	05:45	06:12	19:25 (D02)	06:43	18:41 (D03)	07:13	06:48	07:21
	16:58	17:35	19:07	19:41	32	19:11 (D03)	20:12	12 19:32 (D02)	20:38	20:42	20:15	23 19:48 (D02)	19:28	19 19:00 (D03)	18:38	16:56	16:40
11	07:32	07:08	07:27	06:36		18:38 (D03)	05:55	19:23 (D02)	05:36	05:46	06:13	19:24 (D02)	06:44	18:44 (D03)	07:14	06:50	07:22
	16:59	17:36	19:09	19:42	33	19:11 (D03)	20:13	6 19:29 (D02)	20:39	20:41	20:14	24 19:48 (D02)	19:26	12 18:56 (D03)	18:36	16:55	16:40
12	07:32	07:07	07:26	06:35		18:38 (D03)	05:54		05:36	05:46	06:14	19:24 (D02)	06:45		07:15	06:51	07:23
	17:00	17:37	19:10	19:43	33	19:11 (D03)	20:14		20:39	20:41	20:12	24 19:48 (D02)	19:25		18:35	16:54	16:40
13	07:31	07:05	07:24	06:33		18:38 (D03)	05:53		05:36	05:47	06:15	19:23 (D02)	06:46		07:16	06:52	07:23
	17:01	17:38	19:11	19:44	32	19:10 (D03)	20:15		20:40	20:40	20:11	24 19:47 (D02)	19:23		18:33	16:53	16:40
14	07:31	07:04	07:22	06:32		18:38 (D03)	05:52		05:36	05:48	06:16	19:23 (D02)	06:47		07:17	06:53	07:24
	17:02	17:39	19:12	19:45	32	19:10 (D03)	20:16		20:40	20:40	20:10	23 19:46 (D02)	19:21		18:32	16:52	16:40
15	07:31	07:03	07:21	06:30		18:38 (D03)	05:51		05:36	05:49	06:17	19:24 (D02)	06:48		07:19	06:54	07:25
	17:03	17:41	19:13	19:46	31	19:09 (D03)	20:17		20:41	20:39	20:08	20 19:44 (D02)	19:20		18:30	16:51	16:41
16	07:30	07:02	07:19	06:28		18:39 (D03)	05:50		05:36	05:49	06:18	19:24 (D02)	06:49		07:20	06:56	07:26
	17:04	17:42	19:14	19:47	29	19:08 (D03)	20:18		20:41	20:39	20:07	19 19:43 (D02)	19:18		18:28	16:50	16:41
17	07:30	07:00	07:17	06:27		18:39 (D03)	05:49		05:36	05:50	06:19	19:25 (D02)	06:50		07:21	06:57	07:26
	17:05	17:43	19:15	19:48	28	19:07 (D03)	20:19		20:41	20:38	20:06	17 19:42 (D02)	19:16		18:27	16:49	16:41
18	07:29	06:59	07:16	06:25		18:40 (D03)	05:48		05:36	05:51	06:20	19:25 (D02)	06:51		07:22	06:58	07:27
	17:07	17:44	19:16	19:49	26	19:06 (D03)	20:20		20:42	20:37	20:04	15 19:40 (D02)	19:15		18:25	16:48	16:41
19	07:29	06:58	07:14	06:24		18:41 (D03)	05:47		05:36	05:52	06:21	19:27 (D02)	06:52		07:23	06:59	07:28
	17:08	17:46	19:17	19:50	23	19:04 (D03)	20:21		20:42	20:37	20:03	12 19:39 (D02)	19:13		18:24	16:48	16:42
20	07:28	06:56	07:12	06:22		18:42 (D03)	05:47		05:36	05:53	06:22	19:29 (D02)	06:53		07:24	07:00	07:28
	17:09	17:47	19:18	19:51	21	19:03 (D03)	20:22		20:42	20:36	20:01	9 19:38 (D02)	19:11		18:22	16:47	16:42
21	07:28	06:55	07:11	06:21		18:44 (D03)	05:46		05:36	05:54	06:23	18:51 (D03)	06:54		07:25	07:01	07:29
	17:10	17:48	19:19	19:52	16	19:00 (D03)	20:23		20:43	20:35	20:00	12 19:03 (D03)	19:10		18:21	16:46	16:43
22	07:27	06:53	07:09	06:19		18:47 (D03)	05:45		05:36	05:54	06:24	18:48 (D03)	06:55		07:26	07:03	07:29
	17:11	17:49	19:21	19:53	13	19:30 (D02)	20:24		20:43	20:35	19:58	17 19:05 (D03)	19:08		18:20	16:46	16:43
23	07:26	06:52	07:07	06:18		19:22 (D02)	05:44		05:37	05:55	06:25	18:46 (D03)	06:56		07:27	07:04	07:30
	17:12	17:50	19:22	19:54	10	19:32 (D02)	20:25		20:43	20:34	19:57	21 19:07 (D03)	19:06		18:18	16:45	16:43
24	07:26	06:50	07:06	06:17		19:21 (D02)	05:43		05:37	05:56	06:26	18:44 (D03)	06:57		07:29	07:05	07:30
	17:14	17:51	19:23	19:55	13	19:34 (D02)	20:26		20:43	20:33	19:55	24 19:08 (D03)	19:04		18:17	16:44	16:44
25	07:25	06:49	07:04	06:15		19:19 (D02)	05:43		05:37	05:57	06:27	18:43 (D03)	06:58		07:30	07:06	07:30
	17:15	17:53	19:24	19:56	16	19:35 (D02)	20:26		20:43	20:32	19:54	26 19:09 (D03)	19:03		18:15	16:44	16:45
26	07:24	06:48	07:02	06:14		19:18 (D02)	05:42		05:38	05:58	06:28	18:42 (D03)	06:59		07:31	07:07	07:31
	17:16	17:54	19:25	19:57	17	19:35 (D02)	20:27		20:44	20:31	19:52	28 19:10 (D03)	19:01		18:14	16:43	16:45
27	07:23	06:46	07:01	06:12		19:17 (D02)	05:41		05:38	05:59	06:29	18:41 (D03)	07:00		07:32	07:08	07:31
	17:17	17:55	19:26	19:58	20	19:37 (D02)	20:28		20:44	20:30	19:51	29 19:10 (D03)	18:59		18:13	16:43	16:46
28	07:22	06:45	06:59	06:11		19:17 (D02)	05:41		05:38	06:00	06:30	18:40 (D03)	07:01		07:33	07:09	07:32
	17:18	17:56	19:27	20:00	21	19:38 (D02)	20:29		20:44	20:29	19:49	31 19:11 (D03)	18:58		18:11	16:42	16:46
29	07:22		06:57	06:10		19:15 (D02)	05:40		05:39	06:01	06:31	18:39 (D03)	07:02		07:34	07:10	07:32
	17:20		19:28	20:01	23	19:38 (D02)	20:30		20:44	20:28	19:48	32 19:11 (D03)	18:56		18:10	16:42	16:47
30	07:21		06:56	06:08		19:15 (D02)	05:40		05:39	06:02	06:32	18:39 (D03)	07:03		07:35	07:11	07:32
	17:21		19:29	20:02	24	19:39 (D02)	20:31		20:44	20:27	19:46	32 19:11 (D03)	18:54		18:09	16:42	16:48
31	07:20		06:54				05:39			06:03	06:33	18:38 (D03)			07:37		07:32
	17:22		19:30				20:31			20:26	19:44	33 19:11 (D03)			18:07		16:49
Potential sun hours	298	297	369	398			448	452	458	428		375		346	298	288	
Total, worst case					720		206				638		295				
Sun reduction					0.82		0.92				0.96		0.93				
Oper. time red.					1.00		1.00				1.00		1.00				
Wind dir. red.					0.61		0.53				0.58		0.63				
Total reduction					0.50		0.49				0.55		0.59				
Total, real					362		101				353		174				

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)

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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 11 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (86)

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	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	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	19:40	20:11	20:38	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	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40
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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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
	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	17:14	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	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	07:31
	17:15	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
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
	17:16	17:54	19:25	19:57	20:27	20:44	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	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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
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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 12 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (87)

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	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	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	19:40	20:11	20:38	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	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40
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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41
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	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	17:14	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	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	07:31
	17:15	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
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
	17:16	17:54	19:25	19:57	20:27	20:44	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	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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)

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Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 13 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (88)

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	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06	16:41
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	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
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	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	19:40	20:11	20:38	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	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40
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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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
	17:09	17:47	19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	16:42
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	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29
	17:11	17:49	19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:20	16:46	16:43
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	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
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	17:16	17:54	19:25	19:57	20:27	20:44	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
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28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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
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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 14 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (89)

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 18:28 (D03)	06:07	05:39	05:40	06:04	06:34 18:27 (D03)	07:04	06:38	07:12
	16:50	17:23	17:57	19:31 32 19:00 (D03)	20:03	20:32	20:44	20:25	19:43 25 18:52 (D03)	18:53	18:06	16:41
2	07:33	07:18	06:41	06:51 18:27 (D03)	06:06	05:38	05:40	06:05	06:35 18:26 (D03)	07:05	06:39	07:13
	16:50	17:25	17:58	19:32 33 19:00 (D03)	20:04	20:33	20:44	20:24	19:41 27 18:53 (D03)	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49 18:26 (D03)	06:05	05:38	05:41	06:05	06:36 18:24 (D03)	07:06	06:40	07:14
	16:51	17:26	18:00	19:33 33 18:59 (D03)	20:05	20:34	20:43	20:23	19:40 29 18:53 (D03)	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48 18:26 (D03)	06:03	05:38	05:41	06:06	06:37 18:23 (D03)	07:07	06:41	07:15
	16:52	17:27	18:01	19:34 34 19:00 (D03)	20:06	20:34	20:43	20:22	19:38 31 18:54 (D03)	18:48	17:02	16:40
5	07:33	07:15	06:37	06:46 18:26 (D03)	06:02	05:37	05:42	06:07	06:38 18:22 (D03)	07:08	06:43	07:16
	16:53	17:28	18:02	19:35 33 18:59 (D03)	20:07	20:35	20:43	20:21	19:36 32 18:54 (D03)	18:46	17:01	16:40
6	07:33	07:14	06:35	06:44 18:26 (D03)	06:01	05:37	05:42	06:08	06:39 18:22 (D03)	07:09	06:44	07:17
	16:54	17:30	18:03	19:36 32 18:58 (D03)	20:08	20:36	20:43	20:20	19:35 32 18:54 (D03)	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43 18:26 (D03)	06:00	05:37	05:43	06:09	06:40 18:21 (D03)	07:10	06:45	07:18
	16:55	17:31	18:04	19:37 32 18:58 (D03)	20:09	20:36	20:43	20:19	19:33 33 18:54 (D03)	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41 18:26 (D03)	05:59	05:36	05:44	06:10	06:41 18:21 (D03)	07:11	06:46	07:19
	16:56	17:32	19:05	19:38 31 18:57 (D03)	20:10	20:37	20:42	20:17	19:31 33 18:54 (D03)	18:41	16:58	16:40
9	07:32	07:10	07:30	06:39 18:26 (D03)	05:57	05:36	05:44	06:11	06:42 18:20 (D03)	07:12	06:47	07:20
	16:57	17:33	19:06	19:40 29 18:55 (D03)	20:11	20:38	20:42	20:16	19:30 34 18:54 (D03)	18:39	16:57	16:40
10	07:32	07:09	07:29	06:38 18:28 (D03)	05:56	05:36	05:45	06:12	06:43 18:20 (D03)	07:13	06:48	07:21
	16:58	17:35	19:07	19:41 27 18:55 (D03)	20:12	20:38	20:42	20:15	19:28 33 18:53 (D03)	18:38	16:56	16:40
11	07:32	07:08	07:27	06:36 18:28 (D03)	05:55	05:36	05:46	06:13	06:44 18:20 (D03)	07:14	06:50	07:22
	16:59	17:36	19:09	19:42 25 18:53 (D03)	20:13	20:39	20:41	20:14	19:26 32 18:52 (D03)	18:36	16:55	16:40
12	07:32	07:07	07:26	06:35 18:30 (D03)	05:54	05:36	05:46	06:14	06:45 18:20 (D03)	07:15	06:51	07:23
	17:00	17:37	19:10	19:43 21 18:51 (D03)	20:14	20:39	20:41	20:12	19:25 32 18:52 (D03)	18:35	16:54	16:40
13	07:31	07:05	07:24	06:33 18:31 (D03)	05:53	05:36	05:47	06:15	06:46 18:20 (D03)	07:16	06:52	07:23
	17:01	17:38	19:11	19:44 18 18:49 (D03)	20:15	20:40	20:40	20:11	19:23 31 18:51 (D03)	18:33	16:53	16:40
14	07:31	07:04	07:22	06:32 18:34 (D03)	05:52	05:36	05:48	06:16	06:47 18:21 (D03)	07:17	06:53	07:24
	17:02	17:39	19:12	19:45 12 18:46 (D03)	20:16	20:40	20:40	20:10	19:21 29 18:50 (D03)	18:32	16:52	16:40
15	07:31	07:03	07:21	06:30	05:51	05:36	05:49	06:17	06:48 18:21 (D03)	07:19	06:54	07:25
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20 27 18:48 (D03)	18:30	16:51	16:41
16	07:30	07:02	07:19	06:28	05:50	05:36	05:49	06:18	06:49 18:22 (D03)	07:20	06:56	07:26
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18 25 18:47 (D03)	18:28	16:50	16:41
17	07:30	07:00	07:17	06:27	05:49	05:36	05:50	06:19	06:50 18:24 (D03)	07:21	06:57	07:26
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	19:16 21 18:45 (D03)	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 18:26 (D03)	07:22	06:58	07:27
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15 16 18:42 (D03)	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52 18:28 (D03)	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13 9 18:37 (D03)	18:24	16:48	16:42
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
	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
24	07:26	06:50	07:06 18:43 (D03)	06:17	05:43	05:37	05:56	06:26	06:57	07:29	07:05	07:30
	17:14	17:51	19:23 6 18:49 (D03)	19:55	20:26	20:43	20:33	19:55	19:04	18:17	16:44	16:44
25	07:25	06:49	07:04 18:38 (D03)	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06	07:31
	17:15	17:53	19:24 15 18:53 (D03)	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
26	07:24	06:48	07:02 18:35 (D03)	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07	07:31
	17:16	17:54	19:25 20 18:55 (D03)	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43	16:45
27	07:23	06:46	07:01 18:33 (D03)	06:12	05:41	05:38	05:59	06:29	07:00	07:32	07:08	07:31
	17:17	17:55	19:26 24 18:57 (D03)	19:58	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59 18:31 (D03)	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27 27 18:58 (D03)	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57 18:30 (D03)	06:10	05:40	05:39	06:01	06:31 18:35 (D03)	07:02	07:34	07:10	07:32
	17:20		19:28 28 18:58 (D03)	20:01	20:30	20:44	20:28	19:48 12 18:47 (D03)	18:56	18:10	16:42	16:47
30	07:21		06:56 18:29 (D03)	06:08	05:40	05:39	06:02	06:32 18:32 (D03)	07:03	07:35	07:11	07:32
	17:21		19:29 30 18:59 (D03)	20:02	20:31	20:44	20:27	19:46 18 18:50 (D03)	18:54	18:09	16:42	16:48
31	07:20		06:54 18:28 (D03)		05:39		06:03	06:33 18:30 (D03)		07:37		07:32
	17:22		19:30 31 18:59 (D03)		20:31		20:26	19:44 21 18:51 (D03)		18:07		16:49
Potential sun hours	298	297	369	398	448	452	458	428	375	346	298	288
Total, worst case			181	392				51	531			
Sun reduction			0.73	0.82				0.96	0.93			
Oper. time red.			1.00	1.00				1.00	1.00			
Wind dir. red.			0.67	0.67				0.67	0.67			
Total reduction			0.49	0.55				0.65	0.63			
Total, real			89	217				33	333			

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)

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Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 15 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (90)

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	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	06:10	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:39	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	19:40	20:11	20:38	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	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40
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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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
	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	17:14	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	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	07:31
	17:15	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
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
	17:16	17:54	19:25	19:57	20:27	20:44	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	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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)

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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com

Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 16 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (91)

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	18:13 (D03)	06:07	05:39	05:40	06:04	06:34	19:09 (D02)	07:04	06:38	07:12
	16:50	17:23	17:57	19:31 (29)	18:42 (D03)	20:03	20:32	20:44	20:25	19:43 (4)	19:13 (D02)	18:53	18:06	16:41
2	07:33	07:18	06:41	06:51	18:13 (D03)	06:06	05:38	05:40	06:05	06:35		07:05	06:39	07:13
	16:50	17:25	17:58	19:32 (28)	18:41 (D03)	20:04	20:33	20:44	20:24	19:41		18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	18:14 (D03)	06:05	05:38	05:41	06:05	06:36		07:06	06:40	07:14
	16:51	17:26	18:00	19:33 (25)	18:39 (D03)	20:05	20:34	20:43	20:23	19:40		18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	18:16 (D03)	06:03	05:38	05:41	06:06	06:37		07:07	06:41	07:15
	16:52	17:27	18:01	19:34 (21)	18:37 (D03)	20:06	20:34	20:43	20:22	19:38		18:48	17:02	16:40
5	07:33	07:15	06:37	06:46	18:18 (D03)	06:02	05:37	05:42	06:07	06:38		07:08	06:43	07:16
	16:53	17:28	18:02	19:35 (16)	18:34 (D03)	20:07	20:35	20:43	20:21	19:36		18:46	17:01	16:40
6	07:33	07:14	06:35	06:44	18:21 (D03)	06:01	05:37	05:42	06:08	06:39	18:17 (D03)	07:09	06:44	07:17
	16:54	17:30	18:03	19:36 (9)	18:30 (D03)	20:08	20:36	20:43	20:20	19:35 (8)	18:25 (D03)	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43		06:00	05:37	05:43	06:09	06:40	18:13 (D03)	07:10	06:45	07:18
	16:55	17:31	18:04	19:37		20:09	20:36	20:43	20:19	19:33 (16)	18:29 (D03)	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41		05:59	05:36	05:44	06:10	06:41	18:10 (D03)	07:11	06:46	07:19
	16:56	17:32	19:05	19:38		20:10	20:37	20:42	20:17	19:31 (21)	18:31 (D03)	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	18:08 (D03)	07:12	06:47	07:20
	16:57	17:33	19:06	19:40		20:11	20:38	20:42	20:16	19:30 (25)	18:33 (D03)	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	18:06 (D03)	07:13	06:48	07:21
	16:58	17:35	19:07	19:41		20:12	20:38	20:42	20:15	19:28 (28)	18:34 (D03)	18:38	16:56	16:40
11	07:32	07:08	07:27	06:36	19:10 (D02)	05:55	05:36	05:46	06:13	06:44	18:05 (D03)	07:14	06:50	07:22
	16:59	17:36	19:09	19:42 (4)	19:14 (D02)	20:13	20:39	20:41	20:14	19:26 (29)	18:34 (D03)	18:36	16:55	16:40
12	07:32	07:07	07:26	06:35	19:06 (D02)	05:54	05:36	05:46	06:14	06:45	18:04 (D03)	07:15	06:51	07:23
	17:00	17:37	19:10	19:43 (12)	19:18 (D02)	20:14	20:39	20:41	20:12	19:25 (31)	18:35 (D03)	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	19:03 (D02)	05:53	05:36	05:47	06:15	06:46	18:03 (D03)	07:16	06:52	07:23
	17:01	17:38	19:11	19:44 (17)	19:20 (D02)	20:15	20:40	20:40	20:11	19:23 (32)	18:35 (D03)	18:33	16:53	16:40
14	07:31	07:04	07:22	06:32	19:02 (D02)	05:52	05:36	05:48	06:16 (19:11 (D02))	06:47	18:02 (D03)	07:17	06:53	07:24
	17:02	17:39	19:12	19:45 (20)	19:22 (D02)	20:16	20:40	20:40	20:10 (10) 19:21 (D02)	19:21 (34)	18:36 (D03)	18:32	16:52	16:40
15	07:31	07:03	07:21	18:27 (D03) 06:30	19:00 (D02)	05:51	05:36	05:49	06:17 19:08 (D02)	06:48	18:01 (D03)	07:19	06:54	07:25
	17:03	17:41	19:13 (10)	18:37 (D03) 19:46 (22)	19:22 (D02)	20:17	20:41	20:39	20:08 (15) 19:23 (D02)	19:20 (35)	18:36 (D03)	18:30	16:51	16:41
16	07:30	07:02	07:19	18:22 (D03) 06:28	18:59 (D02)	05:50	05:36	05:49	06:18 19:07 (D02)	06:49	18:00 (D03)	07:20	06:56	07:26
	17:04	17:42	19:14 (18)	18:40 (D03) 19:47 (24)	19:23 (D02)	20:18	20:41	20:39	20:07 (17) 19:24 (D02)	19:18 (36)	18:36 (D03)	18:28	16:50	16:41
17	07:30	07:00	07:17	18:21 (D03) 06:27	18:58 (D02)	05:49	05:36	05:50	06:19 19:05 (D02)	06:50	18:00 (D03)	07:21	06:57	07:26
	17:05	17:43	19:15 (22)	18:43 (D03) 19:48 (25)	19:23 (D02)	20:19	20:41	20:38	20:06 (20) 19:25 (D02)	19:16 (35)	18:35 (D03)	18:27	16:49	16:41
18	07:29	06:59	07:16	18:18 (D03) 06:25	18:58 (D02)	05:48	05:36	05:51	06:20 19:04 (D02)	06:51	17:59 (D03)	07:22	06:58	07:27
	17:07	17:44	19:16 (26)	18:44 (D03) 19:49 (25)	19:23 (D02)	20:20	20:42	20:37	20:04 (22) 19:26 (D02)	19:15 (36)	18:35 (D03)	18:25	16:48	16:41
19	07:29	06:58	07:14	18:16 (D03) 06:24	18:57 (D02)	05:47	05:36	05:52	06:21 19:03 (D02)	06:52	17:58 (D03)	07:23	06:59	07:28
	17:08	17:46	19:17 (29)	18:45 (D03) 19:50 (26)	19:23 (D02)	20:21	20:42	20:37	20:03 (24) 19:27 (D02)	19:13 (35)	18:33 (D03)	18:24	16:48	16:42
20	07:28	06:56	07:12	18:16 (D03) 06:22	18:57 (D02)	05:47	05:36	05:53	06:22 19:02 (D02)	06:53	17:58 (D03)	07:24	07:00	07:28
	17:09	17:47	19:18 (30)	18:46 (D03) 19:51 (26)	19:23 (D02)	20:22	20:42	20:36	20:01 (25) 19:27 (D02)	19:11 (35)	18:33 (D03)	18:22	16:47	16:42
21	07:28	06:55	07:11	18:14 (D03) 06:21	18:57 (D02)	05:46	05:36	05:54	06:23 19:02 (D02)	06:54	17:58 (D03)	07:25	07:01	07:29
	17:10	17:48	19:19 (32)	18:46 (D03) 19:52 (25)	19:22 (D02)	20:23	20:43	20:35	20:00 (25) 19:27 (D02)	19:10 (34)	18:32 (D03)	18:21	16:46	16:43
22	07:27	06:53	07:09	18:13 (D03) 06:19	18:57 (D02)	05:45	05:36	05:54	06:24 19:01 (D02)	06:55	17:58 (D03)	07:26	07:03	07:29
	17:11	17:49	19:21 (34)	18:47 (D03) 19:53 (25)	19:22 (D02)	20:24	20:43	20:35	19:58 (26) 19:27 (D02)	19:08 (33)	18:31 (D03)	18:20	16:46	16:43
23	07:26	06:52	07:07	18:13 (D03) 06:18	18:57 (D02)	05:44	05:37	05:55	06:25 19:01 (D02)	06:56	17:59 (D03)	07:27	07:04	07:30
	17:12	17:50	19:22 (34)	18:47 (D03) 19:54 (24)	19:21 (D02)	20:25	20:43	20:34	19:57 (26) 19:27 (D02)	19:06 (31)	18:30 (D03)	18:18	16:45	16:43
24	07:26	06:50	07:06	18:12 (D03) 06:17	18:57 (D02)	05:43	05:37	05:56	06:26 19:01 (D02)	06:57	17:59 (D03)	07:29	07:05	07:30
	17:14	17:51	19:23 (35)	18:47 (D03) 19:55 (24)	19:21 (D02)	20:26	20:43	20:33	19:55 (26) 19:27 (D02)	19:04 (30)	18:29 (D03)	18:17	16:44	16:44
25	07:25	06:49	07:04	18:11 (D03) 06:15	18:58 (D02)	05:43	05:37	05:57	06:27 19:01 (D02)	06:58	18:00 (D03)	07:30	07:06	07:31
	17:15	17:53	19:24 (36)	18:47 (D03) 19:56 (22)	19:20 (D02)	20:26	20:43	20:32	19:54 (25) 19:26 (D02)	19:03 (27)	18:27 (D03)	18:15	16:44	16:45
26	07:24	06:48	07:02	18:10 (D03) 06:14	18:59 (D02)	05:42	05:38	05:58	06:28 19:01 (D02)	06:59	18:01 (D03)	07:31	07:07	07:31
	17:16	17:54	19:25 (36)	18:46 (D03) 19:57 (19)	19:18 (D02)	20:27	20:44	20:31	19:52 (25) 19:26 (D02)	19:01 (24)	18:25 (D03)	18:14	16:43	16:45
27	07:23	06:46	07:01	18:11 (D03) 06:12	19:00 (D02)	05:41	05:38	05:59	06:29 19:01 (D02)	07:00	18:03 (D03)	07:32	07:08	07:31
	17:17	17:55	19:26 (35)	18:46 (D03) 19:59 (17)	19:17 (D02)	20:28	20:44	20:30	19:51 (24) 19:25 (D02)	18:59 (20)	18:23 (D03)	18:13	16:43	16:46
28	07:22	06:45	06:59	18:11 (D03) 06:11	19:02 (D02)	05:41	05:38	06:00	06:30 19:02 (D02)	07:01	18:06 (D03)	07:33	07:09	07:32
	17:18	17:56	19:27 (34)	18:45 (D03) 20:00 (14)	19:16 (D02)	20:29	20:44	20:29	19:49 (22) 19:24 (D02)	18:58 (13)	18:19 (D03)	18:11	16:42	16:46
29	07:22		06:57	18:10 (D03) 06:10	19:04 (D02)	05:40	05:39	06:01	06:31 19:03 (D02)	07:02		07:34	07:10	07:32
	17:20		19:28 (34)	18:44 (D03) 20:01 (8)	19:12 (D02)	20:30	20:44	20:28	19:48 (19) 19:22 (D02)	18:56		18:10	16:42	16:47
30	07:21		06:56	18:11 (D03) 06:08		05:40	05:39	06:02	06:32 19:04 (D02)	07:03		07:35	07:11	07:32
	17:21		19:29 (33)	18:44 (D03) 20:02		20:31	20:44	20:27	19:46 (17) 19:21 (D02)	18:54		18:09	16:42	16:48
31	07:20		06:54	18:11 (D03)		05:39		06:03	06:33 19:06 (D02)			07:37		07:32
	17:22		19:30 (32)	18:43 (D03)		20:31		20:26	19:45 (12) 19:18 (D02)			18:07		16:49
Potential sun hours	298	297	369	398	448	452	458	428	375	346	298	288
Total, worst case			510	507				380	652			
Sun reduction			0.73	0.82				0.96	0.93			
Oper. time red.			1.00	1.00				1.00	1.00			
Wind dir. red.			0.72	0.61				0.58	0.72			
Total reduction			0.53	0.50				0.56	0.67			
Total, real			269	256				211	438			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 17 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (92)

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		18:27 (D03)	06:07	05:39	05:40	06:04	06:34			07:04	06:38	07:12
	16:50	17:23	17:57			19:31	30	18:57 (D03)	20:03	20:32	20:44	20:25	19:43			18:53	18:06	16:41
2	07:33	07:18	06:41			06:51		18:27 (D03)	06:06	05:38	05:40	06:05	06:35			07:05	06:39	07:13
	16:50	17:25	17:58			19:32	30	18:57 (D03)	20:04	20:33	20:44	20:24	19:41			18:51	17:05	16:41
3	07:33	07:17	06:40			06:49		18:27 (D03)	06:05	05:38	05:41	06:05	06:36		18:31 (D03)	07:06	06:40	07:14
	16:51	17:26	18:00			19:33	29	18:56 (D03)	20:05	20:34	20:43	20:23	19:40	12	18:43 (D03)	18:49	17:04	16:41
4	07:33	07:16	06:38			06:48		18:28 (D03)	06:03	05:38	05:41	06:06	06:37		18:29 (D03)	07:07	06:41	07:15
	16:52	17:27	18:01			19:34	27	18:55 (D03)	20:06	20:34	20:43	20:22	19:38	17	18:46 (D03)	18:48	17:02	16:40
5	07:33	07:15	06:37			06:46		18:28 (D03)	06:02	05:37	05:42	06:07	06:38		18:26 (D03)	07:08	06:43	07:16
	16:53	17:28	18:02			19:35	26	18:54 (D03)	20:07	20:35	20:43	20:21	19:36	21	18:47 (D03)	18:46	17:01	16:40
6	07:33	07:14	06:35			06:44		18:29 (D03)	06:01	05:37	05:42	06:08	06:39		18:25 (D03)	07:09	06:44	07:17
	16:54	17:30	18:03			19:36	23	18:52 (D03)	20:08	20:36	20:43	20:20	19:35	23	18:48 (D03)	18:44	17:00	16:40
7	07:33	07:13	06:34			06:43		18:30 (D03)	06:00	05:37	05:43	06:09	06:40		18:23 (D03)	07:10	06:45	07:18
	16:55	17:31	18:04			19:37	21	18:51 (D03)	20:09	20:36	20:43	20:19	19:33	26	18:49 (D03)	18:43	16:59	16:40
8	07:32	07:12	07:32			06:41		18:32 (D03)	05:59	05:36	05:44	06:10	06:41		18:22 (D03)	07:11	06:46	07:19
	16:56	17:32	19:05			19:38	17	18:49 (D03)	20:10	20:37	20:42	20:17	19:31	27	18:49 (D03)	18:41	16:58	16:40
9	07:32	07:10	07:30			06:39		18:33 (D03)	05:57	05:36	05:44	06:11	06:42		18:21 (D03)	07:12	06:47	07:20
	16:57	17:33	19:06			19:40	12	18:45 (D03)	20:11	20:38	20:42	20:16	19:30	29	18:50 (D03)	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		18:21 (D03)	07:13	06:48	07:21
	16:58	17:35	19:07			19:41			20:12	20:38	20:42	20:15	19:28	29	18:50 (D03)	18:38	16:56	16:40
11	07:32	07:08	07:27			06:36			05:55	05:36	05:46	06:13	06:44		18:20 (D03)	07:14	06:50	07:22
	16:59	17:36	19:09			19:42			20:13	20:39	20:41	20:14	19:26	30	18:50 (D03)	18:36	16:55	16:40
12	07:32	07:07	07:26			06:35			05:54	05:36	05:46	06:14	06:45		18:20 (D03)	07:15	06:51	07:23
	17:00	17:37	19:10			19:43			20:14	20:39	20:41	20:12	19:25	30	18:50 (D03)	18:35	16:54	16:40
13	07:31	07:05	07:24			06:33			05:53	05:36	05:47	06:15	06:46		18:19 (D03)	07:16	06:52	07:23
	17:01	17:38	19:11			19:44			20:15	20:40	20:40	20:11	19:23	30	18:49 (D03)	18:33	16:53	16:40
14	07:31	07:04	07:22			06:32			05:52	05:36	05:48	06:16	06:47		18:19 (D03)	07:17	06:53	07:24
	17:02	17:39	19:12			19:45			20:16	20:40	20:40	20:10	19:21	30	18:49 (D03)	18:32	16:52	16:40
15	07:31	07:03	07:21			06:30			05:51	05:36	05:49	06:17	06:48		18:19 (D03)	07:19	06:54	07:25
	17:03	17:41	19:13			19:46			20:17	20:41	20:39	20:08	19:20	29	18:48 (D03)	18:30	16:51	16:41
16	07:30	07:02	07:19			06:28			05:50	05:36	05:49	06:18	06:49		18:19 (D03)	07:20	06:56	07:26
	17:04	17:42	19:14			19:47			20:18	20:41	20:39	20:07	19:18	28	18:47 (D03)	18:28	16:50	16:41
17	07:30	07:00	07:17			06:27			05:49	05:36	05:50	06:19	06:50		18:20 (D03)	07:21	06:57	07:26
	17:05	17:43	19:15			19:48			20:19	20:41	20:38	20:06	19:16	26	18:46 (D03)	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		18:20 (D03)	07:22	06:58	07:27
	17:07	17:44	19:16			19:49			20:20	20:42	20:37	20:04	19:15	25	18:45 (D03)	18:25	16:48	16:41
19	07:29	06:58	07:14			06:24			05:47	05:36	05:52	06:21	06:52		18:20 (D03)	07:23	06:59	07:28
	17:08	17:46	19:17			19:50			20:21	20:42	20:37	20:03	19:13	22	18:42 (D03)	18:24	16:48	16:42
20	07:28	06:56	07:12			06:22			05:47	05:36	05:53	06:22	06:53		18:22 (D03)	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	18:40 (D03)	18:22	16:47	16:42
21	07:28	06:55	07:11			06:21			05:46	05:36	05:53	06:23	06:54		18:24 (D03)	07:25	07:01	07:29
	17:10	17:48	19:19			19:52			20:23	20:43	20:35	20:00	19:10	13	18:37 (D03)	18:21	16:46	16:42
22	07:27	06:53	07:09		18:40 (D03)	06:19			05:45	05:36	05:54	06:24	06:55			07:26	07:03	07:29
	17:11	17:49	19:21	10	18:50 (D03)	19:53			20:24	20:43	20:35	19:58	19:08			18:19	16:46	16:43
23	07:26	06:52	07:07		18:37 (D03)	06:18			05:44	05:37	05:55	06:25	06:56			07:27	07:04	07:30
	17:12	17:50	19:22	17	18:54 (D03)	19:54			20:25	20:43	20:34	19:57	19:06			18:18	16:45	16:43
24	07:26	06:50	07:06		18:34 (D03)	06:17			05:43	05:37	05:56	06:26	06:57			07:29	07:05	07:30
	17:14	17:51	19:23	21	18:55 (D03)	19:55			20:26	20:43	20:33	19:55	19:04			18:17	16:44	16:44
25	07:25	06:49	07:04		18:32 (D03)	06:15			05:43	05:37	05:57	06:27	06:58			07:30	07:06	07:30
	17:15	17:53	19:24	24	18:56 (D03)	19:56			20:26	20:43	20:32	19:54	19:03			18:15	16:44	16:45
26	07:24	06:48	07:02		18:31 (D03)	06:14			05:42	05:38	05:58	06:28	06:59			07:31	07:07	07:31
	17:16	17:54	19:25	25	18:56 (D03)	19:57			20:27	20:44	20:31	19:52	19:01			18:14	16:43	16:45
27	07:23	06:46	07:01		18:30 (D03)	06:12			05:41	05:38	05:59	06:29	07:00			07:32	07:08	07:31
	17:17	17:55	19:26	28	18:58 (D03)	19:58			20:28	20:44	20:30	19:51	18:59			18:12	16:43	16:46
28	07:22	06:45	06:59		18:29 (D03)	06:11			05:41	05:38	06:00	06:30	07:01			07:33	07:09	07:32
	17:18	17:56	19:27	29	18:58 (D03)	20:00			20:29	20:44	20:29	19:49	18:58			18:11	16:42	16:46
29	07:22		06:57		18:28 (D03)	06:10			05:40	05:39	06:01	06:31	07:02			07:34	07:10	07:32
	17:20		19:28	29	18:57 (D03)	20:01			20:30	20:44	20:28	19:48	18:56			18:10	16:42	16:47
30	07:21		06:56		18:28 (D03)	06:08			05:40	05:39	06:02	06:32	07:03			07:35	07:11	07:32
	17:21		19:29	30	18:58 (D03)	20:02			20:31	20:44	20:27	19:46	18:54			18:09	16:42	16:48
31	07:20		06:54		18:27 (D03)				05:39		06:03	06:33				07:37		07:32
	17:22		19:30	30	18:57 (D03)				20:31		20:26	19:44				18:07		16:49
Potential sun hours	298	297	369			398			448	452	458	428	375			346	298	288
Total, worst case				243			215							465				
Sun reduction				0.73			0.82							0.93				
Oper. time red.				1.00			1.00							1.00				
Wind dir. red.				0.69			0.69							0.69				
Total reduction				0.50			0.56							0.64				
Total, real				122			121							297				

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 18 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (93)

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	18:18 (D03)	06:07	05:39	05:40	06:04		06:34	18:56 (D02)	07:04	18:00 (D03)	06:38	07:12
	16:50	17:23	17:57		19:31	11 18:29 (D03)	20:03	20:32	20:44	20:25		19:43	20 19:16 (D02)	18:53	16 18:16 (D03)	18:06	16:41
2	07:33	07:18	06:41		06:51		06:06	05:38	05:40	06:05		06:35	18:57 (D02)	07:05	18:03 (D03)	06:39	07:13
	16:50	17:25	17:58		19:32		20:04	20:33	20:44	20:24		19:41	18 19:15 (D02)	18:51	8 18:11 (D03)	17:05	16:41
3	07:33	07:17	06:40		06:49		06:05	05:38	05:41	06:05		06:36	18:58 (D02)	07:06		06:40	07:14
	16:51	17:26	18:00		19:33		20:05	20:34	20:43	20:23		19:40	15 19:13 (D02)	18:49		17:04	16:41
4	07:33	07:16	06:38		06:48		06:03	05:38	05:41	06:06		06:37	19:00 (D02)	07:07		06:41	07:15
	16:52	17:27	18:01		19:34		20:06	20:34	20:43	20:22		19:38	11 19:11 (D02)	18:48		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		06:43	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	07:33	07:14	06:35		06:44		06:01	05:37	05:42	06:08		06:39		07:09		06:44	07:17
	16:54	17:30	18:03		19:36		20:08	20:36	20:43	20:20		19:35		18:44		17:00	16:40
7	07:33	07:13	06:34		06:43		06:00	05:37	05:43	06:09		06:40		07:10		06:45	07:18
	16:55	17:31	18:04		19:37		20:09	20:36	20:43	20:19		19:33		18:43		16:59	16:40
8	07:32	07:12	07:32		06:41	19:03 (D02)	05:59	05:36	05:44	06:10		06:41		07:11		06:46	07:19
	16:56	17:32	19:05		19:38	10 19:13 (D02)	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	19:00 (D02)	05:57	05:36	05:44	06:11		06:42		07:12		06:47	07:20
	16:57	17:33	19:06		19:40	15 19:15 (D02)	20:11	20:38	20:42	20:16		19:30		18:39		16:57	16:40
10	07:32	07:09	07:29		06:38	18:59 (D02)	05:56	05:36	05:45	06:12		06:43		07:13		06:48	07:21
	16:58	17:35	19:07		19:41	18 19:17 (D02)	20:12	20:38	20:42	20:15		19:28		18:38		16:56	16:40
11	07:32	07:08	07:27		06:36	18:57 (D02)	05:55	05:36	05:46	06:13		06:44	18:11 (D03)	07:14		06:50	07:22
	16:59	17:36	19:09		19:42	21 19:18 (D02)	20:13	20:39	20:41	20:14		19:26	10 18:21 (D03)	18:36		16:55	16:40
12	07:32	07:07	07:26	18:22 (D03)	06:35	18:56 (D02)	05:54	05:36	05:46	06:14		06:45	18:07 (D03)	07:15		06:51	07:23
	17:00	17:37	19:10	14 18:36 (D03)	19:43	23 19:19 (D02)	20:14	20:39	20:41	20:12		19:25	17 18:24 (D03)	18:35		16:54	16:40
13	07:31	07:06	07:24	18:19 (D03)	06:33	18:55 (D02)	05:53	05:36	05:47	06:15		06:46	18:05 (D03)	07:16		06:52	07:23
	17:01	17:38	19:11	19 18:38 (D03)	19:44	24 19:19 (D02)	20:15	20:40	20:40	20:11		19:23	21 18:26 (D03)	18:33		16:53	16:40
14	07:31	07:04	07:22	18:17 (D03)	06:32	18:55 (D02)	05:52	05:36	05:48	06:16		06:47	18:03 (D03)	07:17		06:53	07:24
	17:02	17:39	19:12	23 18:40 (D03)	19:45	24 19:19 (D02)	20:16	20:40	20:40	20:10		19:21	24 18:27 (D03)	18:32		16:52	16:40
15	07:31	07:03	07:21	18:15 (D03)	06:30	18:54 (D02)	05:51	05:36	05:49	06:17		06:48	18:01 (D03)	07:19		06:54	07:25
	17:03	17:41	19:13	26 18:41 (D03)	19:46	25 19:19 (D02)	20:17	20:41	20:39	20:08		19:20	27 18:28 (D03)	18:30		16:51	16:41
16	07:30	07:02	07:19	18:13 (D03)	06:28	18:54 (D02)	05:50	05:36	05:49	06:18		06:49	18:00 (D03)	07:20		06:56	07:26
	17:04	17:42	19:14	29 18:42 (D03)	19:47	25 19:19 (D02)	20:18	20:41	20:39	20:07		19:18	29 18:29 (D03)	18:28		16:50	16:41
17	07:30	07:00	07:17	18:13 (D03)	06:27	18:53 (D02)	05:49	05:36	05:50	06:19		06:50	17:59 (D03)	07:21		06:57	07:26
	17:05	17:43	19:15	30 18:43 (D03)	19:48	25 19:18 (D02)	20:19	20:41	20:38	20:06		19:16	30 18:29 (D03)	18:27		16:49	16:41
18	07:29	06:59	07:16	18:12 (D03)	06:25	18:54 (D02)	05:48	05:36	05:51	06:20		06:51	17:58 (D03)	07:22		06:58	07:27
	17:07	17:44	19:16	31 18:43 (D03)	19:49	24 19:18 (D02)	20:20	20:42	20:37	20:04		19:15	31 18:29 (D03)	18:25		16:48	16:41
19	07:29	06:58	07:14	18:10 (D03)	06:24	18:54 (D02)	05:47	05:36	05:52	06:21	19:05 (D02)	06:52	17:56 (D03)	07:23		06:59	07:28
	17:08	17:46	19:17	33 18:43 (D03)	19:50	23 19:17 (D02)	20:21	20:42	20:37	20:03	10 19:15 (D02)	19:13	32 18:28 (D03)	18:24		16:48	16:42
20	07:28	06:56	07:12	18:11 (D03)	06:22	18:55 (D02)	05:47	05:36	05:53	06:22	19:03 (D02)	06:53	17:55 (D03)	07:24		07:00	07:28
	17:09	17:47	19:18	33 18:44 (D03)	19:51	21 19:16 (D02)	20:22	20:42	20:36	20:01	14 19:17 (D02)	19:11	33 18:28 (D03)	18:22		16:47	16:42
21	07:28	06:55	07:11	18:10 (D03)	06:21	18:55 (D02)	05:46	05:36	05:54	06:23	19:01 (D02)	06:54	17:54 (D03)	07:25		07:01	07:29
	17:10	17:48	19:19	33 18:43 (D03)	19:52	20 19:15 (D02)	20:23	20:43	20:35	20:00	18 19:19 (D02)	19:10	34 18:28 (D03)	18:21		16:46	16:43
22	07:27	06:53	07:09	18:09 (D03)	06:19	18:56 (D02)	05:45	05:36	05:54	06:24	19:00 (D02)	06:55	17:54 (D03)	07:26		07:03	07:29
	17:11	17:49	19:21	34 18:43 (D03)	19:53	18 19:14 (D02)	20:24	20:43	20:35	19:58	20 19:20 (D02)	19:08	34 18:28 (D03)	18:20		16:46	16:43
23	07:26	06:52	07:07	18:10 (D03)	06:18	18:57 (D02)	05:44	05:37	05:55	06:25	18:58 (D02)	06:56	17:54 (D03)	07:27		07:04	07:30
	17:12	17:50	19:22	33 18:43 (D03)	19:54	14 19:11 (D02)	20:25	20:43	20:34	19:57	22 19:20 (D02)	19:06	33 18:27 (D03)	18:18		16:45	16:43
24	07:26	06:50	07:06	18:09 (D03)	06:17	19:00 (D02)	05:43	05:37	05:56	06:26	18:58 (D02)	06:57	17:54 (D03)	07:29		07:05	07:30
	17:14	17:51	19:23	33 18:42 (D03)	19:55	9 19:09 (D02)	20:26	20:43	20:33	19:55	23 19:21 (D02)	19:04	33 18:27 (D03)	18:17		16:44	16:44
25	07:25	06:49	07:04	18:09 (D03)	06:15		05:43	05:37	05:57	06:27	18:57 (D02)	06:58	17:54 (D03)	07:30		07:06	07:31
	17:15	17:53	19:24	32 18:41 (D03)	19:56		20:26	20:43	20:32	19:54	24 19:21 (D02)	19:03	32 18:26 (D03)	18:15		16:44	16:45
26	07:24	06:48	07:02	18:09 (D03)	06:14		05:42	05:38	05:58	06:28	18:56 (D02)	06:59	17:54 (D03)	07:31		07:07	07:31
	17:16	17:54	19:25	31 18:40 (D03)	19:57		20:27	20:44	20:31	19:52	25 19:21 (D02)	19:01	31 18:25 (D03)	18:14		16:43	16:45
27	07:23	06:46	07:01	18:10 (D03)	06:12		05:41	05:38	05:59	06:29	18:56 (D02)	07:00	17:55 (D03)	07:32		07:08	07:31
	17:17	17:55	19:26	30 18:40 (D03)	19:59		20:28	20:44	20:30	19:51	25 19:21 (D02)	18:59	29 18:24 (D03)	18:13		16:43	16:46
28	07:22	06:45	06:59	18:11 (D03)	06:11		05:41	05:38	06:00	06:30	18:56 (D02)	07:01	17:55 (D03)	07:33		07:09	07:32
	17:18	17:56	19:27	27 18:38 (D03)	20:00		20:29	20:44	20:29	19:49	25 19:21 (D02)	18:58	27 18:22 (D03)	18:11		16:42	16:46
29	07:22		06:57	18:11 (D03)	06:10		05:40	05:39	06:01	06:31	18:56 (D02)	07:02	17:56 (D03)	07:34		07:10	07:32
	17:20		19:28	25 18:36 (D03)	20:01		20:30	20:44	20:28	19:48	24 19:20 (D02)	18:56	24 18:20 (D03)	18:10		16:42	16:47
30	07:21		06:56	18:13 (D03)	06:08		05:40	05:39	06:02	06:32	18:56 (D02)	07:03	17:58 (D03)	07:35		07:11	07:32
	17:21		19:29	22 18:35 (D03)	20:02		20:31	20:44	20:27	19:46	23 19:19 (D02)	18:54	20 18:18 (D03)	18:09		16:42	16:48
31	07:20		06:54	18:15 (D03)			05:39		06:03	06:33	18:56 (D02)			07:37			07:32
	17:22		19:30	17 18:32 (D03)			20:31		20:26	19:45	23 19:19 (D02)			18:07			16:49
Potential sun hours	298	297	369		398		448	452	458	428		375		346		298	288
Total, worst case				555		350					276		615		24		
Sun reduction				0.73		0.82					0.96		0.93		0.84		
Oper. time red.				1.00		1.00					1.00		1.00		1.00		
Wind dir. red.				0.73		0.60					0.60		0.72		0.73		
Total reduction				0.54		0.50					0.58		0.67		0.62		
Total, real				299		173					159		413		15		

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 19 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (94)

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	18:07 (D03)	06:07	05:39	05:40	06:04	06:34	19:00 (D02)	07:04	17:51 (D03)	06:38	07:12
	16:50	17:23	17:57	19:31 23	18:30 (D03)	20:03	20:32	20:44	20:25	19:43 16	19:16 (D02)	18:53 24	18:15 (D03)	18:06	16:41
2	07:33	07:18	06:41	06:51	18:09 (D03)	06:06	05:38	05:40	06:05	06:35	19:02 (D02)	07:05	17:52 (D03)	06:39	07:13
	16:50	17:25	17:58	19:32 18	18:27 (D03)	20:04	20:33	20:44	20:24	19:41 11	19:13 (D02)	18:51 20	18:12 (D03)	17:05	16:41
3	07:33	07:17	06:40	06:49	18:12 (D03)	06:05	05:38	05:41	06:05	06:36		07:06	17:55 (D03)	06:40	07:14
	16:51	17:26	18:00	19:33 11	18:23 (D03)	20:05	20:34	20:43	20:23	19:40		18:49 13	18:08 (D03)	17:04	16:41
4	07:33	07:16	06:38	06:48		06:03	05:38	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		18:48		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		06:43	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	07:33	07:14	06:35	06:44		06:01	05:37	05:42	06:08	06:39		07:09		06:44	07:17
	16:54	17:30	18:03	19:36		20:08	20:36	20:43	20:20	19:35		18:44		17:00	16:40
7	07:33	07:13	06:34	06:43		06:00	05:37	05:43	06:09	06:40		07:10		06:45	07:18
	16:55	17:31	18:04	19:37		20:09	20:36	20:43	20:19	19:33		18:43		16:59	16:40
8	07:32	07:12	07:32	06:41		05:59	05:36	05:44	06:10	06:41		07:11		06:46	07:19
	16:56	17:32	19:05	19:39		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	18:07 (D03)	07:12		06:47	07:20
	16:57	17:33	19:06	19:40		20:11	20:38	20:42	20:16	19:30 10	18:17 (D03)	18:39		16:57	16:40
10	07:32	07:09	07:29 18:20 (D03)	06:38	19:04 (D02)	05:56	05:36	05:45	06:12	06:43	18:03 (D03)	07:13		06:48	07:21
	16:58	17:35	19:07 8 18:28 (D03)	19:41 11	19:15 (D02)	20:12	20:38	20:42	20:15	19:28 17	18:20 (D03)	18:38		16:56	16:40
11	07:32	07:08	07:27 18:16 (D03)	06:36	19:01 (D02)	05:55	05:36	05:46	06:13	06:44	18:00 (D03)	07:14		06:50	07:22
	16:59	17:36	19:09 17 18:33 (D03)	19:42 16	19:17 (D02)	20:13	20:39	20:41	20:14	19:26 22	18:22 (D03)	18:36		16:55	16:40
12	07:32	07:07	07:26 18:13 (D03)	06:35	18:59 (D02)	05:54	05:36	05:46	06:14	06:45	17:58 (D03)	07:15		06:51	07:23
	17:00	17:37	19:10 22 18:35 (D03)	19:43 20	19:19 (D02)	20:14	20:39	20:41	20:12	19:25 26	18:24 (D03)	18:35		16:54	16:40
13	07:31	07:06	07:24 18:10 (D03)	06:33	18:57 (D02)	05:53	05:36	05:47	06:15	06:46	17:56 (D03)	07:16		06:52	07:23
	17:01	17:38	19:11 27 18:37 (D03)	19:44 22	19:19 (D02)	20:15	20:40	20:40	20:11	19:23 29	18:25 (D03)	18:33		16:53	16:40
14	07:31	07:04	07:22 18:09 (D03)	06:32	18:57 (D02)	05:52	05:36	05:48	06:16 19:10 (D02)	06:47	17:54 (D03)	07:17		06:53	07:24
	17:02	17:39	19:12 29 18:38 (D03)	19:45 24	19:21 (D02)	20:16	20:40	20:40	20:10 6 19:16 (D02)	19:21 32	18:26 (D03)	18:32		16:52	16:40
15	07:31	07:03	07:21 18:07 (D03)	06:30	18:55 (D02)	05:51	05:36	05:49	06:17 19:06 (D02)	06:48	17:53 (D03)	07:19		06:54	07:25
	17:03	17:41	19:13 32 18:39 (D03)	19:46 26	19:21 (D02)	20:17	20:41	20:39	20:08 13 19:19 (D02)	19:20 33	18:26 (D03)	18:30		16:51	16:41
16	07:30	07:02	07:19 18:06 (D03)	06:28	18:55 (D02)	05:50	05:36	05:49	06:18 19:04 (D02)	06:49	17:52 (D03)	07:20		06:56	07:26
	17:04	17:42	19:14 34 18:40 (D03)	19:47 26	19:21 (D02)	20:18	20:41	20:39	20:07 17 19:21 (D02)	19:18 35	18:27 (D03)	18:28		16:50	16:41
17	07:30	07:00	07:17 18:05 (D03)	06:27	18:54 (D02)	05:49	05:36	05:50	06:19 19:02 (D02)	06:50	17:51 (D03)	07:21		06:57	07:26
	17:05	17:43	19:15 36 18:41 (D03)	19:48 27	19:21 (D02)	20:19	20:41	20:38	20:06 20 19:22 (D02)	19:16 36	18:27 (D03)	18:27		16:49	16:41
18	07:29	06:59	07:16 18:04 (D03)	06:25	18:54 (D02)	05:48	05:36	05:51	06:20 19:01 (D02)	06:51	17:50 (D03)	07:22		06:58	07:27
	17:07	17:44	19:16 37 18:41 (D03)	19:49 27	19:21 (D02)	20:20	20:42	20:37	20:04 22 19:23 (D02)	19:15 37	18:27 (D03)	18:25		16:48	16:41
19	07:29	06:58	07:14 18:03 (D03)	06:24	18:53 (D02)	05:47	05:36	05:52	06:21 19:00 (D02)	06:52	17:48 (D03)	07:23		06:59	07:28
	17:08	17:46	19:17 38 18:41 (D03)	19:50 28	19:21 (D02)	20:21	20:42	20:37	20:03 24 19:24 (D02)	19:13 38	18:26 (D03)	18:24		16:48	16:42
20	07:28	06:56	07:12 18:03 (D03)	06:22	18:53 (D02)	05:47	05:36	05:53	06:22 18:59 (D02)	06:53	17:47 (D03)	07:24		07:00	07:28
	17:09	17:47	19:18 38 18:41 (D03)	19:51 28	19:21 (D02)	20:22	20:42	20:36	20:01 25 19:24 (D02)	19:11 39	18:26 (D03)	18:22		16:47	16:42
21	07:28	06:55	07:11 18:02 (D03)	06:21	18:53 (D02)	05:46	05:36	05:54	06:23 18:58 (D02)	06:54	17:47 (D03)	07:25		07:01	07:29
	17:10	17:48	19:19 39 18:41 (D03)	19:52 27	19:20 (D02)	20:23	20:43	20:35	20:00 27 19:25 (D02)	19:10 39	18:26 (D03)	18:21		16:46	16:43
22	07:27	06:53	07:09 18:02 (D03)	06:19	18:54 (D02)	05:45	05:36	05:54	06:24 18:58 (D02)	06:55	17:47 (D03)	07:26		07:03	07:29
	17:11	17:49	19:21 38 18:40 (D03)	19:53 26	19:20 (D02)	20:24	20:43	20:35	19:58 27 19:25 (D02)	19:08 38	18:25 (D03)	18:20		16:46	16:43
23	07:26	06:52	07:07 18:02 (D03)	06:18	18:53 (D02)	05:44	05:37	05:55	06:25 18:57 (D02)	06:56	17:46 (D03)	07:27		07:04	07:30
	17:12	17:50	19:22 39 18:41 (D03)	19:54 25	19:18 (D02)	20:25	20:43	20:34	19:57 28 19:25 (D02)	19:06 39	18:25 (D03)	18:18		16:45	16:43
24	07:26	06:50	07:06 18:02 (D03)	06:17	18:54 (D02)	05:43	05:37	05:56	06:26 18:57 (D02)	06:57	17:46 (D03)	07:29		07:05	07:30
	17:14	17:51	19:23 38 18:40 (D03)	19:55 24	19:18 (D02)	20:26	20:43	20:33	19:55 28 19:25 (D02)	19:04 38	18:24 (D03)	18:17		16:44	16:44
25	07:25	06:49	07:04 18:01 (D03)	06:15	18:55 (D02)	05:43	05:37	05:57	06:27 18:57 (D02)	06:58	17:46 (D03)	07:30		07:06	07:31
	17:15	17:53	19:24 38 18:39 (D03)	19:56 22	19:17 (D02)	20:26	20:43	20:32	19:54 27 19:24 (D02)	19:03 37	18:23 (D03)	18:15		16:44	16:45
26	07:24	06:48	07:02 18:01 (D03)	06:14	18:56 (D02)	05:42	05:38	05:58	06:28 18:57 (D02)	06:59	17:46 (D03)	07:31		07:07	07:31
	17:16	17:54	19:25 37 18:38 (D03)	19:57 19	19:15 (D02)	20:27	20:44	20:31	19:52 27 19:24 (D02)	19:01 36	18:22 (D03)	18:14		16:43	16:45
27	07:23	06:46	07:01 18:02 (D03)	06:12	18:58 (D02)	05:41	05:38	05:59	06:29 18:57 (D02)	07:00	17:47 (D03)	07:32		07:08	07:31
	17:17	17:55	19:26 36 18:38 (D03)	19:59 16	19:14 (D02)	20:28	20:44	20:30	19:51 26 19:23 (D02)	18:59 34	18:21 (D03)	18:13		16:43	16:46
28	07:22	06:45	06:59 18:02 (D03)	06:11	19:00 (D02)	05:41	05:38	06:00	06:30 18:57 (D02)	07:01	17:47 (D03)	07:33		07:09	07:32
	17:18	17:56	19:27 34 18:36 (D03)	20:00 12	19:12 (D02)	20:29	20:44	20:29	19:49 26 19:23 (D02)	18:58 33	18:20 (D03)	18:11		16:42	16:46
29	07:22		06:57 18:03 (D03)	06:10	19:04 (D02)	05:40	05:39	06:01	06:31 18:58 (D02)	07:02	17:48 (D03)	07:34		07:10	07:32
	17:20		19:28 32 18:35 (D03)	20:01 2	19:06 (D02)	20:30	20:44	20:28	19:48 24 19:22 (D02)	18:56 31	18:19 (D03)	18:10		16:42	16:47
30	07:21		06:56 18:04 (D03)	06:08		05:40	05:39	06:02	06:32 18:58 (D02)	07:03	17:49 (D03)	07:35		07:11	07:32
	17:21		19:29 30 18:34 (D03)	20:02		20:31	20:44	20:27	19:46 22 19:20 (D02)	18:54 28	18:17 (D03)	18:09		16:42	16:48
31	07:20		06:54 18:05 (D03)			05:39		06:03	06:33 18:59 (D02)			07:37			07:32
	17:22		19:30 27 18:32 (D03)			20:31		20:26	19:45 20 19:19 (D02)			18:07			16:49
Potential sun hours	298	297	369	398	448	452	458	428		375		346		298	288
Total, worst case			706	480				409		734		57			
Sun reduction			0.73	0.82				0.96		0.93		0.84			
Oper. time red.			1.00	1.00				1.00		1.00		1.00			
Wind dir. red.			0.74	0.60				0.59		0.73		0.74			
Total reduction			0.54	0.50				0.56		0.69		0.62			
Total, real			383	238				231		503		36			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 20 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (95)

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
1	07:32		15:45 (D04)	07:19	06:43			06:52		18:06 (D03)	06:07	05:39
	16:50	7	15:52 (D04)	17:23	17:57			19:31	21	18:27 (D03)	20:03	20:32
2	07:33		15:48 (D04)	07:18	06:41			06:51		18:08 (D03)	06:06	05:38
	16:50	2	15:50 (D04)	17:25	17:58			19:32	15	18:23 (D03)	20:04	20:33
3	07:33			07:17	06:40			06:49		18:14 (D03)	06:05	05:38
	16:51			17:26	18:00			19:33	2	18:16 (D03)	20:05	20:34
4	07:33			07:16	06:38			06:48			06:03	05:38
	16:52			17:27	18:01			19:34			20:06	20:34
5	07:33			07:15	06:37			06:46			06:02	05:37
	16:53			17:28	18:02			19:35			20:07	20:35
6	07:33			07:14	06:35			06:44			06:01	05:37
	16:54			17:30	18:03			19:36			20:08	20:36
7	07:33			07:13	06:34			06:43			06:00	05:37
	16:55			17:31	18:04			19:37			20:09	20:36
8	07:32			07:12	07:32			06:41			05:59	05:36
	16:56			17:32	19:05			19:39			20:10	20:37
9	07:32			07:10	07:30		18:15 (D03)	06:39			05:57	05:36
	16:57			17:33	19:06	14	18:29 (D03)	19:40			20:11	20:38
10	07:32			07:09	07:29		18:11 (D03)	06:38		19:03 (D02)	05:56	05:36
	16:58			17:35	19:07	21	18:32 (D03)	19:41	12	19:15 (D02)	20:12	20:38
11	07:32			07:08	07:27		18:09 (D03)	06:36		19:00 (D02)	05:55	05:36
	16:59			17:36	19:09	25	18:34 (D03)	19:42	17	19:17 (D02)	20:13	20:39
12	07:32			07:07	07:26		18:07 (D03)	06:35		18:59 (D02)	05:54	05:36
	17:00			17:37	19:10	29	18:36 (D03)	19:43	20	19:19 (D02)	20:14	20:39
13	07:31			07:06	07:24		18:05 (D03)	06:33		18:57 (D02)	05:53	05:36
	17:01			17:38	19:11	31	18:36 (D03)	19:44	22	19:19 (D02)	20:15	20:40
14	07:31			07:04	07:22		18:04 (D03)	06:32		18:56 (D02)	05:52	05:36
	17:02			17:39	19:12	34	18:38 (D03)	19:45	25	19:21 (D02)	20:16	20:40
15	07:31			07:03	07:21		18:03 (D03)	06:30		18:54 (D02)	05:51	05:36
	17:03			17:41	19:13	35	18:38 (D03)	19:46	27	19:21 (D02)	20:17	20:41
16	07:30			07:02	07:19		18:01 (D03)	06:28		18:54 (D02)	05:50	05:36
	17:04			17:42	19:14	37	18:38 (D03)	19:47	27	19:21 (D02)	20:18	20:41
17	07:30			07:00	07:17		18:01 (D03)	06:27		18:53 (D02)	05:49	05:36
	17:05			17:43	19:15	38	18:39 (D03)	19:48	28	19:21 (D02)	20:19	20:41
18	07:29			06:59	07:16		18:00 (D03)	06:25		18:53 (D02)	05:48	05:36
	17:07			17:44	19:16	39	18:39 (D03)	19:49	29	19:22 (D02)	20:20	20:42
19	07:29			06:58	07:14		17:59 (D03)	06:24		18:52 (D02)	05:47	05:36
	17:08			17:46	19:17	40	18:39 (D03)	19:50	29	19:21 (D02)	20:21	20:42
20	07:28			06:56	07:12		17:59 (D03)	06:22		18:53 (D02)	05:47	05:36
	17:09			17:47	19:18	41	18:40 (D03)	19:51	28	19:21 (D02)	20:22	20:42
21	07:28			06:55	07:11		17:59 (D03)	06:21		18:52 (D02)	05:46	05:36
	17:10			17:48	19:19	40	18:39 (D03)	19:52	28	19:20 (D02)	20:23	20:43
22	07:27			06:53	07:09		17:58 (D03)	06:19		18:53 (D02)	05:45	05:36
	17:11			17:49	19:21	40	18:38 (D03)	19:53	27	19:20 (D02)	20:24	20:43
23	07:26			06:52	07:07		17:59 (D03)	06:18		18:52 (D02)	05:44	05:37
	17:12			17:50	19:22	40	18:39 (D03)	19:54	27	19:19 (D02)	20:25	20:43
24	07:26			06:50	07:06		17:58 (D03)	06:17		18:53 (D02)	05:43	05:37
	17:14			17:51	19:23	40	18:38 (D03)	19:55	25	19:18 (D02)	20:26	20:43
25	07:25			06:49	07:04		17:58 (D03)	06:15		18:54 (D02)	05:43	05:37
	17:15			17:53	19:24	39	18:37 (D03)	19:56	23	19:17 (D02)	20:26	20:43
26	07:24			06:48	07:02		17:59 (D03)	06:14		18:55 (D02)	05:42	05:38
	17:16			17:54	19:25	37	18:36 (D03)	19:57	20	19:15 (D02)	20:27	20:44
27	07:23			06:46	07:01		17:59 (D03)	06:12		18:56 (D02)	05:41	05:38
	17:17			17:55	19:26	36	18:35 (D03)	19:59	18	19:14 (D02)	20:28	20:44
28	07:22			06:45	06:59		18:00 (D03)	06:11		18:58 (D02)	05:41	05:38
	17:18			17:56	19:27	33	18:33 (D03)	20:00	15	19:13 (D02)	20:29	20:44
29	07:22				06:57		18:00 (D03)	06:10		19:00 (D02)	05:40	05:39
	17:20				19:28	32	18:32 (D03)	20:01	9	19:09 (D02)	20:30	20:44
30	07:21				06:56		18:02 (D03)	06:08			05:40	05:39
	17:21				19:29	29	18:31 (D03)	20:02			20:31	20:44
31	07:20				06:54		18:03 (D03)				05:39	
	17:22				19:30	25	18:28 (D03)				20:31	
Potential sun hours	298			297	369			398			448	452
Total, worst case		9				775			494			
Sun reduction		0.45				0.73			0.82			
Oper. time red.		1.00				1.00			1.00			
Wind dir. red.		0.89				0.75			0.60			
Total reduction		0.41				0.55			0.50			
Total, real		4				429			246			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 20 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (95)

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

	July	August			September			October			November	December		
1	05:40	06:04			06:34		18:59 (D02)	07:04		17:45 (D03)	06:38	07:12		
	20:44	20:25			19:43	17	19:16 (D02)	18:53	30	18:15 (D03)	18:06	16:41		
2	05:40	06:05			06:35		19:01 (D02)	07:05		17:46 (D03)	06:39	07:13		
	20:44	20:24			19:41	12	19:13 (D02)	18:51	27	18:13 (D03)	17:05	16:41		
3	05:41	06:05			06:36			07:06		17:48 (D03)	06:40	07:14		
	20:43	20:23			19:40			18:49	22	18:10 (D03)	17:04	16:41		
4	05:41	06:06			06:37			07:07		17:51 (D03)	06:41	07:15		
	20:43	20:22			19:38			18:48	17	18:08 (D03)	17:02	16:40		
5	05:42	06:07			06:38			07:08		17:55 (D03)	06:43	07:16		
	20:43	20:21			19:36			18:46	8	18:03 (D03)	17:01	16:40		
6	05:42	06:08			06:39			07:09			06:44	07:17		
	20:43	20:20			19:35			18:44			17:00	16:40		
7	05:43	06:09			06:40			07:10			06:45	07:18		
	20:43	20:19			19:33			18:43			16:59	16:40		
8	05:44	06:10			06:41			07:11			06:46	07:19		
	20:42	20:17			19:31			18:41			16:58	16:40		
9	05:44	06:11			06:42			07:12			06:47	07:20		
	20:42	20:16			19:30			18:39			16:57	16:40		
10	05:45	06:12			06:43		18:01 (D03)	07:13			06:48	07:21		15:37 (D04)
	20:42	20:15			19:28	15	18:16 (D03)	18:38			16:56	16:40	2	15:39 (D04)
11	05:46	06:13			06:44		17:58 (D03)	07:14			06:50	07:22		15:35 (D04)
	20:41	20:14			19:26	21	18:19 (D03)	18:36			16:55	16:40	7	15:42 (D04)
12	05:46	06:14			06:45		17:56 (D03)	07:15			06:51	07:23		15:35 (D04)
	20:41	20:12			19:25	24	18:20 (D03)	18:35			16:54	16:40	9	15:44 (D04)
13	05:47	06:15			06:46		17:53 (D03)	07:16			06:52	07:23		15:35 (D04)
	20:40	20:11			19:23	29	18:22 (D03)	18:33			16:53	16:40	10	15:45 (D04)
14	05:48	06:16		19:07 (D02)	06:47		17:52 (D03)	07:17			06:53	07:24		15:34 (D04)
	20:40	20:10	10	19:17 (D02)	19:21	31	18:23 (D03)	18:32			16:52	16:40	11	15:45 (D04)
15	05:49	06:17		19:05 (D02)	06:48		17:50 (D03)	07:19			06:54	07:25		15:34 (D04)
	20:39	20:08	15	19:20 (D02)	19:20	34	18:24 (D03)	18:30			16:51	16:41	12	15:46 (D04)
16	05:49	06:18		19:03 (D02)	06:49		17:49 (D03)	07:20			06:56	07:26		15:34 (D04)
	20:39	20:07	18	19:21 (D02)	19:18	35	18:24 (D03)	18:28			16:50	16:41	14	15:48 (D04)
17	05:50	06:19		19:01 (D02)	06:50		17:48 (D03)	07:21			06:57	07:26		15:34 (D04)
	20:38	20:06	21	19:22 (D02)	19:16	36	18:24 (D03)	18:27			16:49	16:41	14	15:48 (D04)
18	05:51	06:20		19:00 (D02)	06:51		17:47 (D03)	07:22			06:58	07:27		15:35 (D04)
	20:37	20:04	23	19:23 (D02)	19:15	38	18:25 (D03)	18:25			16:48	16:41	14	15:49 (D04)
19	05:52	06:21		18:59 (D02)	06:52		17:46 (D03)	07:23			06:59	07:28		15:35 (D04)
	20:37	20:03	25	19:24 (D02)	19:13	39	18:25 (D03)	18:24			16:48	16:42	15	15:50 (D04)
20	05:53	06:22		18:58 (D02)	06:53		17:44 (D03)	07:24			07:00	07:28		15:35 (D04)
	20:36	20:01	26	19:24 (D02)	19:11	40	18:24 (D03)	18:22			16:47	16:42	15	15:50 (D04)
21	05:54	06:23		18:57 (D02)	06:54		17:43 (D03)	07:25			07:01	07:29		15:36 (D04)
	20:35	20:00	28	19:25 (D02)	19:10	41	18:24 (D03)	18:21			16:46	16:43	15	15:51 (D04)
22	05:54	06:24		18:57 (D02)	06:55		17:43 (D03)	07:26			07:03	07:29		15:36 (D04)
	20:35	19:58	28	19:25 (D02)	19:08	40	18:23 (D03)	18:20			16:46	16:43	15	15:51 (D04)
23	05:55	06:25		18:56 (D02)	06:56		17:43 (D03)	07:27			07:04	07:30		15:37 (D04)
	20:34	19:57	29	19:25 (D02)	19:06	40	18:23 (D03)	18:18			16:45	16:43	15	15:52 (D04)
24	05:56	06:26		18:56 (D02)	06:57		17:42 (D03)	07:29			07:05	07:30		15:37 (D04)
	20:33	19:55	29	19:25 (D02)	19:04	40	18:22 (D03)	18:17			16:44	16:44	15	15:52 (D04)
25	05:57	06:27		18:56 (D02)	06:58		17:42 (D03)	07:30			07:06	07:31		15:38 (D04)
	20:32	19:54	28	19:24 (D02)	19:03	40	18:22 (D03)	18:15			16:44	16:45	14	15:52 (D04)
26	05:58	06:28		18:56 (D02)	06:59		17:42 (D03)	07:31			07:07	07:31		15:39 (D04)
	20:31	19:52	28	19:24 (D02)	19:01	39	18:21 (D03)	18:14			16:43	16:45	14	15:53 (D04)
27	05:59	06:29		18:56 (D02)	07:00		17:42 (D03)	07:32			07:08	07:31		15:39 (D04)
	20:30	19:51	27	19:23 (D02)	18:59	38	18:20 (D03)	18:13			16:43	16:46	14	15:53 (D04)
28	06:00	06:30		18:56 (D02)	07:01		17:43 (D03)	07:33			07:09	07:32		15:40 (D04)
	20:29	19:49	27	19:23 (D02)	18:58	36	18:19 (D03)	18:11			16:42	16:46	13	15:53 (D04)
29	06:01	06:31		18:57 (D02)	07:02		17:43 (D03)	07:34			07:10	07:32		15:41 (D04)
	20:28	19:48	25	19:22 (D02)	18:56	35	18:18 (D03)	18:10			16:42	16:47	11	15:52 (D04)
30	06:02	06:32		18:58 (D02)	07:03		17:44 (D03)	07:35			07:11	07:32		15:42 (D04)
	20:27	19:46	22	19:20 (D02)	18:54	32	18:16 (D03)	18:09			16:42	16:48	11	15:53 (D04)
31	06:03	06:33		18:59 (D02)				07:37				07:32		15:43 (D04)
	20:26	19:45	20	19:19 (D02)				18:07				16:49	10	15:53 (D04)
Potential sun hours	458	428			375			346			298	288		
Total, worst case			429			752			104				270	
Sun reduction			0.96			0.93			0.84				0.47	
Oper. time red.			1.00			1.00			1.00				1.00	
Wind dir. red.			0.59			0.74			0.75				0.89	
Total reduction			0.57			0.70			0.64				0.43	
Total, real			245			525			66				115	

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)

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217 Montgomery St., Suite 1000
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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 21 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (96)

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
1	07:32		15:45 (D04)	07:19	06:43			06:52			06:07	05:39
	16:50	11	15:56 (D04)	17:23	17:57			19:31			20:03	20:32
2	07:33		15:46 (D04)	07:18	06:41			06:51			06:06	05:38
	16:50	9	15:55 (D04)	17:25	17:58			19:32			20:04	20:33
3	07:33		15:48 (D04)	07:17	06:40			06:49			06:05	05:38
	16:51	6	15:54 (D04)	17:26	18:00			19:33			20:05	20:34
4	07:33			07:16	06:38			06:48			06:03	05:38
	16:52			17:27	18:01			19:34			20:06	20:34
5	07:33			07:15	06:37			06:46			06:02	05:37
	16:53			17:28	18:02			19:35			20:07	20:35
6	07:33			07:14	06:35			06:44			06:01	05:37
	16:54			17:30	18:03			19:36			20:08	20:36
7	07:33			07:13	06:34		17:15 (D03)	06:43		19:03 (D02)	06:00	05:37
	16:55			17:31	18:04	11	17:26 (D03)	19:37	8	19:11 (D02)	20:09	20:36
8	07:32			07:12	07:32		18:11 (D03)	06:41		18:59 (D02)	05:59	05:36
	16:56			17:32	19:05	18	18:29 (D03)	19:39	14	19:13 (D02)	20:10	20:37
9	07:32			07:10	07:30		18:09 (D03)	06:39		18:57 (D02)	05:57	05:36
	16:57			17:33	19:06	23	18:32 (D03)	19:40	19	19:16 (D02)	20:11	20:38
10	07:32			07:09	07:29		18:06 (D03)	06:38		18:55 (D02)	05:56	05:36
	16:58			17:35	19:07	27	18:33 (D03)	19:41	21	19:16 (D02)	20:12	20:38
11	07:32			07:08	07:27		18:05 (D03)	06:36		18:53 (D02)	05:55	05:36
	16:59			17:36	19:09	30	18:35 (D03)	19:42	24	19:17 (D02)	20:13	20:39
12	07:32			07:07	07:26		18:03 (D03)	06:35		18:53 (D02)	05:54	05:36
	17:00			17:37	19:10	32	18:35 (D03)	19:43	25	19:18 (D02)	20:14	20:39
13	07:31			07:06	07:24		18:02 (D03)	06:33		18:52 (D02)	05:53	05:36
	17:01			17:38	19:11	34	18:36 (D03)	19:44	26	19:18 (D02)	20:15	20:40
14	07:31			07:04	07:22		18:01 (D03)	06:32		18:51 (D02)	05:52	05:36
	17:02			17:39	19:12	36	18:37 (D03)	19:45	27	19:18 (D02)	20:16	20:40
15	07:31			07:03	07:21		18:00 (D03)	06:30		18:51 (D02)	05:51	05:36
	17:03			17:41	19:13	37	18:37 (D03)	19:46	27	19:18 (D02)	20:17	20:41
16	07:30			07:02	07:19		17:59 (D03)	06:28		18:51 (D02)	05:50	05:36
	17:04			17:42	19:14	38	18:37 (D03)	19:47	27	19:18 (D02)	20:18	20:41
17	07:30			07:00	07:17		17:59 (D03)	06:27		18:50 (D02)	05:49	05:36
	17:05			17:43	19:15	38	18:37 (D03)	19:48	27	19:17 (D02)	20:19	20:41
18	07:29			06:59	07:16		17:59 (D03)	06:25		18:51 (D02)	05:48	05:36
	17:07			17:44	19:16	38	18:37 (D03)	19:49	26	19:17 (D02)	20:20	20:42
19	07:29			06:58	07:14		17:58 (D03)	06:24		18:50 (D02)	05:47	05:36
	17:08			17:46	19:17	38	18:36 (D03)	19:50	26	19:16 (D02)	20:21	20:42
20	07:28			06:56	07:12		17:59 (D03)	06:22		18:51 (D02)	05:47	05:36
	17:09			17:47	19:18	38	18:37 (D03)	19:51	25	19:16 (D02)	20:22	20:42
21	07:28			06:55	07:11		17:58 (D03)	06:21		18:51 (D02)	05:46	05:36
	17:10			17:48	19:19	38	18:36 (D03)	19:52	23	19:14 (D02)	20:23	20:43
22	07:27			06:53	07:09		17:58 (D03)	06:19		18:52 (D02)	05:45	05:36
	17:11			17:49	19:21	37	18:35 (D03)	19:53	22	19:14 (D02)	20:24	20:43
23	07:26			06:52	07:07		17:59 (D03)	06:18		18:53 (D02)	05:44	05:37
	17:12			17:50	19:22	36	18:35 (D03)	19:54	19	19:12 (D02)	20:25	20:43
24	07:26			06:50	07:06		17:59 (D03)	06:17		18:55 (D02)	05:43	05:37
	17:14			17:51	19:23	34	18:33 (D03)	19:55	15	19:10 (D02)	20:26	20:43
25	07:25			06:49	07:04		17:59 (D03)	06:15		18:57 (D02)	05:43	05:37
	17:15			17:53	19:24	33	18:32 (D03)	19:56	11	19:08 (D02)	20:26	20:43
26	07:24			06:48	07:02		18:00 (D03)	06:14			05:42	05:38
	17:16			17:54	19:25	30	18:30 (D03)	19:57			20:27	20:44
27	07:23			06:46	07:01		18:02 (D03)	06:12			05:41	05:38
	17:17			17:55	19:26	27	18:29 (D03)	19:59			20:28	20:44
28	07:22			06:45	06:59		18:03 (D03)	06:11			05:41	05:38
	17:18			17:56	19:27	24	18:27 (D03)	20:00			20:29	20:44
29	07:22				06:57		18:04 (D03)	06:10			05:40	05:39
	17:20				19:28	20	18:24 (D03)	20:01			20:30	20:44
30	07:21				06:56		18:08 (D03)	06:08			05:40	05:39
	17:21				19:29	14	18:22 (D03)	20:02			20:31	20:44
31	07:20				06:54						05:39	
	17:22				19:30						20:31	
Potential sun hours	298			297	369			398			448	452
Total, worst case		26				731			412			
Sun reduction		0.45				0.73			0.82			
Oper. time red.		1.00				1.00			1.00			
Wind dir. red.		0.89				0.75			0.60			
Total reduction		0.41				0.56			0.50			
Total, real		11				409			207			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 21 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (96)

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

	July	August		September		October		November	December		
1	05:40	06:04		06:34	18:52 (D02)	07:04	17:41 (D03)	06:38	07:12		
	20:44	20:25		19:43 24	19:16 (D02)	18:53 33	18:14 (D03)	18:06	16:41		
2	05:40	06:05		06:35	18:53 (D02)	07:05	17:42 (D03)	06:39	07:13		
	20:44	20:24		19:41 21	19:14 (D02)	18:51 31	18:13 (D03)	17:05	16:41		
3	05:41	06:05		06:36	18:54 (D02)	07:06	17:43 (D03)	06:40	07:14		
	20:43	20:23		19:40 19	19:13 (D02)	18:49 28	18:11 (D03)	17:04	16:41		
4	05:41	06:06		06:37	18:56 (D02)	07:07	17:45 (D03)	06:41	07:15		
	20:43	20:22		19:38 14	19:10 (D02)	18:48 25	18:10 (D03)	17:02	16:40		
5	05:42	06:07		06:38	18:59 (D02)	07:08	17:47 (D03)	06:43	07:16		
	20:43	20:21		19:36 8	19:07 (D02)	18:46 21	18:08 (D03)	17:01	16:40		
6	05:42	06:08		06:39		07:09	17:50 (D03)	06:44	07:17		
	20:43	20:20		19:35		18:44 15	18:05 (D03)	17:00	16:40		
7	05:43	06:09		06:40		07:10	17:56 (D03)	06:45	07:18		
	20:43	20:19		19:33		18:43 2	17:58 (D03)	16:59	16:40		
8	05:44	06:10		06:41		07:11		06:46	07:19		
	20:42	20:17		19:31		18:41		16:58	16:40		
9	05:44	06:11		06:42		07:12		06:47	07:20		15:36 (D04)
	20:42	20:16		19:30		18:39		16:57	16:40	6	15:42 (D04)
10	05:45	06:12		06:43		07:13		06:48	07:21		15:35 (D04)
	20:42	20:15		19:28		18:38		16:56	16:40	9	15:44 (D04)
11	05:46	06:13		06:44		07:14		06:50	07:22		15:35 (D04)
	20:41	20:14		19:26		18:36		16:55	16:40	11	15:46 (D04)
12	05:46	06:14		06:45		07:15		06:51	07:23		15:35 (D04)
	20:41	20:12		19:25		18:35		16:54	16:40	12	15:47 (D04)
13	05:47	06:15		06:46	17:59 (D03)	07:16		06:52	07:23		15:35 (D04)
	20:40	20:11		19:23 13	18:12 (D03)	18:33		16:53	16:40	13	15:48 (D04)
14	05:48	06:16		06:47	17:56 (D03)	07:17		06:53	07:24		15:34 (D04)
	20:40	20:10		19:21 19	18:15 (D03)	18:32		16:52	16:40	14	15:48 (D04)
15	05:49	06:17		06:48	17:53 (D03)	07:19		06:54	07:25		15:35 (D04)
	20:39	20:08		19:20 24	18:17 (D03)	18:30		16:51	16:41	14	15:49 (D04)
16	05:49	06:18		06:49	17:51 (D03)	07:20		06:56	07:26		15:35 (D04)
	20:39	20:07		19:18 27	18:18 (D03)	18:28		16:50	16:41	15	15:50 (D04)
17	05:50	06:19	19:06 (D02)	06:50	17:50 (D03)	07:21		06:57	07:26		15:35 (D04)
	20:38	20:06 5	19:11 (D02)	19:16 29	18:19 (D03)	18:27		16:49	16:41	15	15:50 (D04)
18	05:51	06:20	19:02 (D02)	06:51	17:48 (D03)	07:22		06:58	07:27		15:35 (D04)
	20:37	20:04 13	19:15 (D02)	19:15 32	18:20 (D03)	18:25		16:48	16:41	16	15:51 (D04)
19	05:52	06:21	19:00 (D02)	06:52	17:46 (D03)	07:23		06:59	07:28		15:36 (D04)
	20:37	20:03 16	19:16 (D02)	19:13 34	18:20 (D03)	18:24		16:48	16:42	16	15:52 (D04)
20	05:53	06:22	18:58 (D02)	06:53	17:45 (D03)	07:24		07:00	07:28		15:36 (D04)
	20:36	20:01 20	19:18 (D02)	19:11 35	18:20 (D03)	18:22		16:47	16:42	16	15:52 (D04)
21	05:54	06:23	18:57 (D02)	06:54	17:44 (D03)	07:25		07:01	07:29		15:37 (D04)
	20:35	20:00 22	19:19 (D02)	19:10 36	18:20 (D03)	18:21		16:46	16:43	16	15:53 (D04)
22	05:54	06:24	18:56 (D02)	06:55	17:43 (D03)	07:26		07:03	07:29		15:37 (D04)
	20:35	19:58 23	19:19 (D02)	19:08 37	18:20 (D03)	18:20		16:46	16:43	16	15:53 (D04)
23	05:55	06:25	18:55 (D02)	06:56	17:42 (D03)	07:27		07:04	07:30		15:38 (D04)
	20:34	19:57 25	19:20 (D02)	19:06 38	18:20 (D03)	18:18		16:45	16:43	16	15:54 (D04)
24	05:56	06:26	18:54 (D02)	06:57	17:42 (D03)	07:29		07:05	07:30		15:38 (D04)
	20:33	19:55 26	19:20 (D02)	19:04 38	18:20 (D03)	18:17		16:44	16:44	16	15:54 (D04)
25	05:57	06:27	18:53 (D02)	06:58	17:41 (D03)	07:30		07:06	07:31		15:38 (D04)
	20:32	19:54 27	19:20 (D02)	19:03 38	18:19 (D03)	18:15		16:44	16:45	16	15:54 (D04)
26	05:58	06:28	18:53 (D02)	06:59	17:41 (D03)	07:31		07:07	07:31		15:40 (D04)
	20:31	19:52 27	19:20 (D02)	19:01 38	18:19 (D03)	18:14		16:43	16:45	15	15:55 (D04)
27	05:59	06:29	18:53 (D02)	07:00	17:41 (D03)	07:32		07:08	07:31		15:40 (D04)
	20:30	19:51 27	19:20 (D02)	18:59 37	18:18 (D03)	18:13		16:43	16:46	15	15:55 (D04)
28	06:00	06:30	18:52 (D02)	07:01	17:41 (D03)	07:33		07:09	07:32		15:41 (D04)
	20:29	19:49 28	19:20 (D02)	18:58 37	18:18 (D03)	18:11		16:42	16:46	14	15:55 (D04)
29	06:01	06:31	18:52 (D02)	07:02	17:41 (D03)	07:34		07:10	07:32		15:41 (D04)
	20:28	19:48 27	19:19 (D02)	18:56 36	18:17 (D03)	18:10		16:42	16:47	14	15:55 (D04)
30	06:02	06:32	18:53 (D02)	07:03	17:41 (D03)	07:35		07:11	07:32		15:43 (D04)
	20:27	19:46 26	19:19 (D02)	18:54 35	18:16 (D03)	18:09		16:42	16:48	13	15:56 (D04)
31	06:03	06:33	18:53 (D02)			07:37			07:32		15:44 (D04)
	20:26	19:45 25	19:18 (D02)			18:07			16:49	12	15:56 (D04)
Potential sun hours	458	428		375		346		298	288		
Total, worst case		337		669		155			320		
Sun reduction		0.96		0.93		0.84			0.47		
Oper. time red.		1.00		1.00		1.00			1.00		
Wind dir. red.		0.60		0.73		0.75			0.89		
Total reduction		0.59		0.69		0.64			0.43		
Total, real		198		465		100			137		

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)

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US-SYRACUSE, NY 13202
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Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 22 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (97)

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	05:40	06:04	06:34	18:53 (D02)	07:04	17:36 (D03)	06:38	07:12
	16:50	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43	23 19:16 (D02)	18:53	37 18:13 (D03)	18:06	16:41
2	07:33	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	18:54 (D02)	07:05	17:36 (D03)	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	20 19:14 (D02)	18:51	36 18:12 (D03)	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	18:55 (D02)	07:06	17:37 (D03)	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	17 19:12 (D02)	18:49	34 18:11 (D03)	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	05:41	06:06	06:37	18:57 (D02)	07:07	17:39 (D03)	06:41	07:15
	16:52	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	13 19:10 (D02)	18:48	31 18:10 (D03)	17:02	16:40
5	07:33	07:15	06:37 17:14 (D03)	06:46	06:02	05:37	05:42	06:07	06:38		07:08	17:40 (D03)	06:43	07:16
	16:53	17:28	18:02 6 17:20 (D03)	19:35	20:07	20:35	20:43	20:21	19:36		18:46	28 18:08 (D03)	17:01	16:40
6	07:33	07:14	06:35 17:09 (D03)	06:44	06:01	05:37	05:42	06:08	06:39		07:09	17:41 (D03)	06:44	07:17
	16:54	17:30	18:03 17 17:26 (D03)	19:36	20:08	20:36	20:43	20:20	19:35		18:44	25 18:06 (D03)	17:00	16:40
7	07:33	07:13	06:34 17:06 (D03)	06:43	06:00	05:37	05:43	06:09	06:40		07:10	17:43 (D03)	06:45	07:18
	16:55	17:31	18:04 22 17:28 (D03)	19:37	20:09	20:36	20:43	20:19	19:33		18:43	20 18:03 (D03)	16:59	16:40
8	07:32	07:12	07:32 18:03 (D03)	06:41 19:00 (D02)	05:59	05:36	05:44	06:10	06:41		07:11	17:47 (D03)	06:46	07:19
	16:56	17:32	19:05 27 18:30 (D03)	19:39 13 19:13 (D02)	20:10	20:37	20:42	20:17	19:31		18:41	12 17:59 (D03)	16:58	16:40
9	07:32	07:10	07:30 18:02 (D03)	06:39 18:58 (D02)	05:57	05:36	05:44	06:11	06:42		07:12		06:47	07:20
	16:57	17:33	19:06 30 18:32 (D03)	19:40 17 19:15 (D02)	20:11	20:38	20:42	20:16	19:30		18:40		16:57	16:40
10	07:32	07:09	07:29 18:00 (D03)	06:38 18:56 (D02)	05:56	05:36	05:45	06:12	06:43		07:13		06:48	07:21
	16:58	17:35	19:07 32 18:32 (D03)	19:41 20 19:16 (D02)	20:12	20:38	20:42	20:15	19:28		18:38		16:56	16:40
11	07:32	07:08	07:27 17:59 (D03)	06:36 18:54 (D02)	05:55	05:36	05:46	06:13	06:44		07:14		06:50	07:22
	16:59	17:36	19:09 35 18:34 (D03)	19:42 23 19:17 (D02)	20:13	20:39	20:41	20:14	19:26		18:36		16:55	16:40
12	07:32	07:07	07:26 17:58 (D03)	06:35 18:53 (D02)	05:54	05:36	05:46	06:14	06:45		07:15		06:51	07:23
	17:00	17:37	19:10 36 18:34 (D03)	19:43 25 19:18 (D02)	20:14	20:39	20:41	20:12	19:25		18:35		16:54	16:40
13	07:31	07:06	07:24 17:56 (D03)	06:33 18:52 (D02)	05:53	05:36	05:47	06:15	06:46	17:55 (D03)	07:16		06:52	07:23
	17:01	17:38	19:11 38 18:34 (D03)	19:44 26 19:18 (D02)	20:15	20:40	20:40	20:11	19:23	15 18:10 (D03)	18:33		16:53	16:40
14	07:31	07:04	07:22 17:56 (D03)	06:32 18:51 (D02)	05:52	05:36	05:48	06:16	06:47	17:52 (D03)	07:17		06:53	07:24
	17:02	17:39	19:12 39 18:35 (D03)	19:45 28 19:19 (D02)	20:16	20:40	20:40	20:10	19:21	20 18:12 (D03)	18:32		16:52	16:40
15	07:31	07:03	07:21 17:55 (D03)	06:30 18:50 (D02)	05:51	05:36	05:49	06:17	06:48	17:49 (D03)	07:19		06:54	07:25
	17:03	17:41	19:13 40 18:35 (D03)	19:46 29 19:19 (D02)	20:17	20:41	20:39	20:08	19:20	25 18:14 (D03)	18:30		16:51	16:41
16	07:30	07:02	07:19 17:54 (D03)	06:28 18:50 (D02)	05:50	05:36	05:49	06:18 19:04 (D02)	06:49	17:47 (D03)	07:20		06:56	07:26
	17:04	17:42	19:14 41 18:35 (D03)	19:47 29 19:19 (D02)	20:18	20:41	20:39	20:07 10 19:14 (D02)	19:18	28 18:15 (D03)	18:28		16:50	16:41
17	07:30	07:00	07:17 17:54 (D03)	06:27 18:50 (D02)	05:49	05:36	05:50	06:19 19:01 (D02)	06:50	17:45 (D03)	07:21		06:57	07:26
	17:05	17:43	19:15 41 18:35 (D03)	19:48 28 19:18 (D02)	20:19	20:41	20:38	20:06 15 19:16 (D02)	19:16	32 18:17 (D03)	18:27		16:49	16:41
18	07:29	06:59	07:16 17:54 (D03)	06:25 18:50 (D02)	05:48	05:36	05:51	06:20 18:59 (D02)	06:51	17:44 (D03)	07:22		06:58	07:27
	17:07	17:44	19:16 41 18:35 (D03)	19:49 29 19:19 (D02)	20:20	20:42	20:37	20:04 19 19:18 (D02)	19:15	33 18:17 (D03)	18:25		16:48	16:41
19	07:29	06:58	07:14 17:53 (D03)	06:24 18:49 (D02)	05:47	05:36	05:52	06:21 18:58 (D02)	06:52	17:42 (D03)	07:23		06:59	07:28
	17:08	17:46	19:17 41 18:34 (D03)	19:50 29 19:18 (D02)	20:21	20:42	20:37	20:03 21 19:19 (D02)	19:13	36 18:18 (D03)	18:24		16:48	16:42
20	07:28	06:56	07:12 17:54 (D03)	06:22 18:50 (D02)	05:47	05:36	05:53	06:22 18:56 (D02)	06:53	17:40 (D03)	07:24		07:00	07:28
	17:09	17:47	19:18 40 18:34 (D03)	19:51 28 19:18 (D02)	20:22	20:42	20:36	20:01 24 19:20 (D02)	19:11	37 18:17 (D03)	18:22		16:47	16:42
21	07:28	06:55	07:11 17:54 (D03)	06:21 18:50 (D02)	05:46	05:36	05:54	06:23 18:55 (D02)	06:54	17:39 (D03)	07:25		07:01	07:29
	17:10	17:48	19:19 39 18:33 (D03)	19:52 26 19:16 (D02)	20:23	20:43	20:35	20:00 26 19:21 (D02)	19:10	39 18:18 (D03)	18:21		16:46	16:43
22	07:27	06:53	07:09 17:54 (D03)	06:19 18:51 (D02)	05:45	05:36	05:54	06:24 18:55 (D02)	06:55	17:38 (D03)	07:26		07:03	07:29
	17:11	17:49	19:21 38 18:32 (D03)	19:53 25 19:16 (D02)	20:24	20:43	20:35	19:58 26 19:21 (D02)	19:08	40 18:18 (D03)	18:20		16:46	16:43
23	07:26	06:52	07:07 17:55 (D03)	06:18 18:51 (D02)	05:44	05:37	05:55	06:25 18:54 (D02)	06:56	17:37 (D03)	07:27		07:04	07:30
	17:12	17:50	19:22 37 18:32 (D03)	19:54 23 19:14 (D02)	20:25	20:43	20:34	19:57 27 19:21 (D02)	19:06	41 18:18 (D03)	18:18		16:45	16:43
24	07:26	06:50	07:06 17:55 (D03)	06:17 18:52 (D02)	05:43	05:37	05:56	06:26 18:53 (D02)	06:57	17:37 (D03)	07:29		07:05	07:30
	17:14	17:51	19:23 36 18:31 (D03)	19:55 21 19:13 (D02)	20:26	20:43	20:33	19:55 29 19:22 (D02)	19:04	41 18:18 (D03)	18:17		16:44	16:44
25	07:25	06:49	07:04 17:55 (D03)	06:15 18:54 (D02)	05:43	05:37	05:57	06:27 18:53 (D02)	06:58	17:36 (D03)	07:30		07:06	07:31
	17:15	17:53	19:24 34 18:29 (D03)	19:56 18 19:12 (D02)	20:26	20:43	20:32	19:54 29 19:22 (D02)	19:03	41 18:17 (D03)	18:15		16:44	16:45
26	07:24	06:48	07:02 17:57 (D03)	06:14 18:55 (D02)	05:42	05:38	05:58	06:28 18:52 (D02)	06:59	17:36 (D03)	07:31		07:07	07:31
	17:16	17:54	19:25 32 18:29 (D03)	19:57 14 19:09 (D02)	20:27	20:44	20:31	19:52 29 19:21 (D02)	19:01	41 18:17 (D03)	18:14		16:43	16:45
27	07:23	06:46	07:01 17:58 (D03)	06:12 18:58 (D02)	05:41	05:38	05:59	06:29 18:52 (D02)	07:00	17:36 (D03)	07:32		07:08	07:31
	17:17	17:55	19:26 29 18:27 (D03)	19:59 8 19:06 (D02)	20:28	20:44	20:30	19:51 29 19:21 (D02)	18:59	40 18:16 (D03)	18:13		16:43	16:46
28	07:22	06:45	06:59 17:59 (D03)	06:11	05:41	05:38	06:00	06:30 18:52 (D02)	07:01	17:35 (D03)	07:33		07:09	07:32
	17:18	17:56	19:27 25 18:24 (D03)	20:00	20:29	20:44	20:29	19:49 29 19:21 (D02)	18:58	41 18:16 (D03)	18:11		16:42	16:46
29	07:22		06:57 18:00 (D03)	06:10	05:40	05:39	06:01	06:31 18:52 (D02)	07:02	17:35 (D03)	07:34		07:10	07:32
	17:20		19:28 21 18:21 (D03)	20:01	20:30	20:44	20:28	19:48 28 19:20 (D02)	18:56	40 18:15 (D03)	18:10		16:42	16:47
30	07:21		06:56 18:03 (D03)	06:08	05:40	05:39	06:02	06:32 18:53 (D02)	07:03	17:36 (D03)	07:35		07:11	07:32
	17:21		19:29 16 18:19 (D03)	20:02	20:31	20:44	20:27	19:46 26 19:19 (D02)	18:54	38 18:14 (D03)	18:09		16:42	16:48
31	07:20		06:54 18:09 (D03)		05:39		06:03	06:33 18:53 (D02)			07:37			07:32
	17:22		19:30 3 18:12 (D03)		20:31		20:26	19:45 25 19:18 (D02)			18:07			16:49
Potential sun hours	298	297	369	398	448	452	458	428	375		346		298	288
Total, worst case			836	459				392	701		223			
Sun reduction			0.73	0.82				0.96	0.93		0.84			
Oper. time red.			1.00	1.00				1.00	1.00		1.00			
Wind dir. red.			0.76	0.60				0.60	0.74		0.76			
Total reduction			0.56	0.49				0.58	0.69		0.64			
Total, real			465	226				226	486		143			

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
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4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 23 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (98)

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	05:40	06:04	06:34	18:47 (D02) / 07:04 / 17:32 (D03)	06:38	07:12
	16:50	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43 (27)	19:14 (D02) / 18:53 (39) / 18:11 (D03)	18:06	16:41
2	07:33	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	18:48 (D02) / 07:05 / 17:31 (D03)	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41 (25)	19:13 (D02) / 18:51 (39) / 18:10 (D03)	17:05	16:41
3	07:33	07:17	06:40	17:06 (D03) / 06:49	06:05	05:38	05:41	06:05	06:36	18:48 (D02) / 07:06 / 17:32 (D03)	06:40	07:14
	16:51	17:26	18:00 (16)	17:22 (D03) / 19:33	20:05	20:34	20:43	20:23	19:40 (24)	19:12 (D02) / 18:49 (37) / 18:09 (D03)	17:04	16:41
4	07:33	07:16	06:38	17:04 (D03) / 06:48	06:03	05:38	05:41	06:06	06:37	18:49 (D02) / 07:07 / 17:33 (D03)	06:41	07:15
	16:52	17:27	18:01 (21)	17:25 (D03) / 19:34	20:06	20:34	20:43	20:22	19:38 (22)	19:11 (D02) / 18:48 (36) / 18:09 (D03)	17:02	16:40
5	07:33	07:15	06:37	17:01 (D03) / 06:46	18:59 (D02) / 06:02	05:37	05:42	06:07	06:38	18:50 (D02) / 07:08 / 17:33 (D03)	06:43	07:16
	16:53	17:28	18:02 (25)	17:26 (D03) / 19:35 (10)	19:09 (D02) / 20:07	20:35	20:43	20:21	19:36 (19)	19:09 (D02) / 18:46 (35) / 18:08 (D03)	17:01	16:40
6	07:33	07:14	06:35	17:00 (D03) / 06:44	18:55 (D02) / 06:01	05:37	05:42	06:08	06:39	18:51 (D02) / 07:09 / 17:34 (D03)	06:44	07:17
	16:54	17:30	18:03 (29)	17:29 (D03) / 19:36 (16)	19:11 (D02) / 20:08	20:36	20:43	20:20	19:35 (16)	19:07 (D02) / 18:44 (32) / 18:06 (D03)	17:00	16:40
7	07:33	07:13	06:34	16:58 (D03) / 06:43	18:54 (D02) / 06:00	05:37	05:43	06:09	06:40	18:54 (D02) / 07:10 / 17:35 (D03)	06:45	07:18
	16:55	17:31	18:04 (31)	17:29 (D03) / 19:37 (19)	19:13 (D02) / 20:09	20:36	20:43	20:19	19:33 (10)	19:04 (D02) / 18:43 (30) / 18:05 (D03)	16:59	16:40
8	07:32	07:12	07:32	17:56 (D03) / 06:41	18:52 (D02) / 05:59	05:36	05:44	06:10	06:41	07:11 / 17:36 (D03)	06:46	07:19
	16:56	17:32	19:05 (34)	18:30 (D03) / 19:39 (22)	19:14 (D02) / 20:10	20:37	20:42	20:17	19:31	18:41 (27) / 18:03 (D03)	16:58	16:40
9	07:32	07:10	07:30	17:56 (D03) / 06:39	18:51 (D02) / 05:57	05:36	05:44	06:11	06:42	07:12 / 17:37 (D03)	06:47	07:20
	16:57	17:33	19:06 (35)	18:31 (D03) / 19:40 (24)	19:15 (D02) / 20:11	20:38	20:42	20:16	19:30	18:39 (24) / 18:01 (D03)	16:57	16:40
10	07:32	07:09	07:29	17:54 (D03) / 06:38	18:50 (D02) / 05:56	05:36	05:45	06:12	06:43	07:13 / 17:39 (D03)	06:48	07:21
	16:58	17:35	19:07 (37)	18:31 (D03) / 19:41 (25)	19:15 (D02) / 20:12	20:38	20:42	20:15	19:28	18:38 (19) / 17:58 (D03)	16:56	16:40
11	07:32	07:08	07:27	17:54 (D03) / 06:36	18:48 (D02) / 05:55	05:36	05:46	06:13	06:44	07:14 / 17:43 (D03)	06:50	07:22
	16:59	17:36	19:09 (38)	18:32 (D03) / 19:42 (27)	19:15 (D02) / 20:13	20:39	20:41	20:14	19:26	18:36 (11) / 17:54 (D03)	16:55	16:40
12	07:32	07:07	07:26	17:53 (D03) / 06:35	18:48 (D02) / 05:54	05:36	05:46	06:14	06:45	07:15	06:51	07:23
	17:00	17:37	19:10 (39)	18:32 (D03) / 19:43 (28)	19:16 (D02) / 20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	17:52 (D03) / 06:33	18:47 (D02) / 05:53	05:36	05:47	06:15	06:46	07:16	06:52	07:23
	17:01	17:38	19:11 (40)	18:32 (D03) / 19:44 (29)	19:16 (D02) / 20:15	20:40	20:40	20:11	19:23	18:33	16:53	16:40
14	07:31	07:04	07:22	17:52 (D03) / 06:32	18:47 (D02) / 05:52	05:36	05:48	06:16	06:47	07:17	06:53	07:24
	17:02	17:39	19:12 (40)	18:32 (D03) / 19:45 (29)	19:16 (D02) / 20:16	20:40	20:40	20:10	19:21	18:32	16:52	16:40
15	07:31	07:03	07:21	17:52 (D03) / 06:30	18:47 (D02) / 05:51	05:36	05:49	06:17	06:48	07:19	06:54	07:25
	17:03	17:41	19:13 (40)	18:32 (D03) / 19:46 (28)	19:15 (D02) / 20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
16	07:30	07:02	07:19	17:51 (D03) / 06:28	18:47 (D02) / 05:50	05:36	05:49	06:18	06:49	17:54 (D03) / 07:20	06:56	07:26
	17:04	17:42	19:14 (40)	18:31 (D03) / 19:47 (28)	19:15 (D02) / 20:18	20:41	20:39	20:07	19:18 (8)	18:02 (D03) / 18:28	16:50	16:41
17	07:30	07:00	07:17	17:52 (D03) / 06:27	18:47 (D02) / 05:49	05:36	05:50	06:19	06:50	17:49 (D03) / 07:21	06:57	07:26
	17:05	17:43	19:15 (39)	18:31 (D03) / 19:48 (27)	19:14 (D02) / 20:19	20:41	20:38	20:06	19:16 (17)	18:06 (D03) / 18:27	16:49	16:41
18	07:29	06:59	07:16	17:52 (D03) / 06:25	18:48 (D02) / 05:48	05:36	05:51	06:20	06:51	17:46 (D03) / 07:22	06:58	07:27
	17:07	17:44	19:16 (38)	18:30 (D03) / 19:49 (26)	19:14 (D02) / 20:20	20:42	20:37	20:04	19:15 (22)	18:08 (D03) / 18:25	16:48	16:41
19	07:29	06:58	07:14	17:52 (D03) / 06:24	18:48 (D02) / 05:47	05:36	05:52	06:21	19:02 (D02) / 06:52	17:44 (D03) / 07:23	06:59	07:28
	17:08	17:46	19:17 (37)	18:29 (D03) / 19:50 (24)	19:12 (D02) / 20:21	20:42	20:37	20:03 (6)	19:08 (D02) / 19:13 (26)	18:10 (D03) / 18:24	16:48	16:42
20	07:28	06:56	07:12	17:53 (D03) / 06:22	18:49 (D02) / 05:47	05:36	05:53	06:22	18:58 (D02) / 06:53	17:41 (D03) / 07:24	07:00	07:28
	17:09	17:47	19:18 (36)	18:29 (D03) / 19:51 (22)	19:11 (D02) / 20:22	20:42	20:36	20:01 (13)	19:11 (D02) / 19:11 (29)	18:10 (D03) / 18:22	16:47	16:42
21	07:28	06:55	07:11	17:53 (D03) / 06:21	18:50 (D02) / 05:46	05:36	05:54	06:23	18:56 (D02) / 06:54	17:39 (D03) / 07:25	07:01	07:29
	17:10	17:48	19:19 (34)	18:27 (D03) / 19:52 (19)	19:09 (D02) / 20:23	20:43	20:35	20:00 (17)	19:13 (D02) / 19:10 (32)	18:11 (D03) / 18:21	16:46	16:43
22	07:27	06:53	07:09	17:54 (D03) / 06:19	18:51 (D02) / 05:45	05:36	05:54	06:24	18:54 (D02) / 06:55	17:38 (D03) / 07:26	07:03	07:29
	17:11	17:49	19:21 (32)	18:26 (D03) / 19:53 (17)	19:08 (D02) / 20:24	20:43	20:35	19:58 (20)	19:14 (D02) / 19:08 (34)	18:12 (D03) / 18:20	16:46	16:43
23	07:26	06:52	07:07	17:55 (D03) / 06:18	18:53 (D02) / 05:44	05:37	05:55	06:25	18:53 (D02) / 06:56	17:37 (D03) / 07:27	07:04	07:30
	17:12	17:50	19:22 (30)	18:25 (D03) / 19:54 (12)	19:05 (D02) / 20:25	20:43	20:34	19:57 (22)	19:15 (D02) / 19:06 (35)	18:12 (D03) / 18:18	16:45	16:43
24	07:26	06:50	07:06	17:56 (D03) / 06:17	18:58 (D02) / 05:43	05:37	05:56	06:26	18:52 (D02) / 06:57	17:35 (D03) / 07:29	07:05	07:30
	17:14	17:51	19:23 (27)	18:23 (D03) / 19:55 (2)	19:00 (D02) / 20:26	20:43	20:33	19:55 (24)	19:16 (D02) / 19:04 (37)	18:12 (D03) / 18:17	16:44	16:44
25	07:25	06:49	07:04	17:57 (D03) / 06:15	05:43	05:37	05:57	06:27	18:51 (D02) / 06:58	17:34 (D03) / 07:30	07:06	07:31
	17:15	17:53	19:24 (23)	18:20 (D03) / 19:56	20:26	20:43	20:32	19:54 (26)	19:17 (D02) / 19:03 (38)	18:12 (D03) / 18:15	16:44	16:45
26	07:24	06:48	07:02	18:00 (D03) / 06:14	05:42	05:38	05:58	06:28	18:50 (D02) / 06:59	17:34 (D03) / 07:31	07:07	07:31
	17:16	17:54	19:25 (18)	18:18 (D03) / 19:57	20:27	20:44	20:31	19:52 (27)	19:17 (D02) / 19:01 (38)	18:12 (D03) / 18:14	16:43	16:45
27	07:23	06:46	07:01	18:04 (D03) / 06:12	05:41	05:38	05:59	06:29	18:49 (D02) / 07:00	17:33 (D03) / 07:32	07:08	07:31
	17:17	17:55	19:26 (10)	18:14 (D03) / 19:59	20:28	20:44	20:30	19:51 (28)	19:17 (D02) / 18:59 (39)	18:12 (D03) / 18:13	16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	18:49 (D02) / 07:01	17:32 (D03) / 07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49 (28)	19:17 (D02) / 18:58 (40)	18:12 (D03) / 18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	18:48 (D02) / 07:02	17:32 (D03) / 07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48 (29)	19:17 (D02) / 18:56 (40)	18:12 (D03) / 18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	18:48 (D02) / 07:03	17:32 (D03) / 07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46 (28)	19:16 (D02) / 18:54 (39)	18:11 (D03) / 18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33	18:48 (D02)	07:37		07:32
	17:22		19:30		20:31		20:26	19:45 (28)	19:16 (D02)	18:07		16:49
Potential sun hours	298	297	369	398	448	452	458	428	375	346	298	288
Total, worst case			789	434				296	617	329		
Sun reduction			0.73	0.82				0.96	0.93	0.84		
Oper. time red.			1.00	1.00				1.00	1.00	1.00		
Wind dir. red.			0.77	0.61				0.61	0.73	0.77		
Total reduction			0.57	0.50				0.59	0.69	0.65		
Total, real			446	219				175	423	214		

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 24 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (99)

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		17:08 (D03)	06:52		06:07	05:39	05:40	06:04		06:34		18:45 (D02)	07:04	17:31 (D03)	06:38	07:12
	16:50	17:23	17:57	12	17:20 (D03)	19:31		20:03	20:32	20:44	20:25		19:43	27	19:12 (D02)	18:53	18:09 (D03)	18:06	16:41
2	07:33	07:18	06:41		17:04 (D03)	06:51		06:06	05:38	05:40	06:05		06:35		18:44 (D02)	07:05	17:31 (D03)	06:39	07:13
	16:50	17:25	17:58	19	17:23 (D03)	19:32		20:04	20:33	20:44	20:24		19:41	28	19:12 (D02)	18:51	18:09 (D03)	17:05	16:41
3	07:33	07:17	06:40		17:01 (D03)	06:49	18:57 (D02)	06:05	05:38	05:41	06:05		06:36		18:44 (D02)	07:06	17:30 (D03)	06:40	07:14
	16:51	17:26	18:00	23	17:24 (D03)	19:33	19:07 (D02)	20:05	20:34	20:43	20:23		19:40	27	19:11 (D02)	18:49	18:08 (D03)	17:04	16:41
4	07:33	07:16	06:38		17:00 (D03)	06:48	18:54 (D02)	06:03	05:38	05:41	06:06		06:37		18:45 (D02)	07:07	17:31 (D03)	06:41	07:15
	16:52	17:27	18:01	27	17:27 (D03)	19:34	19:10 (D02)	20:06	20:34	20:43	20:22		19:38	25	19:10 (D02)	18:48	18:08 (D03)	17:02	16:40
5	07:33	07:15	06:37		16:58 (D03)	06:46	18:52 (D02)	06:02	05:37	05:42	06:07		06:38		18:45 (D02)	07:08	17:31 (D03)	06:43	07:16
	16:53	17:28	18:02	29	17:27 (D03)	19:35	19:11 (D02)	20:07	20:35	20:43	20:21		19:36	24	19:09 (D02)	18:46	18:07 (D03)	17:01	16:40
6	07:33	07:14	06:35		16:57 (D03)	06:44	18:50 (D02)	06:01	05:37	05:42	06:08		06:39		18:46 (D02)	07:09	17:32 (D03)	06:44	07:17
	16:54	17:30	18:03	32	17:29 (D03)	19:36	19:12 (D02)	20:08	20:36	20:43	20:20		19:35	22	19:08 (D02)	18:44	18:06 (D03)	17:00	16:40
7	07:33	07:13	06:34		16:55 (D03)	06:43	18:49 (D02)	06:00	05:37	05:43	06:09		06:40		18:47 (D02)	07:10	17:32 (D03)	06:45	07:18
	16:55	17:31	18:04	34	17:29 (D03)	19:37	19:13 (D02)	20:09	20:36	20:43	20:19		19:33	19	19:06 (D02)	18:43	18:05 (D03)	16:59	16:40
8	07:32	07:12	07:32		17:54 (D03)	06:41	18:48 (D02)	05:59	05:36	05:44	06:10		06:41		18:48 (D02)	07:11	17:33 (D03)	06:46	07:19
	16:56	17:32	19:05	35	18:29 (D03)	19:39	19:13 (D02)	20:10	20:37	20:42	20:17		19:31	16	19:04 (D02)	18:41	18:04 (D03)	16:58	16:40
9	07:32	07:10	07:30		17:54 (D03)	06:39	18:47 (D02)	05:57	05:36	05:44	06:11		06:42		18:51 (D02)	07:12	17:34 (D03)	06:47	07:20
	16:57	17:33	19:06	36	18:30 (D03)	19:40	19:14 (D02)	20:11	20:38	20:42	20:16		19:30	10	19:01 (D02)	18:39	18:02 (D03)	16:57	16:40
10	07:32	07:09	07:29		17:53 (D03)	06:38	18:46 (D02)	05:56	05:36	05:45	06:12		06:43			07:13	17:35 (D03)	06:48	07:21
	16:58	17:35	19:07	37	18:30 (D03)	19:41	19:14 (D02)	20:12	20:38	20:42	20:15		19:28			18:38	18:00 (D03)	16:56	16:40
11	07:32	07:08	07:27		17:53 (D03)	06:36	18:46 (D02)	05:55	05:36	05:46	06:13		06:44			07:14	17:36 (D03)	06:50	07:22
	16:59	17:36	19:09	38	18:31 (D03)	19:42	19:13 (D02)	20:13	20:39	20:41	20:14		19:26			18:36	17:58 (D03)	16:55	16:40
12	07:32	07:07	07:26		17:52 (D03)	06:35	18:46 (D02)	05:54	05:36	05:46	06:14		06:45			07:15	17:39 (D03)	06:51	07:23
	17:00	17:37	19:10	38	18:30 (D03)	19:43	19:13 (D02)	20:14	20:39	20:41	20:12		19:25			18:35	17:55 (D03)	16:54	16:40
13	07:31	07:06	07:24		17:52 (D03)	06:33	18:45 (D02)	05:53	05:36	05:47	06:15		06:46			07:16	17:43 (D03)	06:52	07:23
	17:01	17:38	19:11	38	18:30 (D03)	19:44	19:13 (D02)	20:15	20:40	20:40	20:11		19:23			18:33	17:50 (D03)	16:53	16:40
14	07:31	07:04	07:22		17:52 (D03)	06:32	18:46 (D02)	05:52	05:36	05:48	06:16		06:47			07:17		06:53	07:24
	17:02	17:39	19:12	38	18:30 (D03)	19:45	19:13 (D02)	20:16	20:40	20:40	20:10		19:21			18:32		16:52	16:40
15	07:31	07:03	07:21		17:52 (D03)	06:30	18:46 (D02)	05:51	05:36	05:49	06:17		06:48			07:19		06:54	07:25
	17:03	17:41	19:13	37	18:29 (D03)	19:46	19:11 (D02)	20:17	20:41	20:39	20:08		19:20			18:30		16:51	16:41
16	07:30	07:02	07:19		17:52 (D03)	06:28	18:47 (D02)	05:50	05:36	05:49	06:18		06:49			07:20		06:56	07:26
	17:04	17:42	19:14	36	18:28 (D03)	19:47	19:11 (D02)	20:18	20:41	20:39	20:07		19:18			18:28		16:50	16:41
17	07:30	07:00	07:17		17:53 (D03)	06:27	18:47 (D02)	05:49	05:36	05:50	06:19		06:50			07:21		06:57	07:26
	17:05	17:43	19:15	35	18:28 (D03)	19:48	19:09 (D02)	20:19	20:41	20:38	20:06		19:16			18:27		16:49	16:41
18	07:29	06:59	07:16		17:53 (D03)	06:25	18:48 (D02)	05:48	05:36	05:51	06:20		06:51			07:22		06:58	07:27
	17:07	17:44	19:16	34	18:27 (D03)	19:49	19:08 (D02)	20:20	20:42	20:37	20:04		19:15			18:25		16:48	16:41
19	07:29	06:58	07:14		17:53 (D03)	06:24	18:49 (D02)	05:47	05:36	05:52	06:21		06:52		17:49 (D03)	07:23		06:59	07:28
	17:08	17:46	19:17	32	18:25 (D03)	19:50	19:06 (D02)	20:21	20:42	20:37	20:03		19:13	11	18:00 (D03)	18:24		16:48	16:42
20	07:28	06:56	07:12		17:55 (D03)	06:22	18:51 (D02)	05:47	05:36	05:53	06:22		06:53		17:45 (D03)	07:24		07:00	07:28
	17:09	17:47	19:18	30	18:25 (D03)	19:51	19:04 (D02)	20:22	20:42	20:36	20:01		19:11	19	18:04 (D03)	18:22		16:47	16:42
21	07:28	06:55	07:11		17:55 (D03)	06:21	18:55 (D02)	05:46	05:36	05:54	06:23		06:54		17:42 (D03)	07:25		07:01	07:29
	17:10	17:48	19:19	28	18:23 (D03)	19:52	18:59 (D02)	20:23	20:43	20:35	20:00		19:10	23	18:05 (D03)	18:21		16:46	16:43
22	07:27	06:53	07:09		17:57 (D03)	06:19		05:45	05:36	05:54	06:24	18:59 (D02)	06:55		17:40 (D03)	07:26		07:03	07:29
	17:11	17:49	19:21	24	18:21 (D03)	19:53		20:24	20:43	20:35	19:58	6 19:05 (D02)	19:08	27	18:07 (D03)	18:20		16:46	16:43
23	07:26	06:52	07:07		17:59 (D03)	06:18		05:44	05:37	05:55	06:25	18:55 (D02)	06:56		17:38 (D03)	07:27		07:04	07:30
	17:12	17:50	19:22	20	18:19 (D03)	19:54		20:25	20:43	20:34	19:57	13 19:08 (D02)	19:06	30	18:08 (D03)	18:18		16:45	16:43
24	07:26	06:50	07:06		18:02 (D03)	06:17		05:43	05:37	05:56	06:26	18:53 (D02)	06:57		17:37 (D03)	07:29		07:05	07:30
	17:14	17:51	19:23	13	18:15 (D03)	19:55		20:26	20:43	20:33	19:55	17 19:10 (D02)	19:04	32	18:09 (D03)	18:17		16:44	16:44
25	07:25	06:49	07:04			06:15		05:43	05:37	05:57	06:27	18:51 (D02)	06:58		17:36 (D03)	07:30		07:06	07:31
	17:15	17:53	19:24			19:56		20:26	20:43	20:32	19:54	20 19:11 (D02)	19:03	33	18:09 (D03)	18:15		16:44	16:45
26	07:24	06:48	07:02			06:14		05:42	05:38	05:58	06:28	18:50 (D02)	06:59		17:34 (D03)	07:31		07:07	07:31
	17:16	17:54	19:25			19:57		20:27	20:44	20:31	19:52	22 19:12 (D02)	19:01	35	18:09 (D03)	18:14		16:43	16:45
27	07:23	06:46	07:01			06:12		05:41	05:38	05:59	06:29	18:49 (D02)	07:00		17:33 (D03)	07:32		07:08	07:31
	17:17	17:55	19:26			19:59		20:28	20:44	20:30	19:51	24 19:13 (D02)	18:59	37	18:10 (D03)	18:13		16:43	16:46
28	07:22	06:45	06:59			06:11		05:41	05:38	06:00	06:30	18:48 (D02)	07:01		17:33 (D03)	07:33		07:09	07:32
	17:18	17:56	19:27			20:00		20:29	20:44	20:29	19:49	25 19:13 (D02)	18:58	37	18:10 (D03)	18:11		16:42	16:46
29	07:22		06:57			06:10		05:40	05:39	06:01	06:31	18:47 (D02)	07:02		17:32 (D03)	07:34		07:10	07:32
	17:20		19:28			20:01		20:30	20:44	20:28	19:48	26 19:13 (D02)	18:56	38	18:10 (D03)	18:10		16:42	16:47
30	07:21		06:56			06:08		05:40	05:39	06:02	06:32	18:46 (D02)	07:03		17:31 (D03)	07:35		07:11	07:32
	17:21		19:29			20:02		20:31	20:44	20:27	19:46	28 19:14 (D02)	18:54	38	18:09 (D03)	18:09		16:42	16:48
31	07:20		06:54					05:39		06:03	06:33	18:46 (D02)				07:37			07:32
	17:22		19:30					20:31		20:26	19:45	27 19:13 (D02)				18:07			16:49
Potential sun hours	298	297	369		398		448	452	458	428		375		346		298	288		
Total, worst case				725		405					208		558		383				
Sun reduction				0.73		0.82					0.96		0.93		0.84				
Oper. time red.				1.00		1.00					1.00		1.00		1.00				
Wind dir. red.				0.78		0.62					0.62		0.72		0.78				
Total reduction				0.57		0.51					0.60		0.68		0.66				
Total, real				413		208					125		377		251				

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 25 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (100)

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	05:40	06:04	06:34	18:46 (D02)	07:04	17:39 (D03)	06:38	07:12
	16:50	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43 (26)	19:12 (D02)	18:53 (34)	18:13 (D03)	18:06	16:41
2	07:33	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	18:46 (D02)	07:05	17:39 (D03)	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41 (26)	19:12 (D02)	18:51 (34)	18:13 (D03)	17:05	16:41
3	07:33	07:17	06:40	06:49 18:57 (D02)	06:05	05:38	05:41	06:05	06:36	18:46 (D02)	07:06	17:39 (D03)	06:40	07:14
	16:51	17:26	18:00	19:33 (11) 19:08 (D02)	20:05	20:34	20:43	20:23	19:40 (25)	19:11 (D02)	18:49 (33)	18:12 (D03)	17:04	16:41
4	07:33	07:16	06:38	17:14 (D03) 06:48	18:55 (D02) 06:03	05:38	05:41	06:06	06:37	18:46 (D02)	07:07	17:41 (D03)	06:41	07:15
	16:52	17:27	18:01 (12)	17:26 (D03) 19:34 (16)	19:11 (D02) 20:06	20:34	20:43	20:22	19:38 (24)	19:10 (D02)	18:48 (31)	18:12 (D03)	17:02	16:40
5	07:33	07:15	06:37	17:10 (D03) 06:46	18:53 (D02) 06:02	05:37	05:42	06:07	06:38	18:46 (D02)	07:08	17:41 (D03)	06:43	07:16
	16:53	17:28	18:02 (18)	17:28 (D03) 19:35 (19)	19:12 (D02) 20:07	20:35	20:43	20:21	19:36 (23)	19:09 (D02)	18:46 (29)	18:10 (D03)	17:01	16:40
6	07:33	07:14	06:35	17:08 (D03) 06:44	18:51 (D02) 06:01	05:37	05:42	06:08	06:39	18:47 (D02)	07:09	17:42 (D03)	06:44	07:17
	16:54	17:30	18:03 (23)	17:31 (D03) 19:36 (21)	19:12 (D02) 20:08	20:36	20:43	20:20	19:35 (21)	19:08 (D02)	18:44 (27)	18:09 (D03)	17:00	16:40
7	07:33	07:13	06:34	17:06 (D03) 06:43	18:50 (D02) 06:00	05:37	05:43	06:09	06:40	18:48 (D02)	07:10	17:43 (D03)	06:45	07:18
	16:55	17:31	18:04 (26)	17:32 (D03) 19:37 (23)	19:13 (D02) 20:09	20:36	20:43	20:19	19:33 (19)	19:07 (D02)	18:43 (24)	18:07 (D03)	16:59	16:40
8	07:32	07:12	07:32	18:04 (D03) 06:41	18:49 (D02) 05:59	05:36	05:44	06:10	06:41	18:49 (D02)	07:11	17:44 (D03)	06:46	07:19
	16:56	17:32	19:05 (28)	18:32 (D03) 19:38 (24)	19:13 (D02) 20:10	20:37	20:42	20:17	19:31 (16)	19:05 (D02)	18:41 (21)	18:05 (D03)	16:58	16:40
9	07:32	07:10	07:30	18:03 (D03) 06:39	18:48 (D02) 05:57	05:36	05:44	06:11	06:42	18:51 (D02)	07:12	17:46 (D03)	06:47	07:20
	16:57	17:33	19:06 (31)	18:34 (D03) 19:40 (25)	19:13 (D02) 20:11	20:38	20:42	20:16	19:30 (11)	19:02 (D02)	18:39 (16)	18:02 (D03)	16:57	16:40
10	07:32	07:09	07:29	18:02 (D03) 06:38	18:48 (D02) 05:56	05:36	05:45	06:12	06:43		07:13	17:50 (D03)	06:48	07:21
	16:58	17:35	19:07 (32)	18:34 (D03) 19:41 (26)	19:14 (D02) 20:12	20:38	20:42	20:15	19:28		18:38 (7)	17:57 (D03)	16:56	16:40
11	07:32	07:08	07:27	18:02 (D03) 06:36	18:47 (D02) 05:55	05:36	05:46	06:13	06:44		07:14		06:50	07:22
	16:59	17:36	19:09 (33)	18:35 (D03) 19:42 (26)	19:13 (D02) 20:13	20:39	20:41	20:14	19:26		18:36		16:55	16:40
12	07:32	07:07	07:26	18:01 (D03) 06:35	18:48 (D02) 05:54	05:36	05:46	06:14	06:45		07:15		06:51	07:23
	17:00	17:37	19:10 (34)	18:35 (D03) 19:43 (25)	19:13 (D02) 20:14	20:39	20:41	20:12	19:25		18:35		16:54	16:40
13	07:31	07:06	07:24	18:00 (D03) 06:33	18:47 (D02) 05:53	05:36	05:47	06:15	06:46		07:16		06:52	07:23
	17:01	17:38	19:11 (34)	18:34 (D03) 19:44 (25)	19:12 (D02) 20:15	20:40	20:40	20:11	19:23		18:33		16:53	16:40
14	07:31	07:04	07:22	18:00 (D03) 06:32	18:48 (D02) 05:52	05:36	05:48	06:16	06:47		07:17		06:53	07:24
	17:02	17:39	19:12 (35)	18:35 (D03) 19:45 (24)	19:12 (D02) 20:16	20:40	20:40	20:10	19:21		18:32		16:52	16:40
15	07:31	07:03	07:21	18:00 (D03) 06:30	18:48 (D02) 05:51	05:36	05:49	06:17	06:48		07:19		06:54	07:25
	17:03	17:41	19:13 (34)	18:34 (D03) 19:46 (22)	19:10 (D02) 20:17	20:41	20:39	20:08	19:20		18:30		16:51	16:41
16	07:30	07:02	07:19	17:59 (D03) 06:28	18:49 (D02) 05:50	05:36	05:49	06:18	06:49		07:20		06:56	07:26
	17:04	17:42	19:14 (34)	18:33 (D03) 19:47 (21)	19:10 (D02) 20:18	20:41	20:39	20:07	19:18		18:28		16:50	16:41
17	07:30	07:00	07:17	18:00 (D03) 06:27	18:50 (D02) 05:49	05:36	05:50	06:19	06:50		07:21		06:57	07:26
	17:05	17:43	19:15 (34)	18:34 (D03) 19:48 (18)	19:08 (D02) 20:19	20:41	20:38	20:06	19:16		18:27		16:49	16:41
18	07:29	06:59	07:16	18:00 (D03) 06:25	18:52 (D02) 05:48	05:36	05:51	06:20	06:51	17:59 (D03)	07:22		06:58	07:27
	17:07	17:44	19:16 (32)	18:32 (D03) 19:49 (14)	19:06 (D02) 20:20	20:42	20:37	20:04	19:15 (7)	18:06 (D03)	18:25		16:48	16:41
19	07:29	06:58	07:14	18:00 (D03) 06:24	18:54 (D02) 05:47	05:36	05:52	06:21	06:52	17:53 (D03)	07:23		06:59	07:28
	17:08	17:46	19:17 (31)	18:31 (D03) 19:50 (8)	19:02 (D02) 20:21	20:42	20:37	20:03	19:13 (16)	18:09 (D03)	18:24		16:48	16:42
20	07:28	06:56	07:12	18:01 (D03) 06:22	05:47	05:36	05:53	06:22	06:53	17:50 (D03)	07:24		07:00	07:28
	17:09	17:47	19:18 (30)	18:31 (D03) 19:51	20:22	20:42	20:36	20:01	19:11 (21)	18:11 (D03)	18:22		16:47	16:42
21	07:28	06:55	07:11	18:02 (D03) 06:21	05:46	05:36	05:54	06:23	06:54	17:48 (D03)	07:25		07:01	07:29
	17:10	17:48	19:19 (27)	18:29 (D03) 19:52	20:23	20:43	20:35	20:00	19:10 (24)	18:12 (D03)	18:21		16:46	16:43
22	07:27	06:53	07:09	18:02 (D03) 06:19	05:45	05:36	05:54	06:24	06:55	17:46 (D03)	07:26		07:03	07:29
	17:11	17:49	19:21 (25)	18:27 (D03) 19:53	20:24	20:43	20:35	19:58	19:08 (27)	18:13 (D03)	18:20		16:46	16:43
23	07:26	06:52	07:07	18:04 (D03) 06:18	05:44	05:37	05:55	06:25	06:56	17:45 (D03)	07:27		07:04	07:30
	17:12	17:50	19:22 (22)	18:26 (D03) 19:54	20:25	20:43	20:34	19:57	19:06 (29)	18:14 (D03)	18:18		16:45	16:43
24	07:26	06:50	07:06	18:06 (D03) 06:17	05:43	05:37	05:56	06:26 18:57 (D02)	06:57	17:44 (D03)	07:29		07:05	07:30
	17:14	17:51	19:23 (17)	18:23 (D03) 19:55	20:26	20:43	20:33	19:55 (10) 19:07 (D02)	19:04 (30)	18:14 (D03)	18:17		16:44	16:44
25	07:25	06:49	07:04	18:09 (D03) 06:15	05:43	05:37	05:57	06:27 18:55 (D02)	06:58	17:42 (D03)	07:30		07:06	07:31
	17:15	17:53	19:24 (10)	18:19 (D03) 19:56	20:26	20:43	20:32	19:54 (14) 19:09 (D02)	19:03 (33)	18:15 (D03)	18:15		16:44	16:45
26	07:24	06:48	07:02	06:14	05:42	05:38	05:58	06:28 18:53 (D02)	06:59	17:42 (D03)	07:31		07:07	07:31
	17:16	17:54	19:25	19:57	20:27	20:44	20:31	19:52 (18) 19:11 (D02)	19:01 (33)	18:15 (D03)	18:14		16:43	16:45
27	07:23	06:46	07:01	06:12	05:41	05:38	05:59	06:29 18:51 (D02)	07:00	17:41 (D03)	07:32		07:08	07:31
	17:17	17:55	19:26	19:59	20:28	20:44	20:30	19:51 (21) 19:12 (D02)	18:59 (34)	18:15 (D03)	18:13		16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30 18:50 (D02)	07:01	17:40 (D03)	07:33		07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49 (22) 19:12 (D02)	18:58 (35)	18:15 (D03)	18:11		16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31 18:49 (D02)	07:02	17:40 (D03)	07:34		07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48 (24) 19:13 (D02)	18:56 (34)	18:14 (D03)	18:10		16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32 18:48 (D02)	07:03	17:39 (D03)	07:35		07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46 (25) 19:13 (D02)	18:54 (35)	18:14 (D03)	18:09		16:42	16:48
31	07:20		06:54		05:39		06:03	06:33 18:48 (D02)			07:37			07:32
	17:22		19:30		20:31		20:26	19:45 (25) 19:13 (D02)			18:07			16:49
Potential sun hours	298	297	369	398	448	452	458	428	375		346		298	288
Total, worst case			602	348				159	549		256			
Sun reduction			0.73	0.82				0.96	0.93		0.84			
Oper. time red.			1.00	1.00				1.00	1.00		1.00			
Wind dir. red.			0.77	0.62				0.62	0.72		0.77			
Total reduction			0.56	0.51				0.60	0.67		0.65			
Total, real			338	179				96	367		165			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 26 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (101)

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	05:40	06:04	06:34	18:49 (D02)	07:04	17:47 (D03)	06:38	07:12
	16:50	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43 24	19:13 (D02)	18:53 30	18:17 (D03)	18:06	16:41
2	07:33	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	18:49 (D02)	07:05	17:48 (D03)	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41 24	19:13 (D02)	18:51 27	18:15 (D03)	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	18:49 (D02)	07:06	17:49 (D03)	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40 23	19:12 (D02)	18:49 25	18:14 (D03)	17:04	16:41
4	07:33	07:16	06:38	06:48 19:00 (D02)	06:03	05:38	05:41	06:06	06:37	18:49 (D02)	07:07	17:51 (D03)	06:41	07:15
	16:52	17:27	18:01	19:34 10 19:10 (D02)	20:06	20:34	20:43	20:22	19:38 22	19:11 (D02)	18:48 22	18:13 (D03)	17:02	16:40
5	07:33	07:15	06:37	06:46 18:57 (D02)	06:02	05:37	05:42	06:07	06:38	18:50 (D02)	07:08	17:52 (D03)	06:43	07:16
	16:53	17:28	18:02	19:35 15 19:12 (D02)	20:07	20:35	20:43	20:21	19:36 20	19:10 (D02)	18:46 19	18:11 (D03)	17:01	16:40
6	07:33	07:14	06:35	06:44 18:54 (D02)	06:01	05:37	05:42	06:08	06:39	18:50 (D02)	07:09	17:55 (D03)	06:44	07:17
	16:54	17:30	18:03	19:36 19 19:13 (D02)	20:08	20:36	20:43	20:20	19:35 19	19:09 (D02)	18:44 13	18:08 (D03)	17:00	16:40
7	07:33	07:13	06:34 17:20 (D03)	06:43 18:54 (D02)	06:00	05:37	05:43	06:09	06:40	18:52 (D02)	07:10		06:45	07:18
	16:55	17:31	18:04 9 17:29 (D03)	19:37 20 19:14 (D02)	20:09	20:36	20:43	20:19	19:33 15	19:07 (D02)	18:43		16:59	16:40
8	07:32	07:12	07:32 18:16 (D03)	06:41 18:52 (D02)	05:59	05:36	05:44	06:10	06:41	18:54 (D02)	07:11		06:46	07:19
	16:56	17:32	19:05 16 18:32 (D03)	19:38 22 19:14 (D02)	20:10	20:37	20:42	20:17	19:31 10	19:04 (D02)	18:41		16:58	16:40
9	07:32	07:10	07:30 18:14 (D03)	06:39 18:51 (D02)	05:57	05:36	05:44	06:11	06:42		07:12		06:47	07:20
	16:57	17:33	19:06 21 18:35 (D03)	19:40 23 19:14 (D02)	20:11	20:38	20:42	20:16	19:30		18:39		16:57	16:40
10	07:32	07:09	07:29 18:12 (D03)	06:38 18:51 (D02)	05:56	05:36	05:45	06:12	06:43		07:13		06:48	07:21
	16:58	17:35	19:07 24 18:36 (D03)	19:41 24 19:15 (D02)	20:12	20:38	20:42	20:15	19:28		18:38		16:56	16:40
11	07:32	07:08	07:27 18:11 (D03)	06:36 18:50 (D02)	05:55	05:36	05:46	06:13	06:44		07:14		06:50	07:22
	16:59	17:36	19:09 26 18:37 (D03)	19:42 24 19:14 (D02)	20:13	20:39	20:41	20:14	19:26		18:36		16:55	16:40
12	07:32	07:07	07:26 18:09 (D03)	06:35 18:50 (D02)	05:54	05:36	05:46	06:14	06:45		07:15		06:51	07:23
	17:00	17:37	19:10 29 18:38 (D03)	19:43 25 19:15 (D02)	20:14	20:39	20:41	20:12	19:25		18:35		16:54	16:40
13	07:31	07:06	07:24 18:08 (D03)	06:33 18:50 (D02)	05:53	05:36	05:47	06:15	06:46		07:16		06:52	07:23
	17:01	17:38	19:11 30 18:38 (D03)	19:44 24 19:14 (D02)	20:15	20:40	20:40	20:11	19:23		18:33		16:53	16:40
14	07:31	07:04	07:22 18:08 (D03)	06:32 18:50 (D02)	05:52	05:36	05:48	06:16	06:47		07:17		06:53	07:24
	17:02	17:39	19:12 31 18:39 (D03)	19:45 24 19:14 (D02)	20:16	20:40	20:40	20:10	19:21		18:32		16:52	16:40
15	07:31	07:03	07:21 18:07 (D03)	06:30 18:50 (D02)	05:51	05:36	05:49	06:17	06:48		07:19		06:54	07:25
	17:03	17:41	19:13 32 18:39 (D03)	19:46 22 19:12 (D02)	20:17	20:41	20:39	20:08	19:20		18:30		16:51	16:41
16	07:30	07:02	07:19 18:06 (D03)	06:28 18:51 (D02)	05:50	05:36	05:49	06:18	06:49	18:05 (D03)	07:20		06:56	07:26
	17:04	17:42	19:14 32 18:38 (D03)	19:47 21 19:12 (D02)	20:18	20:41	20:39	20:07	19:18 7	18:12 (D03)	18:28		16:50	16:41
17	07:30	07:00	07:17 18:06 (D03)	06:27 18:52 (D02)	05:49	05:36	05:50	06:19	06:50	18:01 (D03)	07:21		06:57	07:26
	17:05	17:43	19:15 33 18:39 (D03)	19:48 18 19:10 (D02)	20:19	20:41	20:38	20:06	19:16 15	18:16 (D03)	18:27		16:49	16:41
18	07:29	06:59	07:16 18:06 (D03)	06:25 18:53 (D02)	05:48	05:36	05:51	06:20	06:51	17:58 (D03)	07:22		06:58	07:27
	17:07	17:44	19:16 32 18:38 (D03)	19:49 16 19:09 (D02)	20:20	20:42	20:37	20:04	19:15 20	18:18 (D03)	18:25		16:48	16:41
19	07:29	06:58	07:14 18:05 (D03)	06:24 18:55 (D02)	05:47	05:36	05:52	06:21	06:52	17:55 (D03)	07:23		06:59	07:28
	17:08	17:46	19:17 32 18:37 (D03)	19:50 11 19:06 (D02)	20:21	20:42	20:37	20:03	19:13 23	18:18 (D03)	18:24		16:48	16:42
20	07:28	06:56	07:12 18:06 (D03)	06:22	05:47	05:36	05:53	06:22	06:53	17:53 (D03)	07:24		07:00	07:28
	17:09	17:47	19:18 31 18:37 (D03)	19:51	20:22	20:42	20:36	20:01	19:11 26	18:19 (D03)	18:22		16:47	16:42
21	07:28	06:55	07:11 18:06 (D03)	06:21	05:46	05:36	05:53	06:23	06:54	17:52 (D03)	07:25		07:01	07:29
	17:10	17:48	19:19 30 18:36 (D03)	19:52	20:23	20:43	20:35	20:00	19:10 28	18:20 (D03)	18:21		16:46	16:42
22	07:27	06:53	07:09 18:06 (D03)	06:19	05:45	05:36	05:54	06:24	06:55	17:51 (D03)	07:26		07:03	07:29
	17:11	17:49	19:21 29 18:35 (D03)	19:53	20:24	20:43	20:35	19:58	19:08 29	18:20 (D03)	18:20		16:46	16:43
23	07:26	06:52	07:07 18:08 (D03)	06:18	05:44	05:37	05:55	06:25 19:02 (D02)	06:56	17:50 (D03)	07:27		07:04	07:30
	17:12	17:50	19:22 26 18:34 (D03)	19:54	20:25	20:43	20:34	19:57 4 19:06 (D02)	19:06 31	18:21 (D03)	18:18		16:45	16:43
24	07:26	06:50	07:06 18:08 (D03)	06:17	05:43	05:37	05:56	06:26 18:58 (D02)	06:57	17:49 (D03)	07:29		07:05	07:30
	17:14	17:51	19:23 24 18:32 (D03)	19:55	20:26	20:43	20:33	19:55 12 19:10 (D02)	19:04 32	18:21 (D03)	18:17		16:44	16:44
25	07:25	06:49	07:04 18:09 (D03)	06:15	05:43	05:37	05:57	06:27 18:56 (D02)	06:58	17:48 (D03)	07:30		07:06	07:31
	17:15	17:53	19:24 21 18:30 (D03)	19:56	20:26	20:43	20:32	19:54 16 19:12 (D02)	19:03 33	18:21 (D03)	18:15		16:44	16:45
26	07:24	06:48	07:02 18:11 (D03)	06:14	05:42	05:38	05:58	06:28 18:54 (D02)	06:59	17:48 (D03)	07:31		07:07	07:31
	17:16	17:54	19:25 16 18:27 (D03)	19:57	20:27	20:44	20:31	19:52 19 19:13 (D02)	19:01 32	18:20 (D03)	18:14		16:43	16:45
27	07:23	06:46	07:01 18:15 (D03)	06:12	05:41	05:38	05:59	06:29 18:53 (D02)	07:00	17:47 (D03)	07:32		07:08	07:31
	17:17	17:55	19:26 9 18:24 (D03)	19:59	20:28	20:44	20:30	19:51 21 19:14 (D02)	18:59 33	18:20 (D03)	18:13		16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30 18:52 (D02)	07:01	17:47 (D03)	07:33		07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49 22 19:14 (D02)	18:58 32	18:19 (D03)	18:11		16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31 18:51 (D02)	07:02	17:47 (D03)	07:34		07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48 24 19:15 (D02)	18:56 32	18:19 (D03)	18:10		16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32 18:51 (D02)	07:03	17:47 (D03)	07:35		07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46 24 19:15 (D02)	18:54 31	18:18 (D03)	18:09		16:42	16:48
31	07:20		06:54		05:39		06:03	06:33 18:50 (D02)			07:37			07:32
	17:22		19:30		20:31		20:26	19:45 25 19:15 (D02)			18:07			16:49
Potential sun hours	298	297	369	398	448	452	458	428	375		346		298	288
Total, worst case			533	318				167	561		136			
Sun reduction			0.73	0.82				0.96	0.93		0.84			
Oper. time red.			1.00	1.00				1.00	1.00		1.00			
Wind dir. red.			0.75	0.62				0.62	0.71		0.75			
Total reduction			0.55	0.51				0.60	0.67		0.63			
Total, real			293	162				100	374		86			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 28 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (102)

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	05:40	06:04		06:34		18:49 (D02)	07:04	17:50 (D03)	06:38	07:12
	16:50	17:23	17:57		19:31		20:03	20:32	20:44	20:25		19:43	22	19:11 (D02)	18:53	18:18 (D03)	18:06	16:41
2	07:33	07:18	06:41		06:51		06:06	05:38	05:40	06:05		06:35		18:48 (D02)	07:05	17:50 (D03)	06:39	07:13
	16:50	17:25	17:58		19:32	4	19:06 (D02)	20:04	20:33	20:44	20:24	19:41	23	19:11 (D02)	18:51	18:17 (D03)	17:05	16:41
3	07:33	07:17	06:40		06:49		18:57 (D02)	06:05	05:38	05:41	06:05	06:36		18:48 (D02)	07:06	17:51 (D03)	06:40	07:14
	16:51	17:26	18:00		19:33	13	19:10 (D02)	20:05	20:34	20:43	20:23	19:40	23	19:11 (D02)	18:49	18:15 (D03)	17:04	16:41
4	07:33	07:16	06:38		06:48		18:56 (D02)	06:03	05:38	05:41	06:06	06:37		18:48 (D02)	07:07	17:53 (D03)	06:41	07:15
	16:52	17:27	18:01		19:34	16	19:12 (D02)	20:06	20:34	20:43	20:22	19:38	23	19:11 (D02)	18:48	18:15 (D03)	17:02	16:40
5	07:33	07:15	06:37		06:46		18:54 (D02)	06:02	05:37	05:42	06:07	06:38		18:48 (D02)	07:08	17:54 (D03)	06:43	07:16
	16:53	17:28	18:02		19:35	19	19:13 (D02)	20:07	20:35	20:43	20:21	19:36	22	19:10 (D02)	18:46	18:12 (D03)	17:01	16:40
6	07:33	07:14	06:35		06:44		18:52 (D02)	06:01	05:37	05:42	06:08	06:39		18:48 (D02)	07:09	17:56 (D03)	06:44	07:17
	16:54	17:30	18:03		19:36	21	19:13 (D02)	20:08	20:36	20:43	20:20	19:35	21	19:09 (D02)	18:44	18:09 (D03)	17:00	16:40
7	07:33	07:13	06:34	17:22 (D03)	06:43		18:52 (D02)	06:00	05:37	05:43	06:09	06:40		18:49 (D02)	07:10		06:45	07:18
	16:55	17:31	18:04	9 17:31 (D03)	19:37	22	19:14 (D02)	20:09	20:36	20:43	20:19	19:33	19	19:08 (D02)	18:43		16:59	16:40
8	07:32	07:12	07:32	18:18 (D03)	06:41		18:51 (D02)	05:59	05:36	05:44	06:10	06:41		18:50 (D02)	07:11		06:46	07:19
	16:56	17:32	19:05	16 18:34 (D03)	19:38	23	19:14 (D02)	20:10	20:37	20:42	20:17	19:31	16	19:06 (D02)	18:41		16:58	16:40
9	07:32	07:10	07:30	18:16 (D03)	06:39		18:50 (D02)	05:57	05:36	05:44	06:11	06:42		18:51 (D02)	07:12		06:47	07:20
	16:57	17:33	19:06	20 18:36 (D03)	19:40	23	19:13 (D02)	20:11	20:38	20:42	20:16	19:30	13	19:04 (D02)	18:39		16:57	16:40
10	07:32	07:09	07:29	18:14 (D03)	06:38		18:50 (D02)	05:56	05:36	05:45	06:12	06:43		18:55 (D02)	07:13		06:48	07:21
	16:58	17:35	19:07	23 18:37 (D03)	19:41	23	19:13 (D02)	20:12	20:38	20:42	20:15	19:28	5	19:00 (D02)	18:38		16:56	16:40
11	07:32	07:08	07:27	18:12 (D03)	06:36		18:50 (D02)	05:55	05:36	05:46	06:13	06:44			07:14		06:50	07:22
	16:59	17:36	19:09	26 18:38 (D03)	19:42	22	19:12 (D02)	20:13	20:39	20:41	20:14	19:26			18:36		16:55	16:40
12	07:32	07:07	07:26	18:11 (D03)	06:35		18:50 (D02)	05:54	05:36	05:46	06:14	06:45			07:15		06:51	07:23
	17:00	17:37	19:10	28 18:39 (D03)	19:43	22	19:12 (D02)	20:14	20:39	20:41	20:12	19:25			18:35		16:54	16:40
13	07:31	07:05	07:24	18:10 (D03)	06:33		18:50 (D02)	05:53	05:36	05:47	06:15	06:46			07:16		06:52	07:23
	17:01	17:38	19:11	29 18:39 (D03)	19:44	21	19:11 (D02)	20:15	20:40	20:40	20:11	19:23			18:33		16:53	16:40
14	07:31	07:04	07:22	18:10 (D03)	06:32		18:51 (D02)	05:52	05:36	05:48	06:16	06:47			07:17		06:53	07:24
	17:02	17:39	19:12	30 18:40 (D03)	19:45	20	19:11 (D02)	20:16	20:40	20:40	20:10	19:21			18:32		16:52	16:40
15	07:31	07:03	07:21	18:09 (D03)	06:30		18:52 (D02)	05:51	05:36	05:49	06:17	06:48			07:19		06:54	07:25
	17:03	17:41	19:13	31 18:40 (D03)	19:46	17	19:09 (D02)	20:17	20:41	20:39	20:08	19:20			18:30		16:51	16:41
16	07:30	07:02	07:19	18:09 (D03)	06:28		18:54 (D02)	05:50	05:36	05:49	06:18	06:49			07:20		06:56	07:26
	17:04	17:42	19:14	30 18:39 (D03)	19:47	13	19:07 (D02)	20:18	20:41	20:39	20:07	19:18			18:28		16:50	16:41
17	07:30	07:00	07:17	18:09 (D03)	06:27		18:56 (D02)	05:49	05:36	05:50	06:19	06:50			07:21		06:57	07:26
	17:05	17:43	19:15	31 18:40 (D03)	19:48	8	19:04 (D02)	20:19	20:41	20:38	20:06	19:16			18:27		16:49	16:41
18	07:29	06:59	07:16	18:09 (D03)	06:25			05:48	05:36	05:51	06:20	06:51		18:04 (D03)	07:22		06:58	07:27
	17:07	17:44	19:16	30 18:39 (D03)	19:49			20:20	20:42	20:37	20:04	19:15	12	18:16 (D03)	18:25		16:48	16:41
19	07:29	06:58	07:14	18:08 (D03)	06:24			05:47	05:36	05:52	06:21	06:52		18:00 (D03)	07:23		06:59	07:28
	17:08	17:46	19:17	30 18:38 (D03)	19:50			20:21	20:42	20:37	20:03	19:13	17	18:17 (D03)	18:24		16:48	16:42
20	07:28	06:56	07:12	18:09 (D03)	06:22			05:47	05:36	05:53	06:22	06:53		17:57 (D03)	07:24		07:00	07:28
	17:09	17:47	19:18	29 18:38 (D03)	19:51			20:22	20:42	20:36	20:01	19:11	22	18:19 (D03)	18:22		16:47	16:42
21	07:28	06:55	07:11	18:09 (D03)	06:21			05:46	05:36	05:53	06:23	06:54		17:56 (D03)	07:25		07:01	07:29
	17:10	17:48	19:19	27 18:36 (D03)	19:52			20:23	20:43	20:35	20:00	19:10	24	18:20 (D03)	18:21		16:46	16:42
22	07:27	06:53	07:09	18:10 (D03)	06:19			05:45	05:36	05:54	06:24	06:55		17:54 (D03)	07:26		07:03	07:29
	17:11	17:49	19:21	25 18:35 (D03)	19:53			20:24	20:43	20:35	19:58	19:08	26	18:20 (D03)	18:19		16:46	16:43
23	07:26	06:52	07:07	18:12 (D03)	06:18			05:44	05:37	05:55	06:25	06:56		17:53 (D03)	07:27		07:04	07:30
	17:12	17:50	19:22	22 18:34 (D03)	19:54			20:25	20:43	20:34	19:57	19:06	28	18:21 (D03)	18:18		16:45	16:43
24	07:26	06:50	07:06	18:13 (D03)	06:17			05:43	05:37	05:56	06:26	06:57		17:52 (D03)	07:29		07:05	07:30
	17:14	17:51	19:23	18 18:31 (D03)	19:55			20:26	20:43	20:33	19:55	19:04	29	18:21 (D03)	18:17		16:44	16:44
25	07:25	06:49	07:04	18:15 (D03)	06:15			05:43	05:37	05:57	06:27	06:58		17:51 (D03)	07:30		07:06	07:31
	17:15	17:53	19:24	13 18:28 (D03)	19:56			20:26	20:43	20:32	19:54	19:03	30	18:21 (D03)	18:15		16:44	16:45
26	07:24	06:48	07:02	18:19 (D03)	06:14			05:42	05:38	05:58	06:28	18:58 (D02)		06:59	17:50 (D03)	07:31		07:07	07:31
	17:16	17:54	19:25	3 18:22 (D03)	19:57			20:27	20:44	20:31	19:52	9 19:07 (D02)		19:01	31 18:21 (D03)	18:14		16:43	16:45
27	07:23	06:46	07:01		06:12			05:41	05:38	05:59	06:29	18:55 (D02)		07:00	17:50 (D03)	07:32		07:08	07:31
	17:17	17:55	19:26		19:58			20:28	20:44	20:30	19:51	14 19:09 (D02)		18:59	31 18:21 (D03)	18:12		16:43	16:46
28	07:22	06:45	06:59		06:11			05:41	05:38	06:00	06:30	18:54 (D02)		07:01	17:50 (D03)	07:33		07:09	07:32
	17:18	17:56	19:27		20:00			20:29	20:44	20:29	19:49	17 19:11 (D02)		18:58	30 18:20 (D03)	18:11		16:42	16:46
29	07:22		06:57		06:10			05:40	05:39	06:01	06:31	18:52 (D02)		07:02	17:50 (D03)	07:34		07:10	07:32
	17:20		19:28		20:01			20:30	20:44	20:28	19:48	19 19:11 (D02)		18:56	30 18:20 (D03)	18:10		16:42	16:47
30	07:21		06:56		06:08			05:40	05:39	06:02	06:32	18:51 (D02)		07:03	17:50 (D03)	07:35		07:11	07:32
	17:21		19:29		20:02			20:31	20:44	20:27	19:46	21 19:12 (D02)		18:54	29 18:19 (D03)	18:09		16:42	16:48
31	07:20		06:54					05:39		06:03	06:33	18:49 (D02)				07:37			07:32
	17:22		19:30					20:31		20:26	19:44	22 19:11 (D02)				18:07			16:49
Potential sun hours	298	297	369		398		448	452	458	428		375				346		298	288
Total, worst case				470		287					102		526		132				
Sun reduction				0.73		0.82					0.96		0.93		0.84				
Oper. time red.				1.00		1.00					1.00		1.00		1.00				
Wind dir. red.				0.75		0.63					0.63		0.71		0.75				
Total reduction				0.55		0.51					0.60		0.66		0.63				
Total, real				259		148					61		347		84				

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 29 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (103)

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	05:40	06:04	06:34	18:48 (D02)	07:04	17:48 (D03)	06:38	07:12
	16:50	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43 23	19:11 (D02)	18:53 29	18:17 (D03)	18:06	16:41
2	07:33	07:18	06:41	06:51	19:03 (D02)	06:06	05:38	05:40	06:05	06:35	18:48 (D02)	07:05	17:48 (D03)	06:39	07:13
	16:50	17:25	17:58	19:32 2	19:05 (D02)	20:04	20:33	20:44	20:24	19:41 23	19:11 (D02)	18:51 28	18:16 (D03)	17:05	16:41
3	07:33	07:17	06:40	06:49	18:57 (D02)	06:05	05:38	05:41	06:05	06:36	18:47 (D02)	07:06	17:49 (D03)	06:40	07:14
	16:51	17:26	18:00	19:33 12	19:09 (D02)	20:05	20:34	20:43	20:23	19:40 24	19:11 (D02)	18:49 26	18:15 (D03)	17:04	16:41
4	07:33	07:16	06:38	06:48	18:56 (D02)	06:03	05:38	05:41	06:06	06:37	18:47 (D02)	07:07	17:51 (D03)	06:41	07:15
	16:52	17:27	18:01	19:34 16	19:12 (D02)	20:06	20:34	20:43	20:22	19:38 23	19:10 (D02)	18:48 23	18:14 (D03)	17:02	16:40
5	07:33	07:15	06:37	06:46	18:53 (D02)	06:02	05:37	05:42	06:07	06:38	18:47 (D02)	07:08	17:52 (D03)	06:43	07:16
	16:53	17:28	18:02	19:35 19	19:12 (D02)	20:07	20:35	20:43	20:21	19:36 23	19:10 (D02)	18:46 20	18:12 (D03)	17:01	16:40
6	07:33	07:14	06:35	06:44	18:52 (D02)	06:01	05:37	05:42	06:08	06:39	18:48 (D02)	07:09	17:54 (D03)	06:44	07:17
	16:54	17:30	18:03	19:36 21	19:13 (D02)	20:08	20:36	20:43	20:20	19:35 21	19:09 (D02)	18:44 15	18:09 (D03)	17:00	16:40
7	07:33	07:13	06:34	17:19 (D03) 06:43	18:51 (D02)	06:00	05:37	05:43	06:09	06:40	18:48 (D02)	07:10	17:58 (D03)	06:45	07:18
	16:55	17:31	18:04 12	17:31 (D03) 19:37 23	19:14 (D02)	20:09	20:36	20:43	20:19	19:33 19	19:07 (D02)	18:43 7	18:05 (D03)	16:59	16:40
8	07:32	07:12	07:32	18:16 (D03) 06:41	18:50 (D02)	05:59	05:36	05:44	06:10	06:41	18:50 (D02)	07:11		06:46	07:19
	16:56	17:32	19:05 17	18:33 (D03) 19:38 23	19:13 (D02)	20:10	20:37	20:42	20:17	19:31 16	19:06 (D02)	18:41		16:58	16:40
9	07:32	07:10	07:30	18:14 (D03) 06:39	18:49 (D02)	05:57	05:36	05:44	06:11	06:42	18:51 (D02)	07:12		06:47	07:20
	16:57	17:33	19:06 22	18:36 (D03) 19:40 24	19:13 (D02)	20:11	20:38	20:42	20:16	19:30 13	19:04 (D02)	18:39		16:57	16:40
10	07:32	07:09	07:29	18:12 (D03) 06:38	18:50 (D02)	05:56	05:36	05:45	06:12	06:43	18:55 (D02)	07:13		06:48	07:21
	16:58	17:35	19:07 25	18:37 (D03) 19:41 23	19:13 (D02)	20:12	20:38	20:42	20:15	19:28 4	18:59 (D02)	18:38		16:56	16:40
11	07:32	07:08	07:27	18:10 (D03) 06:36	18:49 (D02)	05:55	05:36	05:46	06:13	06:44		07:14		06:50	07:22
	16:59	17:36	19:09 27	18:37 (D03) 19:42 23	19:12 (D02)	20:13	20:39	20:41	20:14	19:26		18:36		16:55	16:40
12	07:32	07:07	07:26	18:10 (D03) 06:35	18:50 (D02)	05:54	05:36	05:46	06:14	06:45		07:15		06:51	07:23
	17:00	17:37	19:10 28	18:38 (D03) 19:43 22	19:12 (D02)	20:14	20:39	20:41	20:12	19:25		18:35		16:54	16:40
13	07:31	07:05	07:24	18:09 (D03) 06:33	18:50 (D02)	05:53	05:36	05:47	06:15	06:46		07:16		06:52	07:23
	17:01	17:38	19:11 29	18:38 (D03) 19:44 21	19:11 (D02)	20:15	20:40	20:40	20:11	19:23		18:33		16:53	16:40
14	07:31	07:04	07:22	18:09 (D03) 06:32	18:51 (D02)	05:52	05:36	05:48	06:16	06:47		07:17		06:53	07:24
	17:02	17:39	19:12 30	18:39 (D03) 19:45 20	19:11 (D02)	20:16	20:40	20:40	20:10	19:21		18:32		16:52	16:40
15	07:31	07:03	07:21	18:08 (D03) 06:30	18:51 (D02)	05:51	05:36	05:49	06:17	06:48		07:19		06:54	07:25
	17:03	17:41	19:13 31	18:39 (D03) 19:46 18	19:09 (D02)	20:17	20:41	20:39	20:08	19:20		18:30		16:51	16:41
16	07:30	07:02	07:19	18:07 (D03) 06:28	18:53 (D02)	05:50	05:36	05:49	06:18	06:49		07:20		06:56	07:26
	17:04	17:42	19:14 31	18:38 (D03) 19:47 14	19:07 (D02)	20:18	20:41	20:39	20:07	19:18		18:28		16:50	16:41
17	07:30	07:00	07:17	18:08 (D03) 06:27	18:54 (D02)	05:49	05:36	05:50	06:19	06:50		07:21		06:57	07:26
	17:05	17:43	19:15 31	18:39 (D03) 19:48 10	19:04 (D02)	20:19	20:41	20:38	20:06	19:16		18:27		16:49	16:41
18	07:29	06:59	07:16	18:07 (D03) 06:25	05:48	05:36	05:51	06:20	06:51	18:03 (D03)	07:22		06:58	07:27
	17:07	17:44	19:16 31	18:38 (D03) 19:49	20:20	20:42	20:37	20:04	19:15 11	18:14 (D03)	18:25		16:48	16:41
19	07:29	06:58	07:14	18:07 (D03) 06:24	05:47	05:36	05:52	06:21	06:52	17:58 (D03)	07:23		06:59	07:28
	17:08	17:46	19:17 30	18:37 (D03) 19:50	20:21	20:42	20:37	20:03	19:13 18	18:16 (D03)	18:24		16:48	16:42
20	07:28	06:56	07:12	18:08 (D03) 06:22	05:47	05:36	05:53	06:22	06:53	17:56 (D03)	07:24		07:00	07:28
	17:09	17:47	19:18 28	18:36 (D03) 19:51	20:22	20:42	20:36	20:01	19:11 21	18:17 (D03)	18:22		16:47	16:42
21	07:28	06:55	07:11	18:08 (D03) 06:21	05:46	05:36	05:53	06:23	06:54	17:54 (D03)	07:25		07:01	07:29
	17:10	17:48	19:19 27	18:35 (D03) 19:52	20:23	20:43	20:35	20:00	19:10 24	18:18 (D03)	18:21		16:46	16:42
22	07:27	06:53	07:09	18:09 (D03) 06:19	05:45	05:36	05:54	06:24	06:55	17:53 (D03)	07:26		07:03	07:29
	17:11	17:49	19:21 24	18:33 (D03) 19:53	20:24	20:43	20:35	19:58	19:08 26	18:19 (D03)	18:19		16:46	16:43
23	07:26	06:52	07:07	18:10 (D03) 06:18	05:44	05:37	05:55	06:25	06:56	17:52 (D03)	07:27		07:04	07:30
	17:12	17:50	19:22 22	18:32 (D03) 19:54	20:25	20:43	20:34	19:57	19:06 28	18:20 (D03)	18:18		16:45	16:43
24	07:26	06:50	07:06	18:12 (D03) 06:17	05:43	05:37	05:56	06:26	06:57	17:51 (D03)	07:29		07:05	07:30
	17:14	17:51	19:23 18	18:30 (D03) 19:55	20:26	20:43	20:33	19:55	19:04 29	18:20 (D03)	18:17		16:44	16:44
25	07:25	06:49	07:04	18:14 (D03) 06:15	05:43	05:37	05:57	06:27	06:58	17:50 (D03)	07:30		07:06	07:31
	17:15	17:53	19:24 13	18:27 (D03) 19:56	20:26	20:43	20:32	19:54	19:03 30	18:20 (D03)	18:15		16:44	16:45
26	07:24	06:48	07:02	06:14	05:42	05:38	05:58	06:28 18:57 (D02)	06:59	17:49 (D03)	07:31		07:07	07:31
	17:16	17:54	19:25	19:57	20:27	20:44	20:31	19:52 11 19:08 (D02)	19:01 31	18:20 (D03)	18:14		16:43	16:45
27	07:23	06:46	07:01	06:12	05:41	05:38	05:59	06:29 18:55 (D02)	07:00	17:49 (D03)	07:32		07:08	07:31
	17:17	17:55	19:26	19:58	20:28	20:44	20:30	19:51 15 19:10 (D02)	18:59 31	18:20 (D03)	18:12		16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30 18:53 (D02)	07:01	17:48 (D03)	07:33		07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49 18 19:11 (D02)	18:58 31	18:19 (D03)	18:11		16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31 18:52 (D02)	07:02	17:48 (D03)	07:34		07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48 20 19:12 (D02)	18:56 31	18:19 (D03)	18:10		16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32 18:51 (D02)	07:03	17:48 (D03)	07:35		07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46 21 19:12 (D02)	18:54 30	18:18 (D03)	18:09		16:42	16:48
31	07:20		06:54		05:39		06:03	06:33 18:49 (D02)			07:37			07:32
	17:22		19:30		20:31		20:26	19:44 22 19:11 (D02)			18:07			16:49
Potential sun hours	298	297	369	398	448	452	458	428	375		346		298	288
Total, worst case			476	291				107	530		148			
Sun reduction			0.73	0.82				0.96	0.93		0.84			
Oper. time red.			1.00	1.00				1.00	1.00		1.00			
Wind dir. red.			0.75	0.63				0.63	0.71		0.75			
Total reduction			0.55	0.51				0.60	0.66		0.63			
Total, real			262	150				64	350		94			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 30 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (104)

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
1	07:32	07:19			06:43		16:50 (D03)	06:52		18:48 (D02)	06:07	05:39
	16:50	17:23			17:57	33	17:23 (D03)	19:31	20	19:08 (D02)	20:03	20:32
2	07:33	07:18			06:41		16:49 (D03)	06:51		18:46 (D02)	06:06	05:38
	16:50	17:25			17:58	34	17:23 (D03)	19:32	22	19:08 (D02)	20:04	20:33
3	07:33	07:17			06:40		16:48 (D03)	06:49		18:44 (D02)	06:05	05:38
	16:51	17:26			18:00	35	17:23 (D03)	19:33	24	19:08 (D02)	20:05	20:34
4	07:33	07:16			06:38		16:48 (D03)	06:48		18:44 (D02)	06:03	05:38
	16:52	17:27			18:01	36	17:24 (D03)	19:34	25	19:09 (D02)	20:06	20:34
5	07:33	07:15			06:37		16:47 (D03)	06:46		18:43 (D02)	06:02	05:37
	16:53	17:28			18:02	37	17:24 (D03)	19:35	26	19:09 (D02)	20:07	20:35
6	07:33	07:14			06:35		16:47 (D03)	06:44		18:42 (D02)	06:01	05:37
	16:54	17:30			18:03	38	17:25 (D03)	19:36	27	19:09 (D02)	20:08	20:36
7	07:33	07:13			06:34		16:46 (D03)	06:43		18:42 (D02)	06:00	05:37
	16:55	17:31			18:04	38	17:24 (D03)	19:37	27	19:09 (D02)	20:09	20:36
8	07:32	07:12			07:32		17:46 (D03)	06:41		18:41 (D02)	05:59	05:36
	16:56	17:32			19:05	37	18:23 (D03)	19:39	28	19:09 (D02)	20:10	20:37
9	07:32	07:10			07:30		17:46 (D03)	06:39		18:42 (D02)	05:57	05:36
	16:57	17:33			19:06	38	18:24 (D03)	19:40	27	19:09 (D02)	20:11	20:38
10	07:32	07:09			07:29		17:46 (D03)	06:38		18:41 (D02)	05:56	05:36
	16:58	17:35			19:07	37	18:23 (D03)	19:41	27	19:08 (D02)	20:12	20:38
11	07:32	07:08			07:27		17:47 (D03)	06:36		18:41 (D02)	05:55	05:36
	16:59	17:36			19:09	36	18:23 (D03)	19:42	25	19:06 (D02)	20:13	20:39
12	07:32	07:07			07:26		17:47 (D03)	06:35		18:42 (D02)	05:54	05:36
	17:00	17:37			19:10	35	18:22 (D03)	19:43	24	19:06 (D02)	20:14	20:39
13	07:31	07:06			07:24		17:47 (D03)	06:33		18:43 (D02)	05:53	05:36
	17:01	17:38			19:11	33	18:20 (D03)	19:44	21	19:04 (D02)	20:15	20:40
14	07:31	07:04			07:22		17:49 (D03)	06:32		18:45 (D02)	05:52	05:36
	17:02	17:39			19:12	31	18:20 (D03)	19:45	18	19:03 (D02)	20:16	20:40
15	07:31	07:03			07:21		17:50 (D03)	06:30		18:46 (D02)	05:51	05:36
	17:03	17:41			19:13	28	18:18 (D03)	19:46	14	19:00 (D02)	20:17	20:41
16	07:30	07:02			07:19		17:51 (D03)	06:28		18:49 (D02)	05:50	05:36
	17:04	17:42			19:14	25	18:16 (D03)	19:47	8	18:57 (D02)	20:18	20:41
17	07:30	07:00			07:17		17:53 (D03)	06:27			05:49	05:36
	17:05	17:43			19:15	21	18:14 (D03)	19:48			20:19	20:41
18	07:29	06:59			07:16		17:55 (D03)	06:25			05:48	05:36
	17:07	17:44			19:16	16	18:11 (D03)	19:49			20:20	20:42
19	07:29	06:58			07:14		18:00 (D03)	06:24			05:47	05:36
	17:08	17:46			19:17	5	18:05 (D03)	19:50			20:21	20:42
20	07:28	06:56			07:12			06:22			05:47	05:36
	17:09	17:47			19:18			19:51			20:22	20:42
21	07:28	06:55			07:11			06:21			05:46	05:36
	17:10	17:48			19:19			19:52			20:23	20:43
22	07:27	06:53			07:09			06:19			05:45	05:36
	17:11	17:49			19:21			19:53			20:24	20:43
23	07:26	06:52		17:04 (D03)	07:07			06:18			05:44	05:37
	17:12	17:50	7	17:11 (D03)	19:22			19:54			20:25	20:43
24	07:26	06:50		16:59 (D03)	07:06			06:17			05:43	05:37
	17:14	17:51	16	17:15 (D03)	19:23			19:55			20:26	20:43
25	07:25	06:49		16:57 (D03)	07:04			06:15			05:43	05:37
	17:15	17:53	21	17:18 (D03)	19:24			19:56			20:26	20:43
26	07:24	06:48		16:54 (D03)	07:02			06:14			05:42	05:38
	17:16	17:54	25	17:19 (D03)	19:25			19:57			20:27	20:44
27	07:23	06:46		16:53 (D03)	07:01			06:12			05:41	05:38
	17:17	17:55	28	17:21 (D03)	19:26			19:59			20:28	20:44
28	07:22	06:45		16:51 (D03)	06:59			06:11			05:41	05:38
	17:18	17:56	31	17:22 (D03)	19:27			20:00			20:29	20:44
29	07:22				06:57			06:10			05:40	05:39
	17:20				19:28			20:01			20:30	20:44
30	07:21				06:56		18:52 (D02)	06:08			05:40	05:39
	17:21				19:29	12	19:04 (D02)	20:02			20:31	20:44
31	07:20				06:54		18:49 (D02)				05:39	
	17:22				19:30	17	19:06 (D02)				20:31	
Potential sun hours	298	297			369			398			448	452
Total, worst case			128			622			363			
Sun reduction			0.62			0.73			0.82			
Oper. time red.			1.00			1.00			1.00			
Wind dir. red.			0.80			0.79			0.64			
Total reduction			0.50			0.58			0.53			
Total, real			64			361			193			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 30 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (104)

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

	July	August		September		October		November	December
1	05:40	06:04		06:34	18:40 (D02)	07:04	17:26 (D03)	06:38	07:12
	20:44	20:25		19:43 25	19:05 (D02)	18:53 34	18:00 (D03)	18:06	16:41
2	05:40	06:05		06:35	18:39 (D02)	07:05	17:25 (D03)	06:39	07:13
	20:44	20:24		19:41 27	19:06 (D02)	18:51 35	18:00 (D03)	17:05	16:41
3	05:41	06:05		06:36	18:39 (D02)	07:06	17:24 (D03)	06:40	07:14
	20:43	20:23		19:40 27	19:06 (D02)	18:49 36	18:00 (D03)	17:04	16:41
4	05:41	06:06		06:37	18:38 (D02)	07:07	17:24 (D03)	06:41	07:15
	20:43	20:22		19:38 28	19:06 (D02)	18:48 37	18:01 (D03)	17:02	16:40
5	05:42	06:07		06:38	18:38 (D02)	07:08	17:24 (D03)	06:43	07:16
	20:43	20:21		19:36 27	19:05 (D02)	18:46 37	18:01 (D03)	17:01	16:40
6	05:42	06:08		06:39	18:38 (D02)	07:09	17:23 (D03)	06:44	07:17
	20:43	20:20		19:35 27	19:05 (D02)	18:44 38	18:01 (D03)	17:00	16:40
7	05:43	06:09		06:40	18:38 (D02)	07:10	17:23 (D03)	06:45	07:18
	20:43	20:19		19:33 26	19:04 (D02)	18:43 37	18:00 (D03)	16:59	16:40
8	05:44	06:10		06:41	18:38 (D02)	07:11	17:22 (D03)	06:46	07:19
	20:42	20:17		19:31 26	19:04 (D02)	18:41 38	18:00 (D03)	16:58	16:40
9	05:44	06:11		06:42	18:38 (D02)	07:12	17:22 (D03)	06:47	07:20
	20:42	20:16		19:30 25	19:03 (D02)	18:39 37	17:59 (D03)	16:57	16:40
10	05:45	06:12		06:43	18:39 (D02)	07:13	17:22 (D03)	06:48	07:21
	20:42	20:15		19:28 22	19:01 (D02)	18:38 36	17:58 (D03)	16:56	16:40
11	05:46	06:13		06:44	18:39 (D02)	07:14	17:22 (D03)	06:50	07:22
	20:41	20:14		19:26 21	19:00 (D02)	18:36 36	17:58 (D03)	16:55	16:40
12	05:46	06:14		06:45	18:41 (D02)	07:15	17:23 (D03)	06:51	07:23
	20:41	20:12		19:25 17	18:58 (D02)	18:35 33	17:56 (D03)	16:54	16:40
13	05:47	06:15		06:46	18:43 (D02)	07:16	17:23 (D03)	06:52	07:23
	20:40	20:11		19:23 12	18:55 (D02)	18:33 32	17:55 (D03)	16:53	16:40
14	05:48	06:16		06:47		07:17	17:24 (D03)	06:53	07:24
	20:40	20:10		19:21		18:32 30	17:54 (D03)	16:52	16:40
15	05:49	06:17		06:48		07:19	17:26 (D03)	06:54	07:25
	20:39	20:08		19:20		18:30 27	17:53 (D03)	16:51	16:41
16	05:49	06:18		06:49		07:20	17:27 (D03)	06:56	07:26
	20:39	20:07		19:18		18:28 24	17:51 (D03)	16:50	16:41
17	05:50	06:19		06:50		07:21	17:29 (D03)	06:57	07:26
	20:38	20:06		19:16		18:27 20	17:49 (D03)	16:49	16:41
18	05:51	06:20		06:51		07:22	17:32 (D03)	06:58	07:27
	20:37	20:04		19:15		18:25 13	17:45 (D03)	16:48	16:41
19	05:52	06:21		06:52		07:23		06:59	07:28
	20:37	20:03		19:13		18:24		16:48	16:42
20	05:53	06:22		06:53		07:24		07:00	07:28
	20:36	20:01		19:11		18:22		16:47	16:42
21	05:54	06:23		06:54		07:25		07:01	07:29
	20:35	20:00		19:10		18:21		16:46	16:43
22	05:54	06:24		06:55		07:26		07:03	07:29
	20:35	19:58		19:08		18:20		16:46	16:43
23	05:55	06:25		06:56		07:27		07:04	07:30
	20:34	19:57		19:06		18:18		16:45	16:43
24	05:56	06:26		06:57		07:29		07:05	07:30
	20:33	19:55		19:04		18:17		16:44	16:44
25	05:57	06:27		06:58	17:39 (D03)	07:30		07:06	07:31
	20:32	19:54		19:03 13	17:52 (D03)	18:15		16:44	16:45
26	05:58	06:28		06:59	17:35 (D03)	07:31		07:07	07:31
	20:31	19:52		19:01 20	17:55 (D03)	18:14		16:43	16:45
27	05:59	06:29	18:51 (D02)	07:00	17:33 (D03)	07:32		07:08	07:31
	20:30	19:51 9	19:00 (D02)	18:59 23	17:56 (D03)	18:13		16:43	16:46
28	06:00	06:30	18:47 (D02)	07:01	17:31 (D03)	07:33		07:09	07:32
	20:29	19:49 15	19:02 (D02)	18:58 27	17:58 (D03)	18:11		16:42	16:46
29	06:01	06:31	18:45 (D02)	07:02	17:29 (D03)	07:34		07:10	07:32
	20:28	19:48 19	19:04 (D02)	18:56 30	17:59 (D03)	18:10		16:42	16:47
30	06:02	06:32	18:44 (D02)	07:03	17:27 (D03)	07:35		07:11	07:32
	20:27	19:46 21	19:05 (D02)	18:54 32	17:59 (D03)	18:09		16:42	16:48
31	06:03	06:33	18:42 (D02)			07:37			07:32
	20:26	19:45 24	19:06 (D02)			18:07			16:49
Potential sun hours	458	428		375		346		298	288
Total, worst case		88		455		580			
Sun reduction		0.96		0.93		0.84			
Oper. time red.		1.00		1.00		1.00			
Wind dir. red.		0.64		0.69		0.80			
Total reduction		0.62		0.65		0.67			
Total, real		55		295		391			

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
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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 31 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (105)

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
1	07:32	07:19			06:43		16:58 (D03)	06:52		18:48 (D02)	06:07	05:39
	16:50	17:23			17:57	27	17:25 (D03)	19:31	20	19:08 (D02)	20:03	20:32
2	07:33	07:18			06:41		16:56 (D03)	06:51		18:46 (D02)	06:06	05:38
	16:50	17:25			17:58	29	17:25 (D03)	19:32	23	19:09 (D02)	20:04	20:33
3	07:33	07:17			06:40		16:55 (D03)	06:49		18:45 (D02)	06:05	05:38
	16:51	17:26			18:00	31	17:26 (D03)	19:33	24	19:09 (D02)	20:05	20:34
4	07:33	07:16			06:38		16:54 (D03)	06:48		18:45 (D02)	06:03	05:38
	16:52	17:27			18:01	33	17:27 (D03)	19:34	25	19:10 (D02)	20:06	20:34
5	07:33	07:15			06:37		16:53 (D03)	06:46		18:44 (D02)	06:02	05:37
	16:53	17:28			18:02	34	17:27 (D03)	19:35	25	19:09 (D02)	20:07	20:35
6	07:33	07:14			06:35		16:53 (D03)	06:44		18:43 (D02)	06:01	05:37
	16:54	17:30			18:03	35	17:28 (D03)	19:36	26	19:09 (D02)	20:08	20:36
7	07:33	07:13			06:34		16:52 (D03)	06:43		18:43 (D02)	06:00	05:37
	16:55	17:31			18:04	35	17:27 (D03)	19:37	26	19:09 (D02)	20:09	20:36
8	07:32	07:12			07:32		17:52 (D03)	06:41		18:43 (D02)	05:59	05:36
	16:56	17:32			19:05	35	18:27 (D03)	19:39	25	19:08 (D02)	20:10	20:37
9	07:32	07:10			07:30		17:52 (D03)	06:39		18:43 (D02)	05:57	05:36
	16:57	17:33			19:06	35	18:27 (D03)	19:40	25	19:08 (D02)	20:11	20:38
10	07:32	07:09			07:29		17:52 (D03)	06:38		18:43 (D02)	05:56	05:36
	16:58	17:35			19:07	34	18:26 (D03)	19:41	24	19:07 (D02)	20:12	20:38
11	07:32	07:08			07:27		17:52 (D03)	06:36		18:43 (D02)	05:55	05:36
	16:59	17:36			19:09	35	18:27 (D03)	19:42	23	19:06 (D02)	20:13	20:39
12	07:32	07:07			07:26		17:52 (D03)	06:35		18:44 (D02)	05:54	05:36
	17:00	17:37			19:10	34	18:26 (D03)	19:43	21	19:05 (D02)	20:14	20:39
13	07:31	07:06			07:24		17:52 (D03)	06:33		18:45 (D02)	05:53	05:36
	17:01	17:38			19:11	32	18:24 (D03)	19:44	18	19:03 (D02)	20:15	20:40
14	07:31	07:04			07:22		17:54 (D03)	06:32		18:47 (D02)	05:52	05:36
	17:02	17:39			19:12	30	18:24 (D03)	19:45	14	19:01 (D02)	20:16	20:40
15	07:31	07:03			07:21		17:54 (D03)	06:30		18:50 (D02)	05:51	05:36
	17:03	17:41			19:13	28	18:22 (D03)	19:46	7	18:57 (D02)	20:17	20:41
16	07:30	07:02			07:19		17:55 (D03)	06:28			05:50	05:36
	17:04	17:42			19:14	25	18:20 (D03)	19:47			20:18	20:41
17	07:30	07:00			07:17		17:57 (D03)	06:27			05:49	05:36
	17:05	17:43			19:15	22	18:19 (D03)	19:48			20:19	20:41
18	07:29	06:59			07:16		17:58 (D03)	06:25			05:48	05:36
	17:07	17:44			19:16	18	18:16 (D03)	19:49			20:20	20:42
19	07:29	06:58			07:14		18:01 (D03)	06:24			05:47	05:36
	17:08	17:46			19:17	11	18:12 (D03)	19:50			20:21	20:42
20	07:28	06:56			07:12			06:22			05:47	05:36
	17:09	17:47			19:18			19:51			20:22	20:42
21	07:28	06:55			07:11			06:21			05:46	05:36
	17:10	17:48			19:19			19:52			20:23	20:43
22	07:27	06:53			07:09			06:19			05:45	05:36
	17:11	17:49			19:21			19:53			20:24	20:43
23	07:26	06:52			07:07			06:18			05:44	05:37
	17:12	17:50			19:22			19:54			20:25	20:43
24	07:26	06:50			07:06			06:17			05:43	05:37
	17:14	17:51			19:23			19:55			20:26	20:43
25	07:25	06:49		17:10 (D03)	07:04			06:15			05:43	05:37
	17:15	17:53	4	17:14 (D03)	19:24			19:56			20:26	20:43
26	07:24	06:48		17:04 (D03)	07:02			06:14			05:42	05:38
	17:16	17:54	15	17:19 (D03)	19:25			19:57			20:27	20:44
27	07:23	06:46		17:02 (D03)	07:01			06:12			05:41	05:38
	17:17	17:55	20	17:22 (D03)	19:26			19:59			20:28	20:44
28	07:22	06:45		16:59 (D03)	06:59			06:11			05:41	05:38
	17:18	17:56	24	17:23 (D03)	19:27			20:00			20:29	20:44
29	07:22				06:57			06:10			05:40	05:39
	17:20				19:28			20:01			20:30	20:44
30	07:21				06:56		18:52 (D02)	06:08			05:40	05:39
	17:21				19:29	12	19:04 (D02)	20:02			20:31	20:44
31	07:20				06:54		18:49 (D02)				05:39	
	17:22				19:30	17	19:06 (D02)				20:31	
Potential sun hours	298	297			369			398			448	452
Total, worst case			63			592			326			
Sun reduction			0.62			0.73			0.82			
Oper. time red.			1.00			1.00			1.00			
Wind dir. red.			0.79			0.78			0.65			
Total reduction			0.49			0.57			0.53			
Total, real			31			340			173			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 31 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (105)

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

	July	August		September		October		November	December
1	05:40	06:04		06:34	18:42 (D02)	07:04	17:31 (D03)	06:38	07:12
	20:44	20:25		19:43 23	19:05 (D02)	18:53 33	18:04 (D03)	18:06	16:41
2	05:40	06:05		06:35	18:41 (D02)	07:05	17:30 (D03)	06:39	07:13
	20:44	20:24		19:41 24	19:05 (D02)	18:51 34	18:04 (D03)	17:05	16:41
3	05:41	06:05		06:36	18:40 (D02)	07:06	17:29 (D03)	06:40	07:14
	20:43	20:23		19:40 25	19:05 (D02)	18:49 35	18:04 (D03)	17:04	16:41
4	05:41	06:06		06:37	18:40 (D02)	07:07	17:30 (D03)	06:41	07:15
	20:43	20:22		19:38 25	19:05 (D02)	18:48 35	18:05 (D03)	17:02	16:40
5	05:42	06:07		06:38	18:39 (D02)	07:08	17:29 (D03)	06:43	07:16
	20:43	20:21		19:36 26	19:05 (D02)	18:46 36	18:05 (D03)	17:01	16:40
6	05:42	06:08		06:39	18:39 (D02)	07:09	17:29 (D03)	06:44	07:17
	20:43	20:20		19:35 26	19:05 (D02)	18:44 35	18:04 (D03)	17:00	16:40
7	05:43	06:09		06:40	18:39 (D02)	07:10	17:29 (D03)	06:45	07:18
	20:43	20:19		19:33 25	19:04 (D02)	18:43 35	18:04 (D03)	16:59	16:40
8	05:44	06:10		06:41	18:39 (D02)	07:11	17:29 (D03)	06:46	07:19
	20:42	20:17		19:31 25	19:04 (D02)	18:41 34	18:03 (D03)	16:58	16:40
9	05:44	06:11		06:42	18:39 (D02)	07:12	17:29 (D03)	06:47	07:20
	20:42	20:16		19:30 24	19:03 (D02)	18:39 33	18:02 (D03)	16:57	16:40
10	05:45	06:12		06:43	18:39 (D02)	07:13	17:29 (D03)	06:48	07:21
	20:42	20:15		19:28 23	19:02 (D02)	18:38 32	18:01 (D03)	16:56	16:40
11	05:46	06:13		06:44	18:40 (D02)	07:14	17:29 (D03)	06:50	07:22
	20:41	20:14		19:26 20	19:00 (D02)	18:36 31	18:00 (D03)	16:55	16:40
12	05:46	06:14		06:45	18:41 (D02)	07:15	17:30 (D03)	06:51	07:23
	20:41	20:12		19:25 18	18:59 (D02)	18:35 28	17:58 (D03)	16:54	16:40
13	05:47	06:15		06:46	18:43 (D02)	07:16	17:31 (D03)	06:52	07:23
	20:40	20:11		19:23 13	18:56 (D02)	18:33 26	17:57 (D03)	16:53	16:40
14	05:48	06:16		06:47	18:47 (D02)	07:17	17:32 (D03)	06:53	07:24
	20:40	20:10		19:21 5	18:52 (D02)	18:32 23	17:55 (D03)	16:52	16:40
15	05:49	06:17		06:48		07:19	17:35 (D03)	06:54	07:25
	20:39	20:08		19:20		18:30 18	17:53 (D03)	16:51	16:41
16	05:49	06:18		06:49		07:20	17:38 (D03)	06:56	07:26
	20:39	20:07		19:18		18:28 12	17:50 (D03)	16:50	16:41
17	05:50	06:19		06:50		07:21		06:57	07:26
	20:38	20:06		19:16		18:27		16:49	16:41
18	05:51	06:20		06:51		07:22		06:58	07:27
	20:37	20:04		19:15		18:25		16:48	16:41
19	05:52	06:21		06:52		07:23		06:59	07:28
	20:37	20:03		19:13		18:24		16:48	16:42
20	05:53	06:22		06:53		07:24		07:00	07:28
	20:36	20:01		19:11		18:22		16:47	16:42
21	05:54	06:23		06:54		07:25		07:01	07:29
	20:35	20:00		19:10		18:21		16:46	16:43
22	05:54	06:24		06:55		07:26		07:03	07:29
	20:35	19:58		19:08		18:20		16:46	16:43
23	05:55	06:25		06:56		07:27		07:04	07:30
	20:34	19:57		19:06		18:18		16:45	16:43
24	05:56	06:26		06:57	17:46 (D03)	07:29		07:05	07:30
	20:33	19:55		19:04 8	17:54 (D03)	18:17		16:44	16:44
25	05:57	06:27		06:58	17:42 (D03)	07:30		07:06	07:31
	20:32	19:54		19:03 16	17:58 (D03)	18:15		16:44	16:45
26	05:58	06:28		06:59	17:39 (D03)	07:31		07:07	07:31
	20:31	19:52		19:01 21	18:00 (D03)	18:14		16:43	16:45
27	05:59	06:29		07:00	17:37 (D03)	07:32		07:08	07:31
	20:30	19:51		18:59 24	18:01 (D03)	18:13		16:43	16:46
28	06:00	06:30	18:51 (D02)	07:01	17:35 (D03)	07:33		07:09	07:32
	20:29	19:49 8	18:59 (D02)	18:58 27	18:02 (D03)	18:11		16:42	16:46
29	06:01	06:31	18:48 (D02)	07:02	17:33 (D03)	07:34		07:10	07:32
	20:28	19:48 14	19:02 (D02)	18:56 30	18:03 (D03)	18:10		16:42	16:47
30	06:02	06:32	18:46 (D02)	07:03	17:32 (D03)	07:35		07:11	07:32
	20:27	19:46 18	19:04 (D02)	18:54 32	18:04 (D03)	18:09		16:42	16:48
31	06:03	06:33	18:44 (D02)			07:37			07:32
	20:26	19:45 21	19:05 (D02)			18:07			16:49
Potential sun hours	458	428		375		346		298	288
Total, worst case		61		460		480			
Sun reduction		0.96		0.93		0.84			
Oper. time red.		1.00		1.00		1.00			
Wind dir. red.		0.65		0.70		0.79			
Total reduction		0.62		0.65		0.67			
Total, real		38		299		320			

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)

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Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 32 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (106)

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	05:40	06:04	06:34		07:04	17:50 (D03)	06:38	07:12
	16:50	17:23	17:57		19:31	20:03	20:32	20:44	20:25	19:43		18:53	28 18:18 (D03)	18:06	16:41
2	07:33	07:18	06:41		06:51	06:06	05:38	05:40	06:04	06:35		07:05	17:50 (D03)	06:39	07:13
	16:50	17:25	17:58		19:32	20:04	20:33	20:44	20:24	19:41		18:51	28 18:18 (D03)	17:05	16:41
3	07:33	07:17	06:40		06:49	06:05	05:38	05:41	06:05	06:36		07:06	17:50 (D03)	06:40	07:14
	16:51	17:26	18:00		19:33	20:05	20:34	20:43	20:23	19:40		18:49	27 18:17 (D03)	17:04	16:41
4	07:33	07:16	06:38		06:48	06:03	05:38	05:41	06:06	06:37		07:07	17:51 (D03)	06:41	07:15
	16:52	17:27	18:01		19:34	20:06	20:34	20:43	20:22	19:38		18:48	26 18:17 (D03)	17:02	16:40
5	07:33	07:15	06:37		17:20 (D03)	06:46	06:02	05:37	05:42	06:07	06:38	07:08	17:51 (D03)	06:43	07:16
	16:53	17:28	18:02	13	17:33 (D03)	19:35	20:07	20:35	20:43	20:21	19:36	18:46	25 18:16 (D03)	17:01	16:40
6	07:33	07:14	06:35		17:18 (D03)	06:44	06:01	05:37	05:42	06:08	06:39	07:09	17:52 (D03)	06:44	07:17
	16:54	17:30	18:03	18	17:36 (D03)	19:36	20:08	20:36	20:43	20:20	19:35	18:44	22 18:14 (D03)	17:00	16:40
7	07:33	07:13	06:34		17:16 (D03)	06:43	06:00	05:37	05:43	06:09	06:40	07:10	17:53 (D03)	06:45	07:18
	16:55	17:31	18:04	21	17:37 (D03)	19:37	20:09	20:36	20:43	20:19	19:33	18:43	20 18:13 (D03)	16:59	16:40
8	07:32	07:12	07:32		18:14 (D03)	06:41	05:58	05:36	05:44	06:10	06:41	07:11	17:55 (D03)	06:46	07:19
	16:56	17:32	19:05	24	18:38 (D03)	19:38	20:10	20:37	20:42	20:17	19:31	18:41	15 18:10 (D03)	16:58	16:40
9	07:32	07:10	07:30		18:14 (D03)	06:39	05:57	05:36	05:44	06:11	06:42	07:12	17:57 (D03)	06:47	07:20
	16:57	17:33	19:06	25	18:39 (D03)	19:40	20:11	20:38	20:42	20:16	19:30	18:39	10 18:07 (D03)	16:57	16:40
10	07:32	07:09	07:29		18:12 (D03)	06:38	05:56	05:36	05:45	06:12	06:43	07:13		06:48	07:21
	16:58	17:35	19:07	27	18:39 (D03)	19:41	20:12	20:38	20:42	20:15	19:28	18:38		16:56	16:40
11	07:32	07:08	07:27		18:11 (D03)	06:36	05:55	05:36	05:46	06:13	06:44	07:14		06:50	07:22
	16:59	17:36	19:09	28	18:39 (D03)	19:42	20:13	20:39	20:41	20:14	19:26	18:36		16:55	16:40
12	07:32	07:07	07:26		18:11 (D03)	06:35	05:54	05:36	05:46	06:14	06:45	07:15		06:51	07:23
	17:00	17:37	19:10	29	18:40 (D03)	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		18:11 (D03)	06:33	05:53	05:36	05:47	06:15	06:46	07:16		06:52	07:23
	17:01	17:38	19:11	28	18:39 (D03)	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		18:11 (D03)	06:32	05:52	05:36	05:48	06:16	06:47	07:17		06:53	07:24
	17:02	17:39	19:12	28	18:39 (D03)	19:45	20:16	20:40	20:40	20:10	19:21	18:32		16:52	16:40
15	07:31	07:03	07:21		18:11 (D03)	06:30	05:51	05:36	05:49	06:17	06:48	07:19		06:54	07:25
	17:03	17:41	19:13	28	18:39 (D03)	19:46	20:17	20:41	20:39	20:08	19:20	18:30		16:51	16:41
16	07:30	07:02	07:19		18:11 (D03)	06:28	05:50	05:36	05:49	06:18	06:49	07:20		06:56	07:26
	17:04	17:42	19:14	26	18:37 (D03)	19:47	20:18	20:41	20:39	20:07	19:18	18:28		16:50	16:41
17	07:30	07:00	07:17		18:12 (D03)	06:27	05:49	05:36	05:50	06:19	06:50	07:21		06:57	07:26
	17:05	17:43	19:15	25	18:37 (D03)	19:48	20:19	20:41	20:38	20:06	19:16	18:27		16:49	16:41
18	07:29	06:59	07:16		18:12 (D03)	06:25	05:48	05:36	05:51	06:20	06:51	07:22		06:58	07:27
	17:07	17:44	19:16	24	18:36 (D03)	19:49	20:20	20:42	20:37	20:04	19:15	18:25		16:48	16:41
19	07:29	06:58	07:14		18:13 (D03)	06:24	05:47	05:36	05:52	06:21	06:52	07:23		06:59	07:28
	17:08	17:46	19:17	21	18:34 (D03)	19:50	20:21	20:42	20:37	20:03	19:13	18:24		16:48	16:42
20	07:28	06:56	07:12		18:15 (D03)	06:22	05:47	05:36	05:53	06:22	06:53	07:24		07:00	07:28
	17:09	17:47	19:18	18	18:33 (D03)	19:51	20:22	20:42	20:36	20:01	19:11	18:22		16:47	16:42
21	07:28	06:55	07:11		18:16 (D03)	06:21	05:46	05:36	05:53	06:23	06:54	07:25		07:01	07:29
	17:10	17:48	19:19	14	18:30 (D03)	19:52	20:23	20:43	20:35	20:00	19:10	18:21		16:46	16:42
22	07:27	06:53	07:09		18:21 (D03)	06:19	05:45	05:36	05:54	06:24	06:55	18:02 (D03)	07:26	07:03	07:29
	17:11	17:49	19:21	3	18:24 (D03)	19:53	20:24	20:43	20:35	19:58	19:08	11 18:13 (D03)	18:19	16:46	16:43
23	07:26	06:52	07:07			06:18	05:44	05:37	05:55	06:25	06:56	17:59 (D03)	07:27	07:04	07:30
	17:12	17:50	19:22			19:54	20:25	20:43	20:34	19:57	19:06	16 18:15 (D03)	18:18	16:45	16:43
24	07:26	06:50	07:06			06:17	05:43	05:37	05:56	06:26	06:57	17:57 (D03)	07:29	07:05	07:30
	17:14	17:51	19:23			19:55	20:26	20:43	20:33	19:55	19:04	20 18:17 (D03)	18:17	16:44	16:44
25	07:25	06:49	07:04			06:15	05:43	05:37	05:57	06:27	06:58	17:55 (D03)	07:30	07:06	07:31
	17:15	17:53	19:24			19:56	20:26	20:43	20:32	19:54	19:03	23 18:18 (D03)	18:15	16:44	16:45
26	07:24	06:48	07:02			06:14	05:42	05:38	05:58	06:28	06:59	17:53 (D03)	07:31	07:07	07:31
	17:16	17:54	19:25			19:57	20:27	20:44	20:31	19:52	19:01	25 18:18 (D03)	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	17:52 (D03)	07:32	07:08	07:31
	17:17	17:55	19:26			19:58	20:28	20:44	20:30	19:51	18:59	27 18:19 (D03)	18:12	16:43	16:46
28	07:22	06:45	06:59			06:11	05:41	05:38	06:00	06:30	07:01	17:51 (D03)	07:33	07:09	07:32
	17:18	17:56	19:27			20:00	20:29	20:44	20:29	19:49	18:58	28 18:19 (D03)	18:11	16:42	16:46
29	07:22		06:57			06:10	05:40	05:39	06:01	06:31	07:02	17:51 (D03)	07:34	07:10	07:32
	17:20		19:28			20:01	20:30	20:44	20:28	19:48	18:56	28 18:19 (D03)	18:10	16:42	16:47
30	07:21		06:56			06:08	05:40	05:39	06:02	06:32	07:03	17:50 (D03)	07:35	07:11	07:32
	17:21		19:29			20:02	20:31	20:44	20:27	19:46	18:54	29 18:19 (D03)	18:09	16:42	16:48
31	07:20		06:54				05:39		06:03	06:33			07:37		07:32
	17:22		19:30				20:31		20:26	19:44			18:07		16:49
Potential sun hours	298	297	369		398	448	452	458	428	375		346		298	288
Total, worst case				400							207		201		
Sun reduction				0.73							0.93		0.84		
Oper. time red.				1.00							1.00		1.00		
Wind dir. red.				0.76							0.76		0.76		
Total reduction				0.55							0.70		0.64		
Total, real				221							146		128		

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 33 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (107)

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	05:40	06:04	06:34			07:04		17:56 (D03)	06:38	07:12
	16:50	17:23	17:57			19:31	20:03	20:32	20:44	20:25	19:43			18:53	25	18:21 (D03)	18:06	16:41
2	07:33	07:18	06:41			06:51	06:06	05:38	05:40	06:05	06:35			07:05		17:56 (D03)	06:39	07:13
	16:50	17:25	17:58			19:32	20:04	20:33	20:44	20:24	19:41			18:51	24	18:20 (D03)	17:05	16:41
3	07:33	07:17	06:40			06:49	06:05	05:38	05:41	06:05	06:36			07:06		17:57 (D03)	06:40	07:14
	16:51	17:26	18:00			19:33	20:05	20:34	20:43	20:23	19:40			18:49	21	18:18 (D03)	17:04	16:41
4	07:33	07:16	06:38			06:48	06:03	05:38	05:41	06:06	06:37			07:07		18:00 (D03)	06:41	07:15
	16:52	17:27	18:01			19:34	20:06	20:34	20:43	20:22	19:38			18:48	17	18:17 (D03)	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		18:02 (D03)	06:43	07:16
	16:53	17:28	18:02			19:35	20:07	20:35	20:43	20:21	19:36			18:46	12	18:14 (D03)	17:01	16:40
6	07:33	07:14	06:35			06:44	06:01	05:37	05:42	06:08	06:39			07:09			06:44	07:17
	16:54	17:30	18:03			19:36	20:08	20:36	20:43	20:20	19:35			18:44			17:00	16:40
7	07:33	07:13	06:34			06:43	06:00	05:37	05:43	06:09	06:40			07:10			06:45	07:18
	16:55	17:31	18:04			19:37	20:09	20:36	20:43	20:19	19:33			18:43			16:59	16:40
8	07:32	07:12	07:32		18:26 (D03)	06:41	05:58	05:36	05:44	06:10	06:41			07:11			06:46	07:19
	16:56	17:32	19:05	9	18:35 (D03)	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		18:23 (D03)	06:39	05:57	05:36	05:44	06:11	06:42			07:12			06:47	07:20
	16:57	17:33	19:06	16	18:39 (D03)	19:40	20:11	20:38	20:42	20:16	19:30			18:39			16:57	16:40
10	07:32	07:09	07:29		18:20 (D03)	06:38	05:56	05:36	05:45	06:12	06:43			07:13			06:48	07:21
	16:58	17:35	19:07	20	18:40 (D03)	19:41	20:12	20:38	20:42	20:15	19:28			18:38			16:56	16:40
11	07:32	07:08	07:27		18:18 (D03)	06:36	05:55	05:36	05:46	06:13	06:44			07:14			06:50	07:22
	16:59	17:36	19:09	23	18:41 (D03)	19:42	20:13	20:39	20:41	20:14	19:26			18:36			16:55	16:40
12	07:32	07:07	07:26		18:17 (D03)	06:35	05:54	05:36	05:46	06:14	06:45			07:15			06:51	07:23
	17:00	17:37	19:10	25	18:42 (D03)	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		18:16 (D03)	06:33	05:53	05:36	05:47	06:15	06:46			07:16			06:52	07:23
	17:01	17:38	19:11	26	18:42 (D03)	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		18:16 (D03)	06:32	05:52	05:36	05:48	06:16	06:47			07:17			06:53	07:24
	17:02	17:39	19:12	27	18:43 (D03)	19:45	20:16	20:40	20:40	20:10	19:21			18:32			16:52	16:40
15	07:31	07:03	07:21		18:15 (D03)	06:30	05:51	05:36	05:49	06:17	06:48			07:19			06:54	07:25
	17:03	17:41	19:13	28	18:43 (D03)	19:46	20:17	20:41	20:39	20:08	19:20			18:30			16:51	16:41
16	07:30	07:02	07:19		18:14 (D03)	06:28	05:50	05:36	05:49	06:18	06:49			07:20			06:56	07:26
	17:04	17:42	19:14	29	18:43 (D03)	19:47	20:18	20:41	20:39	20:07	19:18			18:28			16:50	16:41
17	07:30	07:00	07:17		18:14 (D03)	06:27	05:49	05:36	05:50	06:19	06:50			07:21			06:57	07:26
	17:05	17:43	19:15	29	18:43 (D03)	19:48	20:19	20:41	20:38	20:06	19:16			18:27			16:49	16:41
18	07:29	06:59	07:16		18:14 (D03)	06:25	05:48	05:36	05:51	06:20	06:51		18:09 (D03)	07:22			06:58	07:27
	17:07	17:44	19:16	28	18:42 (D03)	19:49	20:20	20:42	20:37	20:04	19:15	10	18:19 (D03)	18:25			16:48	16:41
19	07:29	06:58	07:14		18:14 (D03)	06:24	05:47	05:36	05:52	06:21	06:52		18:05 (D03)	07:23			06:59	07:28
	17:08	17:46	19:17	27	18:41 (D03)	19:50	20:21	20:42	20:37	20:03	19:13	16	18:21 (D03)	18:24			16:48	16:42
20	07:28	06:56	07:12		18:15 (D03)	06:22	05:47	05:36	05:53	06:22	06:53		18:03 (D03)	07:24			07:00	07:28
	17:09	17:47	19:18	26	18:41 (D03)	19:51	20:22	20:42	20:36	20:01	19:11	19	18:22 (D03)	18:22			16:47	16:42
21	07:28	06:55	07:11		18:15 (D03)	06:21	05:46	05:36	05:53	06:23	06:54		18:01 (D03)	07:25			07:01	07:29
	17:10	17:48	19:19	25	18:40 (D03)	19:52	20:23	20:43	20:35	20:00	19:10	22	18:23 (D03)	18:21			16:46	16:42
22	07:27	06:53	07:09		18:15 (D03)	06:19	05:45	05:36	05:54	06:24	06:55		18:00 (D03)	07:26			07:03	07:29
	17:11	17:49	19:21	23	18:38 (D03)	19:53	20:24	20:43	20:35	19:58	19:08	24	18:24 (D03)	18:19			16:46	16:43
23	07:26	06:52	07:07		18:17 (D03)	06:18	05:44	05:37	05:55	06:25	06:56		17:58 (D03)	07:27			07:04	07:30
	17:12	17:50	19:22	20	18:37 (D03)	19:54	20:25	20:43	20:34	19:57	19:06	27	18:25 (D03)	18:18			16:45	16:43
24	07:26	06:50	07:06		18:18 (D03)	06:17	05:43	05:37	05:56	06:26	06:57		17:57 (D03)	07:29			07:05	07:30
	17:14	17:51	19:23	17	18:35 (D03)	19:55	20:26	20:43	20:33	19:55	19:04	28	18:25 (D03)	18:17			16:44	16:44
25	07:25	06:49	07:04		18:20 (D03)	06:15	05:43	05:37	05:57	06:27	06:58		17:57 (D03)	07:30			07:06	07:31
	17:15	17:53	19:24	12	18:32 (D03)	19:56	20:26	20:43	20:32	19:54	19:03	28	18:25 (D03)	18:15			16:44	16:45
26	07:24	06:48	07:02			06:14	05:42	05:38	05:58	06:28	06:59		17:56 (D03)	07:31			07:07	07:31
	17:16	17:54	19:25			19:57	20:27	20:44	20:31	19:52	19:01	29	18:25 (D03)	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		17:56 (D03)	07:32			07:08	07:31
	17:17	17:55	19:26			19:58	20:28	20:44	20:30	19:51	18:59	28	18:24 (D03)	18:12			16:43	16:46
28	07:22	06:45	06:59			06:11	05:41	05:38	06:00	06:30	07:01		17:55 (D03)	07:33			07:09	07:32
	17:18	17:56	19:27			20:00	20:29	20:44	20:29	19:49	18:58	29	18:24 (D03)	18:11			16:42	16:46
29	07:22		06:57			06:10	05:40	05:39	06:01	06:31	07:02		17:55 (D03)	07:34			07:10	07:32
	17:20		19:28			20:01	20:30	20:44	20:28	19:48	18:56	28	18:23 (D03)	18:10			16:42	16:47
30	07:21		06:56			06:08	05:40	05:39	06:02	06:32	07:03		17:55 (D03)	07:35			07:11	07:32
	17:21		19:29			20:02	20:31	20:44	20:27	19:46	18:54	27	18:22 (D03)	18:09			16:42	16:48
31	07:20		06:54				05:39		06:03	06:33				07:37				07:32
	17:22		19:30				20:31		20:26	19:44				18:07				16:49
Potential sun hours	298	297	369			398	448	452	458	428	375			346			298	288
Total, worst case				410								315			99			
Sun reduction				0.73								0.93			0.84			
Oper. time red.				1.00								1.00			1.00			
Wind dir. red.				0.74								0.74			0.74			
Total reduction				0.54								0.69			0.63			
Total, real				223								218			62			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 34 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (108)

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
1	07:33		15:44 (D03)	07:19			06:43		17:03 (D02)	06:52	06:07	05:39
	16:50	30	16:14 (D03)	17:23			17:57	18	17:21 (D02)	19:31	20:03	20:32
2	07:33		15:45 (D03)	07:18			06:41		17:05 (D02)	06:51	06:06	05:38
	16:50	29	16:14 (D03)	17:25			17:58	13	17:18 (D02)	19:32	20:04	20:33
3	07:33		15:45 (D03)	07:17			06:40		17:07 (D02)	06:49	06:05	05:38
	16:51	30	16:15 (D03)	17:26			18:00	8	17:15 (D02)	19:33	20:05	20:34
4	07:33		15:46 (D03)	07:16			06:38			06:48	06:03	05:38
	16:52	29	16:15 (D03)	17:27			18:01			19:34	20:06	20:34
5	07:33		15:46 (D03)	07:15			06:37			06:46	06:02	05:37
	16:53	30	16:16 (D03)	17:28			18:02			19:35	20:07	20:35
6	07:33		15:46 (D03)	07:14			06:35			06:44	06:01	05:37
	16:54	30	16:16 (D03)	17:30			18:03			19:36	20:08	20:36
7	07:33		15:47 (D03)	07:13			06:34			06:43	06:00	05:37
	16:55	30	16:17 (D03)	17:31			18:04			19:37	20:09	20:36
8	07:32		15:47 (D03)	07:12			07:32			06:41	05:58	05:36
	16:56	29	16:16 (D03)	17:32			19:05			19:39	20:10	20:37
9	07:32		15:47 (D03)	07:10			07:30			06:39	05:57	05:36
	16:57	30	16:17 (D03)	17:33			19:06			19:40	20:11	20:38
10	07:32		15:48 (D03)	07:09			07:29			06:38	05:56	05:36
	16:58	30	16:18 (D03)	17:35			19:07			19:41	20:12	20:38
11	07:32		15:49 (D03)	07:08			07:27			06:36	05:55	05:36
	16:59	29	16:18 (D03)	17:36			19:09			19:42	20:13	20:39
12	07:32		15:49 (D03)	07:07			07:26			06:35	05:54	05:36
	17:00	29	16:18 (D03)	17:37			19:10			19:43	20:14	20:39
13	07:31		15:50 (D03)	07:06			07:24			06:33	05:53	05:36
	17:01	28	16:18 (D03)	17:38			19:11			19:44	20:15	20:40
14	07:31		15:50 (D03)	07:04			07:22			06:32	05:52	05:36
	17:02	28	16:18 (D03)	17:39			19:12			19:45	20:16	20:40
15	07:31		15:51 (D03)	07:03			07:21			06:30	05:51	05:36
	17:03	28	16:19 (D03)	17:41			19:13			19:46	20:17	20:41
16	07:30		15:51 (D03)	07:02		17:07 (D02)	07:19			06:28	05:50	05:36
	17:04	27	16:18 (D03)	17:42	11	17:18 (D02)	19:14			19:47	20:18	20:41
17	07:30		15:52 (D03)	07:00		17:05 (D02)	07:17			06:27	05:49	05:36
	17:05	27	16:19 (D03)	17:43	15	17:20 (D02)	19:15			19:48	20:19	20:42
18	07:29		15:53 (D03)	06:59		17:04 (D02)	07:16			06:25	05:48	05:36
	17:07	25	16:18 (D03)	17:44	18	17:22 (D02)	19:16			19:49	20:20	20:42
19	07:29		15:54 (D03)	06:58		17:02 (D02)	07:14			06:24	05:47	05:36
	17:08	24	16:18 (D03)	17:46	20	17:22 (D02)	19:17			19:50	20:21	20:42
20	07:28		15:55 (D03)	06:56		17:02 (D02)	07:12			06:22	05:47	05:36
	17:09	23	16:18 (D03)	17:47	22	17:24 (D02)	19:18			19:51	20:22	20:42
21	07:28		15:57 (D03)	06:55		17:00 (D02)	07:11			06:21	05:46	05:36
	17:10	21	16:18 (D03)	17:48	24	17:24 (D02)	19:19			19:52	20:23	20:43
22	07:27		15:58 (D03)	06:53		17:00 (D02)	07:09			06:19	05:45	05:36
	17:11	19	16:17 (D03)	17:49	24	17:24 (D02)	19:21			19:53	20:24	20:43
23	07:26		15:59 (D03)	06:52		17:01 (D02)	07:07			06:18	05:44	05:37
	17:12	16	16:15 (D03)	17:50	24	17:25 (D02)	19:22			19:54	20:25	20:43
24	07:26		16:01 (D03)	06:50		17:00 (D02)	07:06			06:17	05:43	05:37
	17:14	13	16:14 (D03)	17:51	24	17:24 (D02)	19:23			19:55	20:26	20:43
25	07:25		16:05 (D03)	06:49		17:01 (D02)	07:04			06:15	05:43	05:37
	17:15	7	16:12 (D03)	17:53	23	17:24 (D02)	19:24			19:56	20:26	20:43
26	07:24			06:48		17:00 (D02)	07:02			06:14	05:42	05:38
	17:16			17:54	23	17:23 (D02)	19:25			19:57	20:27	20:44
27	07:23			06:46		17:01 (D02)	07:01			06:12	05:41	05:38
	17:17			17:55	22	17:23 (D02)	19:26			19:59	20:28	20:44
28	07:22			06:45		17:02 (D02)	06:59			06:11	05:41	05:38
	17:18			17:56	20	17:22 (D02)	19:27			20:00	20:29	20:44
29	07:22						06:57			06:10	05:40	05:39
	17:20						19:28			20:01	20:30	20:44
30	07:21						06:56			06:08	05:40	05:39
	17:21						19:29			20:02	20:31	20:44
31	07:20						06:54				05:39	
	17:22						19:30				20:31	
Potential sun hours	298			297			369			398	448	452
Total, worst case		641			270			39				
Sun reduction		0.45			0.62			0.73				
Oper. time red.		1.00			1.00			1.00				
Wind dir. red.		0.89			0.81			0.81				
Total reduction		0.40			0.51			0.60				
Total, real		259			137			23				

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)

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Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 34 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (108)

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

	July	August	September	October		November		December		
1	05:40	06:04	06:34	07:04		06:38		07:12		15:31 (D03)
	20:44	20:25	19:43	18:53		18:06		16:41	29	16:00 (D03)
2	05:40	06:04	06:35	07:05		06:39		07:13		15:31 (D03)
	20:44	20:24	19:41	18:51		17:05		16:41	30	16:01 (D03)
3	05:41	06:05	06:36	07:06		06:40		07:14		15:31 (D03)
	20:43	20:23	19:40	18:49		17:04		16:41	30	16:01 (D03)
4	05:41	06:06	06:37	07:07		06:41		07:15		15:32 (D03)
	20:43	20:22	19:38	18:48		17:02		16:40	29	16:01 (D03)
5	05:42	06:07	06:38	07:08		06:43		07:16		15:32 (D03)
	20:43	20:21	19:36	18:46		17:01		16:40	30	16:02 (D03)
6	05:42	06:08	06:39	07:09		06:44		07:17		15:33 (D03)
	20:43	20:20	19:35	18:44		17:00		16:40	29	16:02 (D03)
7	05:43	06:09	06:40	07:10		06:45		07:18		15:33 (D03)
	20:43	20:19	19:33	18:43		16:59		16:40	30	16:03 (D03)
8	05:44	06:10	06:41	07:11		06:46		07:19		15:34 (D03)
	20:42	20:17	19:31	18:41		16:58		16:40	29	16:03 (D03)
9	05:44	06:11	06:42	07:12		06:47		07:20		15:33 (D03)
	20:42	20:16	19:30	18:39		16:57		16:40	30	16:03 (D03)
10	05:45	06:12	06:43	07:13		06:48		07:21		15:34 (D03)
	20:42	20:15	19:28	18:38		16:56		16:40	29	16:03 (D03)
11	05:46	06:13	06:44	07:14	17:40 (D02)	06:50		07:22		15:34 (D03)
	20:41	20:14	19:26	18:36	11 17:51 (D02)	16:55		16:40	30	16:04 (D03)
12	05:46	06:14	06:45	07:15	17:37 (D02)	06:51		07:23		15:35 (D03)
	20:41	20:12	19:25	18:35	16 17:53 (D02)	16:54		16:40	29	16:04 (D03)
13	05:47	06:15	06:46	07:16	17:35 (D02)	06:52		07:23		15:36 (D03)
	20:40	20:11	19:23	18:33	19 17:54 (D02)	16:53		16:40	29	16:05 (D03)
14	05:48	06:16	06:47	07:17	17:34 (D02)	06:53		07:24		15:36 (D03)
	20:40	20:10	19:21	18:32	20 17:54 (D02)	16:52		16:40	28	16:04 (D03)
15	05:49	06:17	06:48	07:19	17:34 (D02)	06:54		07:25		15:36 (D03)
	20:39	20:08	19:20	18:30	22 17:56 (D02)	16:51		16:41	29	16:05 (D03)
16	05:49	06:18	06:49	07:20	17:33 (D02)	06:56		07:26		15:37 (D03)
	20:39	20:07	19:18	18:28	23 17:56 (D02)	16:50		16:41	29	16:06 (D03)
17	05:50	06:19	06:50	07:21	17:32 (D02)	06:57	15:38 (D03)	07:26		15:37 (D03)
	20:38	20:06	19:16	18:27	24 17:56 (D02)	16:49	7 15:45 (D03)	16:41	29	16:06 (D03)
18	05:51	06:20	06:51	07:22	17:32 (D02)	06:58	15:35 (D03)	07:27		15:38 (D03)
	20:37	20:04	19:15	18:25	24 17:56 (D02)	16:48	13 15:48 (D03)	16:41	28	16:06 (D03)
19	05:52	06:21	06:52	07:23	17:31 (D02)	06:59	15:34 (D03)	07:28		15:39 (D03)
	20:37	20:03	19:13	18:24	24 17:55 (D02)	16:48	16 15:50 (D03)	16:42	28	16:07 (D03)
20	05:53	06:22	06:53	07:24	17:31 (D02)	07:00	15:33 (D03)	07:28		15:39 (D03)
	20:36	20:01	19:11	18:22	24 17:55 (D02)	16:47	19 15:52 (D03)	16:42	28	16:07 (D03)
21	05:53	06:23	06:54	07:25	17:31 (D02)	07:01	15:32 (D03)	07:29		15:40 (D03)
	20:35	20:00	19:10	18:21	23 17:54 (D02)	16:46	21 15:53 (D03)	16:42	28	16:08 (D03)
22	05:54	06:24	06:55	07:26	17:33 (D02)	07:03	15:31 (D03)	07:29		15:40 (D03)
	20:35	19:58	19:08	18:19	21 17:54 (D02)	16:46	23 15:54 (D03)	16:43	28	16:08 (D03)
23	05:55	06:25	06:56	07:27	17:33 (D02)	07:04	15:30 (D03)	07:30		15:41 (D03)
	20:34	19:57	19:06	18:18	20 17:53 (D02)	16:45	24 15:54 (D03)	16:43	28	16:09 (D03)
24	05:56	06:26	06:57	07:29	17:34 (D02)	07:05	15:31 (D03)	07:30		15:41 (D03)
	20:33	19:55	19:04	18:17	17 17:51 (D02)	16:44	25 15:56 (D03)	16:44	28	16:09 (D03)
25	05:57	06:27	06:58	07:30	17:35 (D02)	07:06	15:30 (D03)	07:31		15:41 (D03)
	20:32	19:54	19:03	18:15	14 17:49 (D02)	16:44	27 15:57 (D03)	16:45	28	16:09 (D03)
26	05:58	06:28	06:59	07:31	17:37 (D02)	07:07	15:30 (D03)	07:31		15:42 (D03)
	20:31	19:52	19:01	18:14	10 17:47 (D02)	16:43	27 15:57 (D03)	16:45	28	16:10 (D03)
27	05:59	06:29	07:00	07:32		07:08	15:30 (D03)	07:31		15:42 (D03)
	20:30	19:51	18:59	18:12		16:43	28 15:58 (D03)	16:46	29	16:11 (D03)
28	06:00	06:30	07:01	07:33		07:09	15:30 (D03)	07:32		15:42 (D03)
	20:29	19:49	18:58	18:11		16:42	28 15:58 (D03)	16:46	29	16:11 (D03)
29	06:01	06:31	07:02	07:34		07:10	15:30 (D03)	07:32		15:43 (D03)
	20:28	19:48	18:56	18:10		16:42	28 15:58 (D03)	16:47	28	16:11 (D03)
30	06:02	06:32	07:03	07:35		07:11	15:30 (D03)	07:32		15:44 (D03)
	20:27	19:46	18:54	18:09		16:42	29 15:59 (D03)	16:48	29	16:13 (D03)
31	06:03	06:33		07:37				07:32		15:44 (D03)
	20:26	19:45		18:07				16:49	29	16:13 (D03)
Potential sun hours	458	428	375	346		298		288		
Total, worst case					312		315		894	
Sun reduction					0.84		0.61		0.47	
Oper. time red.					1.00		1.00		1.00	
Wind dir. red.					0.81		0.89		0.89	
Total reduction					0.69		0.55		0.42	
Total, real					215		172		377	

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
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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 35 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (109)

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	07:33		15:55 (D03)	07:19	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38			07:12		15:39 (D03)
	16:50	24	16:19 (D03)	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06			16:41	28	16:07 (D03)
2	07:33		15:55 (D03)	07:18	06:41	06:51	06:06	05:38	05:40	06:04	06:35	07:05	06:39			07:13		15:40 (D03)
	16:50	24	16:19 (D03)	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05			16:41	27	16:07 (D03)
3	07:33		15:55 (D03)	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40			07:14		15:40 (D03)
	16:51	25	16:20 (D03)	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04			16:41	28	16:08 (D03)
4	07:33		15:55 (D03)	07:16	06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07	06:41			07:15		15:41 (D03)
	16:52	26	16:21 (D03)	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02			16:40	27	16:08 (D03)
5	07:33		15:55 (D03)	07:15	06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:43			07:16		15:41 (D03)
	16:53	26	16:21 (D03)	17:28	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01			16:40	27	16:08 (D03)
6	07:33		15:56 (D03)	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44			07:17		15:42 (D03)
	16:54	26	16:22 (D03)	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00			16:40	26	16:08 (D03)
7	07:33		15:56 (D03)	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45			07:18		15:43 (D03)
	16:55	27	16:23 (D03)	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59			16:40	26	16:09 (D03)
8	07:32		15:56 (D03)	07:12	07:32	06:41	05:58	05:36	05:44	06:10	06:41	07:11	06:46			07:19		15:43 (D03)
	16:56	27	16:23 (D03)	17:32	19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58			16:40	26	16:09 (D03)
9	07:32		15:56 (D03)	07:10	07:30	06:39	05:57	05:36	05:44	06:11	06:42	07:12	06:47			07:20		15:43 (D03)
	16:57	28	16:24 (D03)	17:33	19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:39	16:57			16:40	25	16:08 (D03)
10	07:32		15:57 (D03)	07:09	07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13	06:48			07:21		15:44 (D03)
	16:58	27	16:24 (D03)	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56			16:40	24	16:08 (D03)
11	07:32		15:57 (D03)	07:08	07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14	06:50			07:22		15:45 (D03)
	16:59	28	16:25 (D03)	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55			16:40	24	16:09 (D03)
12	07:32		15:57 (D03)	07:07	07:26	06:35	05:54	05:36	05:46	06:14	06:45	07:15	06:51			07:23		15:45 (D03)
	17:00	28	16:25 (D03)	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54			16:40	24	16:09 (D03)
13	07:31		15:58 (D03)	07:06	07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52			07:23		15:46 (D03)
	17:01	28	16:26 (D03)	17:38	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53			16:40	24	16:10 (D03)
14	07:31		15:57 (D03)	07:04	07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53		15:43 (D03)	07:24		15:46 (D03)
	17:02	29	16:26 (D03)	17:39	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52	10	15:53 (D03)	16:40	23	16:09 (D03)
15	07:31		15:58 (D03)	07:03	07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19	06:54		15:42 (D03)	07:25		15:47 (D03)
	17:03	28	16:26 (D03)	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	14	15:56 (D03)	16:41	23	16:10 (D03)
16	07:30		15:58 (D03)	07:02	07:19	06:28	05:50	05:36	05:49	06:18	06:49	07:20	06:56		15:40 (D03)	07:26		15:48 (D03)
	17:04	28	16:26 (D03)	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	18	15:58 (D03)	16:41	22	16:10 (D03)
17	07:30		15:59 (D03)	07:00	07:17	06:27	05:49	05:36	05:50	06:19	06:50	07:21	06:57		15:39 (D03)	07:26		15:48 (D03)
	17:05	28	16:27 (D03)	17:43	19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	16:49	20	15:59 (D03)	16:41	22	16:10 (D03)
18	07:29		15:59 (D03)	06:59	07:16	06:25	05:48	05:36	05:51	06:20	06:51	07:22	06:58		15:38 (D03)	07:27		15:49 (D03)
	17:07	28	16:27 (D03)	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	22	16:00 (D03)	16:41	22	16:11 (D03)
19	07:29		16:00 (D03)	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59		15:38 (D03)	07:28		15:50 (D03)
	17:08	27	16:27 (D03)	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	23	16:01 (D03)	16:42	22	16:12 (D03)
20	07:28		16:01 (D03)	06:56	07:12	06:22	05:47	05:36	05:53	06:22	06:53	07:24	07:00		15:38 (D03)	07:28		15:50 (D03)
	17:09	26	16:27 (D03)	17:47	19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	24	16:02 (D03)	16:42	21	16:11 (D03)
21	07:28		16:02 (D03)	06:55	07:11	06:21	05:46	05:36	05:53	06:23	06:54	07:25	07:01		15:37 (D03)	07:29		15:51 (D03)
	17:10	25	16:27 (D03)	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	25	16:02 (D03)	16:42	21	16:12 (D03)
22	07:27		16:03 (D03)	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03		15:37 (D03)	07:29		15:51 (D03)
	17:11	24	16:27 (D03)	17:49	19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:19	16:46	26	16:03 (D03)	16:43	21	16:12 (D03)
23	07:26		16:03 (D03)	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04		15:36 (D03)	07:30		15:52 (D03)
	17:12	23	16:26 (D03)	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	27	16:03 (D03)	16:43	21	16:13 (D03)
24	07:26		16:04 (D03)	06:50	07:06	06:17	05:43	05:37	05:56	06:26	06:57	07:29	07:05		15:37 (D03)	07:30		15:52 (D03)
	17:14	22	16:26 (D03)	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	16:44	28	16:05 (D03)	16:44	21	16:13 (D03)
25	07:25		16:06 (D03)	06:49	07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06		15:37 (D03)	07:31		15:52 (D03)
	17:15	20	16:26 (D03)	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	28	16:05 (D03)	16:45	22	16:14 (D03)
26	07:24		16:07 (D03)	06:48	07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07		15:37 (D03)	07:31		15:53 (D03)
	17:16	18	16:25 (D03)	17:54	19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43	28	16:05 (D03)	16:45	22	16:15 (D03)
27	07:23		16:09 (D03)	06:46	07:01	06:12	05:41	05:38	05:59	06:29	07:00	07:32	07:08		15:37 (D03)	07:31		15:53 (D03)
	17:17	14	16:23 (D03)	17:55	19:26	19:59	20:28	20:44	20:30	19:51	18:59	18:12	16:43	28	16:05 (D03)	16:46	22	16:15 (D03)
28	07:22		16:12 (D03)	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09		15:37 (D03)	07:32		15:53 (D03)
	17:18	9	16:21 (D03)	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	29	16:06 (D03)	16:46	23	16:16 (D03)
29	07:22				06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10		15:38 (D03)	07:32		15:53 (D03)
	17:20				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	28	16:06 (D03)	16:47	23	16:16 (D03)
30	07:21				06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11		15:38 (D03)	07:32		15:54 (D03)
	17:21				19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	28	16:06 (D03)	16:48	23	16:17 (D03)
31	07:20				06:54		05:39		06:03	06:33		07:37				07:32		15:54 (D03)
	17:22				19:30		20:31		20:26	19:45		18:07				16:49	24	16:18 (D03)
Potential sun hours	298			297	369	398	448	452	458	428	375	346	298			288		
Total, worst case		693												406			734	
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		277												220			306	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 36 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (110)

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	07:33		16:01 (D03)	07:19	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38			07:12		15:44 (D03)
	16:50	19	16:20 (D03)	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06			16:41	26	16:10 (D03)
2	07:33		16:01 (D03)	07:18	06:41	06:51	06:06	05:38	05:40	06:04	06:35	07:05	06:39			07:13		15:44 (D03)
	16:50	20	16:21 (D03)	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05			16:41	26	16:10 (D03)
3	07:33		16:01 (D03)	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40			07:14		15:45 (D03)
	16:51	21	16:22 (D03)	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04			16:41	25	16:10 (D03)
4	07:33		16:01 (D03)	07:16	06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07	06:41			07:15		15:46 (D03)
	16:52	21	16:22 (D03)	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02			16:40	24	16:10 (D03)
5	07:33		16:01 (D03)	07:15	06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:43			07:16		15:46 (D03)
	16:53	22	16:23 (D03)	17:28	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01			16:40	24	16:10 (D03)
6	07:33		16:01 (D03)	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44			07:17		15:47 (D03)
	16:54	23	16:24 (D03)	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00			16:40	23	16:10 (D03)
7	07:33		16:01 (D03)	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45			07:18		15:48 (D03)
	16:55	24	16:25 (D03)	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59			16:40	22	16:10 (D03)
8	07:32		16:01 (D03)	07:12	07:32	06:41	05:58	05:36	05:44	06:10	06:41	07:11	06:46			07:19		15:49 (D03)
	16:56	24	16:25 (D03)	17:32	19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58			16:40	22	16:11 (D03)
9	07:32		16:01 (D03)	07:10	07:30	06:39	05:57	05:36	05:44	06:11	06:42	07:12	06:47			07:20		15:49 (D03)
	16:57	25	16:26 (D03)	17:33	19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:39	16:57			16:40	21	16:10 (D03)
10	07:32		16:01 (D03)	07:09	07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13	06:48			07:21		15:50 (D03)
	16:58	26	16:27 (D03)	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56			16:40	20	16:10 (D03)
11	07:32		16:02 (D03)	07:08	07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14	06:50			07:22		15:51 (D03)
	16:59	26	16:28 (D03)	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55			16:40	19	16:10 (D03)
12	07:32		16:01 (D03)	07:07	07:26	06:35	05:54	05:36	05:46	06:14	06:45	07:15	06:51		15:47 (D03)	07:23		15:52 (D03)
	17:00	27	16:28 (D03)	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	10	15:57 (D03)	16:40	18	16:10 (D03)
13	07:31		16:02 (D03)	07:06	07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52		15:45 (D03)	07:23		15:53 (D03)
	17:01	27	16:29 (D03)	17:38	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53	14	15:59 (D03)	16:40	18	16:11 (D03)
14	07:31		16:01 (D03)	07:04	07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53		15:43 (D03)	07:24		15:53 (D03)
	17:02	28	16:29 (D03)	17:39	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52	18	16:01 (D03)	16:40	17	16:10 (D03)
15	07:31		16:02 (D03)	07:03	07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19	06:54		15:43 (D03)	07:25		15:54 (D03)
	17:03	28	16:30 (D03)	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	20	16:03 (D03)	16:41	16	16:10 (D03)
16	07:30		16:02 (D03)	07:02	07:19	06:28	05:50	05:36	05:49	06:18	06:49	07:20	06:56		15:42 (D03)	07:26		15:55 (D03)
	17:04	28	16:30 (D03)	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	21	16:03 (D03)	16:41	16	16:11 (D03)
17	07:30		16:03 (D03)	07:00	07:17	06:27	05:49	05:36	05:50	06:19	06:50	07:21	06:57		15:41 (D03)	07:26		15:55 (D03)
	17:05	28	16:31 (D03)	17:43	19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	16:49	23	16:04 (D03)	16:41	16	16:11 (D03)
18	07:29		16:03 (D03)	06:59	07:16	06:25	05:48	05:36	05:51	06:20	06:51	07:22	06:58		15:40 (D03)	07:27		15:56 (D03)
	17:07	27	16:30 (D03)	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	25	16:05 (D03)	16:41	15	16:11 (D03)
19	07:29		16:04 (D03)	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59		15:41 (D03)	07:28		15:57 (D03)
	17:08	27	16:31 (D03)	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	25	16:06 (D03)	16:42	15	16:12 (D03)
20	07:28		16:04 (D03)	06:56	07:12	06:22	05:47	05:36	05:53	06:22	06:53	07:24	07:00		15:40 (D03)	07:28		15:57 (D03)
	17:09	27	16:31 (D03)	17:47	19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	27	16:07 (D03)	16:42	15	16:12 (D03)
21	07:28		16:05 (D03)	06:55	07:11	06:21	05:46	05:36	05:53	06:23	06:54	07:25	07:01		15:40 (D03)	07:29		15:58 (D03)
	17:10	27	16:32 (D03)	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	27	16:07 (D03)	16:42	15	16:13 (D03)
22	07:27		16:05 (D03)	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03		15:40 (D03)	07:29		15:58 (D03)
	17:11	27	16:32 (D03)	17:49	19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:19	16:46	27	16:07 (D03)	16:43	15	16:13 (D03)
23	07:26		16:06 (D03)	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04		15:40 (D03)	07:30		15:59 (D03)
	17:12	25	16:31 (D03)	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	27	16:07 (D03)	16:43	15	16:14 (D03)
24	07:26		16:06 (D03)	06:50	07:06	06:17	05:43	05:37	05:56	06:26	06:57	07:29	07:05		15:41 (D03)	07:30		15:59 (D03)
	17:14	25	16:31 (D03)	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	16:44	27	16:08 (D03)	16:44	15	16:14 (D03)
25	07:25		16:08 (D03)	06:49	07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06		15:41 (D03)	07:31		15:59 (D03)
	17:15	23	16:31 (D03)	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	28	16:09 (D03)	16:45	15	16:14 (D03)
26	07:24		16:09 (D03)	06:48	07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07		15:41 (D03)	07:31		16:00 (D03)
	17:16	21	16:30 (D03)	17:54	19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43	28	16:09 (D03)	16:45	15	16:15 (D03)
27	07:23		16:10 (D03)	06:46	07:01	06:12	05:41	05:38	05:59	06:29	07:00	07:32	07:08		15:41 (D03)	07:31		16:00 (D03)
	17:17	20	16:30 (D03)	17:55	19:26	19:59	20:28	20:44	20:30	19:51	18:59	18:12	16:43	28	16:09 (D03)	16:46	16	16:16 (D03)
28	07:22		16:11 (D03)	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09		15:42 (D03)	07:32		16:00 (D03)
	17:18	18	16:29 (D03)	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	27	16:09 (D03)	16:46	16	16:16 (D03)
29	07:22		16:13 (D03)		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10		15:42 (D03)	07:32		16:00 (D03)
	17:20	14	16:27 (D03)		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	27	16:09 (D03)	16:47	17	16:17 (D03)
30	07:21		16:15 (D03)		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11		15:42 (D03)	07:32		16:01 (D03)
	17:21	10	16:25 (D03)		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	27	16:09 (D03)	16:48	17	16:18 (D03)
31	07:20				06:54		05:39		06:03	06:33		07:37				07:32		16:01 (D03)
	17:22				19:30		20:31		20:26	19:45		18:07				16:49	18	16:19 (D03)
Potential sun hours	298			297	369	398	448	452	458	428	375	346	298			288		
Total, worst case		708												456			572	
Sun reduction		0.45												0.61			0.47	
Oper. time red.		1.00												1.00			1.00	
Wind dir. red.		0.88												0.88			0.88	
Total reduction		0.40												0.54			0.42	
Total, real		282												246			238	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 37 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (111)

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		16:09 (D03)	07:19	16:20 (D03)	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38		07:12	15:49 (D03)
	16:50	11	16:20 (D03)	17:23	9 16:29 (D03)	17:57	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06		16:41	23 16:12 (D03)
2	07:33		16:08 (D03)	07:18		06:41	06:51	06:06	05:38	05:40	06:04	06:35	07:05	06:39		07:13	15:50 (D03)
	16:50	13	16:21 (D03)	17:25		17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05		16:41	22 16:12 (D03)
3	07:33		16:08 (D03)	07:17		06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40		07:14	15:51 (D03)
	16:51	14	16:22 (D03)	17:26		18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04		16:41	21 16:12 (D03)
4	07:33		16:08 (D03)	07:16		06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07	06:41		07:15	15:52 (D03)
	16:52	15	16:23 (D03)	17:27		18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02		16:40	20 16:12 (D03)
5	07:33		16:08 (D03)	07:15		06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:43		07:16	15:53 (D03)
	16:53	16	16:24 (D03)	17:28		18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01		16:40	19 16:12 (D03)
6	07:33		16:08 (D03)	07:14		06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44		07:17	15:54 (D03)
	16:54	17	16:25 (D03)	17:30		18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00		16:40	17 16:11 (D03)
7	07:33		16:08 (D03)	07:13		06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45		07:18	15:55 (D03)
	16:55	18	16:26 (D03)	17:31		18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59		16:40	16 16:11 (D03)
8	07:32		16:07 (D03)	07:12		07:32	06:41	05:58	05:36	05:44	06:10	06:41	07:11	06:46		07:19	15:56 (D03)
	16:56	20	16:27 (D03)	17:32		19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58		16:40	15 16:11 (D03)
9	07:32		16:07 (D03)	07:10		07:30	06:39	05:57	05:36	05:44	06:11	06:42	07:12	06:47		07:20	15:56 (D03)
	16:57	21	16:28 (D03)	17:33		19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:39	16:57		16:40	14 16:10 (D03)
10	07:32		16:07 (D03)	07:09		07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13	06:48	15:50 (D03)	07:21	15:57 (D03)
	16:58	22	16:29 (D03)	17:35		19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	10 16:00 (D03)	16:40	13 16:10 (D03)
11	07:32		16:07 (D03)	07:08		07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14	06:50	15:49 (D03)	07:22	15:59 (D03)
	16:59	23	16:30 (D03)	17:36		19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	14 16:03 (D03)	16:40	11 16:10 (D03)
12	07:32		16:07 (D03)	07:07		07:26	06:35	05:54	05:36	05:46	06:14	06:45	07:15	06:51	15:47 (D03)	07:23	16:00 (D03)
	17:00	23	16:30 (D03)	17:37		19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	17 16:04 (D03)	16:40	9 16:09 (D03)
13	07:31		16:07 (D03)	07:06		07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52	15:46 (D03)	07:23	16:02 (D03)
	17:01	24	16:31 (D03)	17:38		19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53	19 16:05 (D03)	16:40	7 16:09 (D03)
14	07:31		16:06 (D03)	07:04		07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53	15:45 (D03)	07:24	16:03 (D03)
	17:02	25	16:31 (D03)	17:39		19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52	21 16:06 (D03)	16:40	5 16:08 (D03)
15	07:31		16:07 (D03)	07:03		07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19	06:54	15:45 (D03)	07:25	16:05 (D03)
	17:03	26	16:33 (D03)	17:41		19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	23 16:08 (D03)	16:41	1 16:06 (D03)
16	07:30		16:06 (D03)	07:02		07:19	06:28	05:50	05:36	05:49	06:18	06:49	07:20	06:56	15:44 (D03)	07:26	
	17:04	27	16:33 (D03)	17:42		19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	24 16:08 (D03)	16:41	
17	07:30		16:07 (D03)	07:00		07:17	06:27	05:49	05:36	05:50	06:19	06:50	07:21	06:57	15:44 (D03)	07:26	
	17:05	27	16:34 (D03)	17:43		19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	16:49	25 16:09 (D03)	16:41	
18	07:29		16:07 (D03)	06:59		07:16	06:25	05:48	05:36	05:51	06:20	06:51	07:22	06:58	15:43 (D03)	07:27	
	17:07	27	16:34 (D03)	17:44		19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	26 16:09 (D03)	16:41	
19	07:29		16:08 (D03)	06:58		07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	15:44 (D03)	07:28	
	17:08	27	16:35 (D03)	17:46		19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	26 16:10 (D03)	16:42	
20	07:28		16:08 (D03)	06:56		07:12	06:22	05:47	05:36	05:53	06:22	06:53	07:24	07:00	15:44 (D03)	07:28	
	17:09	27	16:35 (D03)	17:47		19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	27 16:11 (D03)	16:42	
21	07:28		16:09 (D03)	06:55		07:11	06:21	05:46	05:36	05:53	06:23	06:54	07:25	07:01	15:44 (D03)	07:29	
	17:10	27	16:36 (D03)	17:48		19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	27 16:11 (D03)	16:42	
22	07:27		16:09 (D03)	06:53		07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	15:44 (D03)	07:29	
	17:11	27	16:36 (D03)	17:49		19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:19	16:46	27 16:11 (D03)	16:43	
23	07:26		16:09 (D03)	06:52		07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	15:44 (D03)	07:30	
	17:12	26	16:35 (D03)	17:50		19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	27 16:11 (D03)	16:43	
24	07:26		16:09 (D03)	06:50		07:06	06:17	05:43	05:37	05:56	06:26	06:57	07:29	07:05	15:45 (D03)	07:30	
	17:14	26	16:35 (D03)	17:51		19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	16:44	27 16:12 (D03)	16:44	
25	07:25		16:11 (D03)	06:49		07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06	15:45 (D03)	07:31	
	17:15	25	16:36 (D03)	17:53		19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	27 16:12 (D03)	16:45	
26	07:24		16:11 (D03)	06:48		07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07	15:46 (D03)	07:31	
	17:16	24	16:35 (D03)	17:54		19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43	26 16:12 (D03)	16:45	
27	07:23		16:12 (D03)	06:46		07:01	06:12	05:41	05:38	05:59	06:29	07:00	07:32	07:08	15:46 (D03)	07:31	
	17:17	23	16:35 (D03)	17:55		19:26	19:59	20:28	20:44	20:30	19:51	18:59	18:12	16:43	26 16:12 (D03)	16:46	
28	07:22		16:13 (D03)	06:45		06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	15:46 (D03)	07:32	
	17:18	21	16:34 (D03)	17:56		19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	26 16:12 (D03)	16:46	
29	07:22		16:14 (D03)			06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	15:47 (D03)	07:32	16:10 (D03)
	17:20	19	16:33 (D03)			19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	24 16:11 (D03)	16:47	4 16:14 (D03)
30	07:21		16:15 (D03)			06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	15:48 (D03)	07:32	16:10 (D03)
	17:21	17	16:32 (D03)			19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	23 16:11 (D03)	16:48	7 16:17 (D03)
31	07:20		16:17 (D03)			06:54		05:39		06:03	06:33		07:37			07:32	16:09 (D03)
	17:22	14	16:31 (D03)			19:30		20:31		20:26	19:45		18:07			16:49	9 16:18 (D03)
Potential sun hours	298			297		369	398	448	452	458	428	375	346	298		288	
Total, worst case		672			9										492		233
Sun reduction		0.45			0.62										0.61		0.47
Oper. time red.		1.00			1.00										1.00		1.00
Wind dir. red.		0.88			0.88										0.88		0.88
Total reduction		0.40			0.55										0.54		0.41
Total, real		267			5										265		97

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 38 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (112)

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		16:23 (D03)	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38		07:12		16:04 (D03)
	16:50		17:23	19	16:42 (D03)	17:57	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06		16:41	10	16:14 (D03)
2	07:33		07:18		16:24 (D03)	06:41	06:51	06:06	05:38	05:40	06:04	06:35	07:05	06:39		07:13		16:07 (D03)
	16:50		17:25	17	16:41 (D03)	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05		16:41	5	16:12 (D03)
3	07:33		07:17		16:26 (D03)	06:40	06:49	06:04	05:38	05:41	06:05	06:36	07:06	06:40		07:14		
	16:51		17:26	13	16:39 (D03)	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04		16:41		
4	07:33		07:16		16:29 (D03)	06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07	06:41		07:15		
	16:52		17:27	8	16:37 (D03)	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	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	06:43		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	07:33		07:14			06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44		07:17		
	16:54		17:30			18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00		16:40		
7	07:33		07:13			06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	15:58 (D03)	07:18		
	16:55		17:31			18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	9	16:07 (D03)		16:40
8	07:32		07:12			07:32	06:41	05:58	05:36	05:44	06:10	06:41	07:11	06:46	15:57 (D03)	07:19		
	16:56		17:32			19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58	13	16:10 (D03)		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		15:55 (D03)		07:20
	16:57		17:33			19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:39	16:57	17	16:12 (D03)		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		15:54 (D03)		07:21
	16:58	4	17:35			19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	19	16:13 (D03)		16:40
11	07:32		07:08			07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14	06:50		15:54 (D03)		07:22
	16:59	9	17:36			19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	20	16:14 (D03)		16:40
12	07:32		07:07			07:26	06:35	05:54	05:36	05:46	06:14	06:45	07:15	06:51		15:53 (D03)		07:23
	17:00	12	17:37			19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	22	16:15 (D03)		16:40
13	07:31		07:06			07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52		15:52 (D03)		07:23
	17:01	14	17:38			19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53	23	16:15 (D03)		16:40
14	07:31		07:04			07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53		15:52 (D03)		07:24
	17:02	16	17:39			19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52	24	16:16 (D03)		16:40
15	07:31		07:03			07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19	06:54		15:52 (D03)		07:25
	17:03	18	17:41			19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	25	16:17 (D03)		16:40
16	07:30		07:02			07:19	06:28	05:50	05:36	05:49	06:18	06:49	07:20	06:56		15:52 (D03)		07:26
	17:04	19	17:42			19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	25	16:17 (D03)		16:41
17	07:30		07:00			07:17	06:27	05:49	05:36	05:50	06:19	06:50	07:21	06:57		15:52 (D03)		07:26
	17:05	21	17:43			19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	16:49	25	16:17 (D03)		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		15:52 (D03)		07:27
	17:07	21	17:44			19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	25	16:17 (D03)		16:41
19	07:29		06:58			07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59		15:53 (D03)		07:28
	17:08	23	17:46			19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	25	16:18 (D03)		16:42
20	07:28		06:56			07:12	06:22	05:47	05:36	05:53	06:22	06:53	07:24	07:00		15:53 (D03)		07:28
	17:09	23	17:47			19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	25	16:18 (D03)		16:42
21	07:28		06:55			07:11	06:21	05:46	05:36	05:53	06:23	06:54	07:25	07:01		15:53 (D03)		07:29
	17:10	24	17:48			19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	24	16:17 (D03)		16:42
22	07:27		06:53			07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03		15:54 (D03)		07:29
	17:11	25	17:49			19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:19	16:46	23	16:17 (D03)		16:43
23	07:26		06:52			07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04		15:54 (D03)		07:30
	17:12	25	17:50			19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	23	16:17 (D03)		16:43
24	07:26		06:50			07:06	06:17	05:43	05:37	05:56	06:26	06:57	07:29	07:05		15:56 (D03)		07:30
	17:14	25	17:51			19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	16:44	21	16:17 (D03)		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		15:56 (D03)		07:31
	17:15	25	17:53			19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	21	16:17 (D03)		16:45
26	07:24		06:48			07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07		15:57 (D03)		07:31
	17:16	25	17:54			19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43	20	16:17 (D03)		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		15:58 (D03)		07:31
	17:17	25	17:55			19:26	19:59	20:28	20:44	20:30	19:51	18:59	18:12	16:43	18	16:16 (D03)		16:46
28	07:22		06:45			06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09		15:59 (D03)		07:32
	17:18	24	17:56			19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16	16:15 (D03)		16:46
29	07:22					06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10		16:00 (D03)		07:32
	17:20	23				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	15	16:15 (D03)		16:47
30	07:21					06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11		16:01 (D03)		07:32
	17:21	22				19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	13	16:14 (D03)		16:48
31	07:20					06:54		05:39		06:03	06:33		07:37					07:32
	17:22	20				19:30		20:31		20:26	19:44		18:07					16:49
Potential sun hours	298		297			369	398	448	452	458	428	375	346	298		288		
Total, worst case		443		57											491		15	
Sun reduction		0.45		0.62											0.61		0.47	
Oper. time red.		1.00		1.00											1.00		1.00	
Wind dir. red.		0.88		0.88											0.88		0.88	
Total reduction		0.39		0.54											0.53		0.41	
Total, real		175		31											263		6	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 39 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (113)

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
1	07:33		15:55 (D03)	07:19			06:43		17:06 (D02)	06:52	06:07	05:39
	16:50	23	16:18 (D03)	17:23			17:57	23	17:29 (D02)	19:31	20:03	20:32
2	07:33		15:55 (D03)	07:18			06:41		17:06 (D02)	06:51	06:06	05:38
	16:50	23	16:18 (D03)	17:25			17:58	22	17:28 (D02)	19:32	20:04	20:33
3	07:33		15:55 (D03)	07:17			06:40		17:06 (D02)	06:49	06:05	05:38
	16:51	24	16:19 (D03)	17:26			18:00	21	17:27 (D02)	19:33	20:05	20:34
4	07:33		15:56 (D03)	07:16			06:38		17:07 (D02)	06:48	06:03	05:38
	16:52	24	16:20 (D03)	17:27			18:01	19	17:26 (D02)	19:34	20:06	20:34
5	07:33		15:56 (D03)	07:15			06:37		17:08 (D02)	06:46	06:02	05:37
	16:53	25	16:21 (D03)	17:28			18:02	16	17:24 (D02)	19:35	20:07	20:35
6	07:33		15:56 (D03)	07:14			06:35		17:10 (D02)	06:44	06:01	05:37
	16:54	26	16:22 (D03)	17:30			18:03	13	17:23 (D02)	19:36	20:08	20:36
7	07:33		15:56 (D03)	07:13			06:34		17:14 (D02)	06:43	06:00	05:37
	16:55	26	16:22 (D03)	17:31			18:04	4	17:18 (D02)	19:37	20:09	20:36
8	07:32		15:56 (D03)	07:12			07:32			06:41	05:58	05:36
	16:56	26	16:22 (D03)	17:32			19:05			19:39	20:10	20:37
9	07:32		15:56 (D03)	07:10			07:30			06:39	05:57	05:36
	16:57	27	16:23 (D03)	17:33			19:06			19:40	20:11	20:38
10	07:32		15:56 (D03)	07:09			07:29			06:38	05:56	05:36
	16:58	28	16:24 (D03)	17:35			19:07			19:41	20:12	20:38
11	07:32		15:57 (D03)	07:08			07:27			06:36	05:55	05:36
	16:59	28	16:25 (D03)	17:36			19:09			19:42	20:13	20:39
12	07:32		15:56 (D03)	07:07			07:26			06:35	05:54	05:36
	17:00	29	16:25 (D03)	17:37			19:10			19:43	20:14	20:39
13	07:31		15:57 (D03)	07:06			07:24			06:33	05:53	05:36
	17:01	29	16:26 (D03)	17:38			19:11			19:44	20:15	20:40
14	07:31		15:57 (D03)	07:04			07:22			06:32	05:52	05:36
	17:02	29	16:26 (D03)	17:39			19:12			19:45	20:16	20:40
15	07:31		15:57 (D03)	07:03			07:21			06:30	05:51	05:36
	17:03	30	16:27 (D03)	17:41			19:13			19:46	20:17	20:41
16	07:30		15:57 (D03)	07:02			07:19			06:28	05:50	05:36
	17:04	30	16:27 (D03)	17:42			19:14			19:47	20:18	20:41
17	07:30		15:58 (D03)	07:00			07:17			06:27	05:49	05:36
	17:05	30	16:28 (D03)	17:43			19:15			19:48	20:19	20:41
18	07:29		15:58 (D03)	06:59			07:16			06:25	05:48	05:36
	17:07	29	16:27 (D03)	17:44			19:16			19:49	20:20	20:42
19	07:29		15:59 (D03)	06:58			07:14			06:24	05:47	05:36
	17:08	29	16:28 (D03)	17:46			19:17			19:50	20:21	20:42
20	07:28		15:59 (D03)	06:56		17:13 (D02)	07:12			06:22	05:47	05:36
	17:09	29	16:28 (D03)	17:47	10	17:23 (D02)	19:18			19:51	20:22	20:42
21	07:28		16:00 (D03)	06:55		17:10 (D02)	07:11			06:21	05:46	05:36
	17:10	29	16:29 (D03)	17:48	15	17:25 (D02)	19:19			19:52	20:23	20:43
22	07:27		16:00 (D03)	06:53		17:09 (D02)	07:09			06:19	05:45	05:36
	17:11	29	16:29 (D03)	17:49	18	17:27 (D02)	19:21			19:53	20:24	20:43
23	07:26		16:01 (D03)	06:52		17:08 (D02)	07:07			06:18	05:44	05:37
	17:12	27	16:28 (D03)	17:50	20	17:28 (D02)	19:22			19:54	20:25	20:43
24	07:26		16:01 (D03)	06:50		17:07 (D02)	07:06			06:17	05:43	05:37
	17:14	27	16:28 (D03)	17:51	22	17:29 (D02)	19:23			19:55	20:26	20:43
25	07:25		16:03 (D03)	06:49		17:07 (D02)	07:04			06:15	05:43	05:37
	17:15	25	16:28 (D03)	17:53	23	17:30 (D02)	19:24			19:56	20:26	20:43
26	07:24		16:04 (D03)	06:48		17:06 (D02)	07:02			06:14	05:42	05:38
	17:16	24	16:28 (D03)	17:54	23	17:29 (D02)	19:25			19:57	20:27	20:44
27	07:23		16:05 (D03)	06:46		17:06 (D02)	07:01			06:12	05:41	05:38
	17:17	22	16:27 (D03)	17:55	24	17:30 (D02)	19:26			19:59	20:28	20:44
28	07:22		16:06 (D03)	06:45		17:05 (D02)	06:59			06:11	05:41	05:38
	17:18	20	16:26 (D03)	17:56	24	17:29 (D02)	19:27			20:00	20:29	20:44
29	07:22		16:08 (D03)				06:57			06:10	05:40	05:39
	17:20	17	16:25 (D03)				19:28			20:01	20:30	20:44
30	07:21		16:10 (D03)				06:56			06:08	05:40	05:39
	17:21	13	16:23 (D03)				19:29			20:02	20:31	20:44
31	07:20		16:13 (D03)				06:54				05:39	
	17:22	7	16:20 (D03)				19:30				20:31	
Potential sun hours	298			297			369			398	448	452
Total, worst case		784			179			118				
Sun reduction		0.45			0.62			0.73				
Oper. time red.		1.00			1.00			1.00				
Wind dir. red.		0.89			0.80			0.80				
Total reduction		0.40			0.50			0.59				
Total, real		315			90			70				

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 39 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (113)

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

	July	August	September	October		November		December		
1	05:40	06:04	06:34	07:04		06:38		07:12		15:39 (D03)
	20:44	20:25	19:43	18:53		18:06		16:41	28	16:07 (D03)
2	05:40	06:04	06:35	07:05		06:39		07:13		15:39 (D03)
	20:44	20:24	19:41	18:51		17:05		16:41	28	16:07 (D03)
3	05:41	06:05	06:36	07:06		06:40		07:14		15:40 (D03)
	20:43	20:23	19:40	18:49		17:04		16:41	27	16:07 (D03)
4	05:41	06:06	06:37	07:07		06:41		07:15		15:41 (D03)
	20:43	20:22	19:38	18:48		17:02		16:40	26	16:07 (D03)
5	05:42	06:07	06:38	07:08		06:43		07:16		15:41 (D03)
	20:43	20:21	19:36	18:46		17:01		16:40	27	16:08 (D03)
6	05:42	06:08	06:39	07:09		06:44		07:17		15:42 (D03)
	20:43	20:20	19:35	18:44		17:00		16:40	26	16:08 (D03)
7	05:43	06:09	06:40	07:10		17:48 (D02)	06:45	07:18		15:43 (D03)
	20:43	20:19	19:33	18:43	9	17:57 (D02)	16:59	16:40	25	16:08 (D03)
8	05:44	06:10	06:41	07:11		17:45 (D02)	06:46	07:19		15:44 (D03)
	20:42	20:17	19:31	18:41	14	17:59 (D02)	16:58	16:40	24	16:08 (D03)
9	05:44	06:11	06:42	07:12		17:43 (D02)	06:47	07:20		15:43 (D03)
	20:42	20:16	19:30	18:39	17	18:00 (D02)	16:57	16:40	24	16:07 (D03)
10	05:45	06:12	06:43	07:13		17:41 (D02)	06:48	07:21		15:44 (D03)
	20:42	20:15	19:28	18:38	20	18:01 (D02)	16:56	16:40	23	16:07 (D03)
11	05:46	06:13	06:44	07:14		17:40 (D02)	06:50	15:44 (D03)	07:22	15:45 (D03)
	20:41	20:14	19:26	18:36	22	18:02 (D02)	16:55	8 15:52 (D03)	16:40	23 16:08 (D03)
12	05:46	06:14	06:45	07:15		17:39 (D02)	06:51	15:41 (D03)	07:23	15:46 (D03)
	20:41	20:12	19:25	18:35	23	18:02 (D02)	16:54	14 15:55 (D03)	16:40	22 16:08 (D03)
13	05:47	06:15	06:46	07:16		17:38 (D02)	06:52	15:39 (D03)	07:23	15:47 (D03)
	20:40	20:11	19:23	18:33	24	18:02 (D02)	16:53	18 15:57 (D03)	16:40	21 16:08 (D03)
14	05:48	06:16	06:47	07:17		17:38 (D02)	06:53	15:38 (D03)	07:24	15:47 (D03)
	20:40	20:10	19:21	18:32	24	18:02 (D02)	16:52	20 15:58 (D03)	16:40	21 16:08 (D03)
15	05:49	06:17	06:48	07:19		17:38 (D02)	06:54	15:38 (D03)	07:25	15:48 (D03)
	20:39	20:08	19:20	18:30	24	18:02 (D02)	16:51	22 16:00 (D03)	16:41	20 16:08 (D03)
16	05:49	06:18	06:49	07:20		17:38 (D02)	06:56	15:37 (D03)	07:26	15:49 (D03)
	20:39	20:07	19:18	18:28	24	18:02 (D02)	16:50	24 16:01 (D03)	16:41	20 16:09 (D03)
17	05:50	06:19	06:50	07:21		17:38 (D02)	06:57	15:36 (D03)	07:26	15:49 (D03)
	20:38	20:06	19:16	18:27	23	18:01 (D02)	16:49	25 16:01 (D03)	16:41	19 16:08 (D03)
18	05:51	06:20	06:51	07:22		17:39 (D02)	06:58	15:35 (D03)	07:27	15:50 (D03)
	20:37	20:04	19:15	18:25	21	18:00 (D02)	16:48	27 16:02 (D03)	16:41	19 16:09 (D03)
19	05:52	06:21	06:52	07:23		17:39 (D02)	06:59	15:36 (D03)	07:28	15:51 (D03)
	20:37	20:03	19:13	18:24	20	17:59 (D02)	16:48	27 16:03 (D03)	16:42	19 16:10 (D03)
20	05:53	06:22	06:53	07:24		17:40 (D02)	07:00	15:35 (D03)	07:28	15:51 (D03)
	20:36	20:01	19:11	18:22	17	17:57 (D02)	16:47	29 16:04 (D03)	16:42	19 16:10 (D03)
21	05:53	06:23	06:54	07:25		17:42 (D02)	07:01	15:35 (D03)	07:29	15:52 (D03)
	20:35	20:00	19:10	18:21	13	17:55 (D02)	16:46	29 16:04 (D03)	16:42	19 16:11 (D03)
22	05:54	06:24	06:55	07:26		17:45 (D02)	07:03	15:35 (D03)	07:29	15:52 (D03)
	20:35	19:58	19:08	18:19	8	17:53 (D02)	16:46	29 16:04 (D03)	16:43	19 16:11 (D03)
23	05:55	06:25	06:56	07:27			07:04	15:35 (D03)	07:30	15:53 (D03)
	20:34	19:57	19:06	18:18			16:45	29 16:04 (D03)	16:43	19 16:12 (D03)
24	05:56	06:26	06:57	07:29			07:05	15:36 (D03)	07:30	15:53 (D03)
	20:33	19:55	19:04	18:17			16:44	29 16:05 (D03)	16:44	19 16:12 (D03)
25	05:57	06:27	06:58	07:30			07:06	15:36 (D03)	07:31	15:53 (D03)
	20:32	19:54	19:03	18:15			16:44	30 16:06 (D03)	16:45	19 16:12 (D03)
26	05:58	06:28	06:59	07:31			07:07	15:36 (D03)	07:31	15:54 (D03)
	20:31	19:52	19:01	18:14			16:43	30 16:06 (D03)	16:45	19 16:13 (D03)
27	05:59	06:29	07:00	07:32			07:08	15:36 (D03)	07:31	15:54 (D03)
	20:30	19:51	18:59	18:12			16:43	30 16:06 (D03)	16:46	20 16:14 (D03)
28	06:00	06:30	07:01	07:33			07:09	15:37 (D03)	07:32	15:54 (D03)
	20:29	19:49	18:58	18:11			16:42	29 16:06 (D03)	16:46	20 16:14 (D03)
29	06:01	06:31	07:02	07:34			07:10	15:37 (D03)	07:32	15:54 (D03)
	20:28	19:48	18:56	18:10			16:42	29 16:06 (D03)	16:47	21 16:15 (D03)
30	06:02	06:32	07:03	07:35			07:11	15:37 (D03)	07:32	15:55 (D03)
	20:27	19:46	18:54	18:09			16:42	29 16:06 (D03)	16:48	21 16:16 (D03)
31	06:03	06:33		07:37					07:32	15:55 (D03)
	20:26	19:45		18:07					16:49	22 16:17 (D03)
Potential sun hours	458	428	375	346		298		288		
Total, worst case					303		507		679	
Sun reduction					0.84		0.61		0.47	
Oper. time red.					1.00		1.00		1.00	
Wind dir. red.					0.80		0.89		0.89	
Total reduction					0.68		0.55		0.42	
Total, real					206		276		285	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 40 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (114)

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		16:32 (D03)	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04		06:38	16:04 (D03)	07:12
	16:50		17:23	23	16:55 (D03)	17:57	19:31	20:03	20:32	20:44	20:25	19:43	18:53		18:06	21	16:25 (D03)	16:41
2	07:33		07:18		16:31 (D03)	06:41	06:51	06:06	05:38	05:40	06:04	06:35	07:05		06:39		16:03 (D03)	07:13
	16:50		17:25	25	16:56 (D03)	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51		17:05	22	16:25 (D03)	16:41
3	07:33		07:17		16:31 (D03)	06:40	06:49	06:04	05:38	05:41	06:05	06:36	07:06		06:40		16:02 (D03)	07:14
	16:51		17:26	25	16:56 (D03)	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49		17:04	23	16:25 (D03)	16:41
4	07:33		07:16		16:31 (D03)	06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07		06:41		16:02 (D03)	07:15
	16:52		17:27	25	16:56 (D03)	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48		17:02	25	16:27 (D03)	16:40
5	07:33		07:15		16:32 (D03)	06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08		06:43		16:02 (D03)	07:16
	16:53		17:28	25	16:57 (D03)	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46		17:01	25	16:27 (D03)	16:40
6	07:33		07:14		16:32 (D03)	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09		06:44		16:01 (D03)	07:17
	16:54		17:30	25	16:57 (D03)	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44		17:00	26	16:27 (D03)	16:40
7	07:33		07:13		16:33 (D03)	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10		06:45		16:01 (D03)	07:18
	16:55		17:31	24	16:57 (D03)	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43		16:59	25	16:26 (D03)	16:40
8	07:32		07:12		16:33 (D03)	07:32	06:41	05:58	05:36	05:44	06:10	06:41	07:11		06:46		16:02 (D03)	07:19
	16:56		17:32	24	16:57 (D03)	19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41		16:58	25	16:27 (D03)	16:40
9	07:32		07:10		16:33 (D03)	07:30	06:39	05:57	05:36	05:44	06:11	06:42	07:12		06:47		16:02 (D03)	07:20
	16:57		17:33	22	16:55 (D03)	19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:39		16:57	25	16:27 (D03)	16:40
10	07:32		07:09		16:34 (D03)	07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13		06:48		16:02 (D03)	07:21
	16:58		17:35	21	16:55 (D03)	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38		16:56	24	16:26 (D03)	16:40
11	07:32		07:08		16:36 (D03)	07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14		06:50		16:04 (D03)	07:22
	16:59		17:36	18	16:54 (D03)	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36		16:55	22	16:26 (D03)	16:40
12	07:32		07:07		16:37 (D03)	07:26	06:35	05:54	05:36	05:46	06:14	06:45	07:15		06:51		16:04 (D03)	07:23
	17:00		17:37	16	16:53 (D03)	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35		16:54	22	16:26 (D03)	16:40
13	07:31		07:05		16:39 (D03)	07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16		06:52		16:05 (D03)	07:23
	17:01		17:38	11	16:50 (D03)	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33		16:53	20	16:25 (D03)	16:40
14	07:31		07:04			07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17		06:53		16:06 (D03)	07:24
	17:02		17:39			19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32		16:52	17	16:23 (D03)	16:40
15	07:31		07:03			07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19		06:54		16:08 (D03)	07:25
	17:03		17:41			19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30		16:51	15	16:23 (D03)	16:40
16	07:30		07:02			07:19	06:28	05:50	05:36	05:49	06:18	06:49	07:20		06:56		16:10 (D03)	07:26
	17:04		17:42			19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28		16:50	11	16:21 (D03)	16:41
17	07:30		07:00			07:17	06:27	05:49	05:36	05:50	06:19	06:50	07:21		06:57		16:12 (D03)	07:26
	17:05		17:43			19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27		16:49	7	16:19 (D03)	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
	17:07		17:44			19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25		16:48			16:41
19	07:29		06:58			07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23		06:59			07:28
	17:08		17:46			19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24		16:48			16:42
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
	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	07:28		06:55			07:11	06:21	05:46	05:36	05:53	06:23	06:54	07:25		07:01			07:29
	17:10		17:48			19:19	19:52	20:23	20:43	20:35	20:00	19:10	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		07:03			07:29
	17:11		17:49			19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:19		16:46			16:43
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
	17:12		17:50			19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18		16:45			16:43
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
	17:14		17:51			19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17		16:44			16:44
25	07:25	16:39 (D03)	06:49			07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30		07:06			07:31
	17:15	7 16:46 (D03)	17:53			19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15		16:44			16:45
26	07:24	16:37 (D03)	06:48			07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31		07:07			07:31
	17:16	11 16:48 (D03)	17:54			19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14		16:43			16:45
27	07:23	16:35 (D03)	06:46			07:01	06:12	05:41	05:38	05:59	06:29	07:00	07:32		07:08			07:31
	17:17	15 16:50 (D03)	17:55			19:26	19:58	20:28	20:44	20:30	19:51	18:59	18:12		16:43			16:46
28	07:22	16:34 (D03)	06:45			06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	17:12 (D03)	07:09			07:32
	17:18	18 16:52 (D03)	17:56			19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	5 17:17 (D03)	16:42			16:46
29	07:22	16:33 (D03)				06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	17:08 (D03)	07:10			07:32
	17:20	20 16:53 (D03)				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	12 17:20 (D03)	16:42			16:47
30	07:21	16:32 (D03)				06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	17:06 (D03)	07:11			07:32
	17:21	22 16:54 (D03)				19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16 17:22 (D03)	16:42			16:48
31	07:20	16:32 (D03)				06:54		05:39		06:03	06:33		07:37	17:05 (D03)				07:32
	17:22	22 16:54 (D03)				19:30		20:31		20:26	19:44		18:07	19 17:24 (D03)				16:49
Potential sun hours	298		297			369	398	448	452	458	428	375	346		298			288
Total, worst case		115		284										52		355		
Sun reduction		0.45		0.62										0.84		0.61		
Oper. time red.		1.00		1.00										1.00		1.00		
Wind dir. red.		0.86		0.86										0.86		0.86		
Total reduction		0.39		0.54										0.73		0.53		
Total, real		45		152										38		187		

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 41 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (115)

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	07:33		15:46 (D03)	07:19	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38	07:12		
	16:50	13	15:59 (D03)	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 (D03)	07:18	06:41	06:51	06:06	05:38	05:40	06:04	06:35	07:05	06:39	07:13		
	16:50	12	15:59 (D03)	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41		
3	07:33		15:48 (D03)	07:17	06:40	06:49	06:04	05:38	05:41	06:05	06:36	07:06	06:40	07:14		
	16:51	10	15:58 (D03)	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41		
4	07:33		15:50 (D03)	07:16	06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07	06:41	07:15		
	16:52	8	15:58 (D03)	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02	16:40		
5	07:33		15:53 (D03)	07:15	06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:43	07:16		
	16:53	3	15:56 (D03)	17:28	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01	16:40		
6	07:33			07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17		
	16:54			17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40		
7	07:33			07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18		15:40 (D03)
	16:55			17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40	3	15:43 (D03)
8	07:32			07:12	07:32	06:41	05:58	05:36	05:44	06:10	06:41	07:11	06:46	07:19		15:38 (D03)
	16:56			17:32	19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58	16:40	8	15:46 (D03)
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		15:37 (D03)
	16:57			17:33	19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:39	16:57	16:40	9	15:46 (D03)
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		15:36 (D03)
	16:58			17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40	12	15:48 (D03)
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		15:36 (D03)
	16:59			17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40	13	15:49 (D03)
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		15:36 (D03)
	17:00			17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40	14	15:50 (D03)
13	07:31			07:06	07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52	07:23		15:36 (D03)
	17:01			17:38	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53	16:40	15	15:51 (D03)
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		15:36 (D03)
	17:02			17:39	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52	16:40	15	15:51 (D03)
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		15:36 (D03)
	17:03			17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:40	16	15:52 (D03)
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		15:37 (D03)
	17:04			17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41	16	15:53 (D03)
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		15:36 (D03)
	17:05			17:43	19:15	19:48	20:19	20:42	20:38	20:06	19:16	18:27	16:49	16:41	17	15:53 (D03)
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		15:37 (D03)
	17:07			17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41	17	15:54 (D03)
19	07:29			06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28		15:38 (D03)
	17:08			17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42	17	15:55 (D03)
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		15:38 (D03)
	17:09			17:47	19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	16:42	17	15:55 (D03)
21	07:28			06:55	07:11	06:21	05:46	05:36	05:53	06:23	06:54	07:25	07:01	07:29		15:39 (D03)
	17:10			17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:42	17	15:56 (D03)
22	07:27			06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29		15:39 (D03)
	17:11			17:49	19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:19	16:46	16:43	17	15:56 (D03)
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		15:40 (D03)
	17:12			17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43	17	15:57 (D03)
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		15:40 (D03)
	17:14			17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	16:44	16:44	17	15:57 (D03)
25	07:25			06:49	07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06	07:31		15:40 (D03)
	17:15			17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45	17	15:57 (D03)
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		15:41 (D03)
	17:16			17:54	19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43	16:45	17	15:58 (D03)
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		15:42 (D03)
	17:17			17:55	19:26	19:59	20:28	20:44	20:30	19:51	18:59	18:12	16:43	16:46	16	15:58 (D03)
28	07:22			06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32		15:42 (D03)
	17:18			17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46	16	15:58 (D03)
29	07:22				06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32		15:43 (D03)
	17:20				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47	15	15:58 (D03)
30	07:21				06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32		15:44 (D03)
	17:21				19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48	15	15:59 (D03)
31	07:20				06:54		05:39		06:03	06:33		07:37		07:32		15:45 (D03)
	17:22				19:30		20:31		20:26	19:45		18:07		16:49	14	15:59 (D03)
Potential sun hours	298			297	369	398	448	452	458	428	375	346	298	288		
Total, worst case		46													367	
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		18													154	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 42 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (116)

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	07:33		15:50 (D03)	07:19	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38			07:12		15:39 (D03)
	16:50	25	16:15 (D03)	17:23	17:57	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06			16:41	20	15:59 (D03)
2	07:33		15:51 (D03)	07:18	06:41	06:51	06:06	05:38	05:40	06:04	06:35	07:05	06:39			07:13		15:39 (D03)
	16:50	24	16:15 (D03)	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05			16:41	21	16:00 (D03)
3	07:33		15:51 (D03)	07:17	06:40	06:49	06:04	05:38	05:41	06:05	06:36	07:06	06:40			07:14		15:39 (D03)
	16:51	25	16:16 (D03)	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04			16:41	22	16:01 (D03)
4	07:33		15:52 (D03)	07:16	06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07	06:41			07:15		15:39 (D03)
	16:52	24	16:16 (D03)	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02			16:40	23	16:02 (D03)
5	07:33		15:52 (D03)	07:15	06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:43			07:16		15:39 (D03)
	16:53	24	16:16 (D03)	17:28	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01			16:40	23	16:02 (D03)
6	07:33		15:53 (D03)	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44			07:17		15:39 (D03)
	16:54	24	16:17 (D03)	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00			16:40	24	16:03 (D03)
7	07:33		15:54 (D03)	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45			07:18		15:40 (D03)
	16:55	23	16:17 (D03)	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59			16:40	23	16:03 (D03)
8	07:32		15:54 (D03)	07:12	07:32	06:41	05:58	05:36	05:44	06:10	06:41	07:11	06:46			07:19		15:40 (D03)
	16:56	22	16:16 (D03)	17:32	19:05	19:38	20:10	20:37	20:42	20:17	19:31	18:41	16:58			16:40	24	16:04 (D03)
9	07:32		15:55 (D03)	07:10	07:30	06:39	05:57	05:36	05:44	06:11	06:42	07:12	06:47			07:20		15:39 (D03)
	16:57	22	16:17 (D03)	17:33	19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:39	16:57			16:40	25	16:04 (D03)
10	07:32		15:56 (D03)	07:09	07:29	06:38	05:56	05:36	05:45	06:12	06:43	07:13	06:48			07:21		15:40 (D03)
	16:58	21	16:17 (D03)	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56			16:40	24	16:04 (D03)
11	07:32		15:57 (D03)	07:08	07:27	06:36	05:55	05:36	05:46	06:13	06:44	07:14	06:50			07:22		15:40 (D03)
	16:59	20	16:17 (D03)	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55			16:40	25	16:05 (D03)
12	07:32		15:57 (D03)	07:07	07:26	06:35	05:54	05:36	05:46	06:14	06:45	07:15	06:51			07:23		15:41 (D03)
	17:00	19	16:16 (D03)	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54			16:40	25	16:06 (D03)
13	07:31		15:59 (D03)	07:06	07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52			07:23		15:41 (D03)
	17:01	18	16:17 (D03)	17:38	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53			16:40	25	16:06 (D03)
14	07:31		15:59 (D03)	07:04	07:22	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53			07:24		15:41 (D03)
	17:02	17	16:16 (D03)	17:39	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52			16:40	25	16:06 (D03)
15	07:31		16:01 (D03)	07:03	07:21	06:30	05:51	05:36	05:49	06:17	06:48	07:19	06:54			07:25		15:42 (D03)
	17:03	14	16:15 (D03)	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51			16:40	25	16:07 (D03)
16	07:30		16:02 (D03)	07:02	07:19	06:28	05:50	05:36	05:49	06:18	06:49	07:20	06:56			07:26		15:43 (D03)
	17:04	12	16:14 (D03)	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50			16:41	25	16:08 (D03)
17	07:30		16:05 (D03)	07:00	07:17	06:27	05:49	05:36	05:50	06:19	06:50	07:21	06:57			07:26		15:42 (D03)
	17:05	8	16:13 (D03)	17:43	19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	16:49			16:41	26	16:08 (D03)
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 (D03)
	17:07			17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48			16:41	25	16:08 (D03)
19	07:29			06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59			07:28		15:44 (D03)
	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	16:09 (D03)
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		15:44 (D03)
	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	16:09 (D03)
21	07:28			06:55	07:11	06:21	05:46	05:36	05:53	06:23	06:54	07:25	07:01			07:29		15:45 (D03)
	17:10			17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46			16:42	25	16:10 (D03)
22	07:27			06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03			07:29		15:45 (D03)
	17:11			17:49	19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:19	16:46			16:43	25	16:10 (D03)
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		15:46 (D03)
	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	16:11 (D03)
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		15:46 (D03)
	17:14			17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	16:44			16:44	25	16:11 (D03)
25	07:25			06:49	07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06		15:44 (D03)	07:31		15:46 (D03)
	17:15			17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	7	15:51 (D03)	16:45	25	16:11 (D03)
26	07:24			06:48	07:02	06:14	05:42	05:38	05:58	06:28	06:59	07:31	07:07		15:42 (D03)	07:31		15:47 (D03)
	17:16			17:54	19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43	11	15:53 (D03)	16:45	26	16:13 (D03)
27	07:23			06:46	07:01	06:12	05:41	05:38	05:59	06:29	07:00	07:32	07:08		15:40 (D03)	07:31		15:47 (D03)
	17:17			17:55	19:26	19:59	20:28	20:44	20:30	19:51	18:59	18:12	16:43	14	15:54 (D03)	16:46	26	16:13 (D03)
28	07:22			06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09		15:40 (D03)	07:32		15:48 (D03)
	17:18			17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16	15:56 (D03)	16:46	25	16:13 (D03)
29	07:22				06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10		15:39 (D03)	07:32		15:48 (D03)
	17:20				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	18	15:57 (D03)	16:47	25	16:13 (D03)
30	07:21				06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11		15:38 (D03)	07:32		15:49 (D03)
	17:21				19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	19	15:57 (D03)	16:48	25	16:14 (D03)
31	07:20				06:54		05:39		06:03	06:33		07:37				07:32		15:50 (D03)
	17:22				19:30		20:31		20:26	19:45		18:07				16:49	25	16:15 (D03)
Potential sun hours	298			297	369	398	448	452	458	428	375	346	298			288		
Total, worst case		342												85			757	
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		137												46			317	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 43 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (117)

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 44 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (118)

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	07:33	07:19	06:43		06:53	06:07	05:39	05:40	06:04	06:34		07:04	07:46 (D01)	06:38	07:13
	16:50	17:24	17:57		19:31	20:03	20:32	20:44	20:26	19:43		18:53	31 08:17 (D01)	18:06	16:41
2	07:33	07:18	06:42		06:51	06:06	05:38	05:40	06:05	06:35		07:05	07:46 (D01)	06:39	07:14
	16:51	17:25	17:59		19:32	20:04	20:33	20:44	20:25	19:41		18:51	31 08:17 (D01)	17:05	16:41
3	07:33	07:17	06:40	07:23 (D01)	06:49	06:05	05:38	05:41	06:06	06:36		07:06	07:46 (D01)	06:40	07:15
	16:51	17:26	18:00	4 07:27 (D01)	19:33	20:05	20:34	20:44	20:23	19:40		18:49	30 08:16 (D01)	17:04	16:41
4	07:33	07:16	06:39	07:17 (D01)	06:48	06:03	05:38	05:41	06:07	06:37		07:07	07:46 (D01)	06:42	07:16
	16:52	17:27	18:01	14 07:31 (D01)	19:34	20:06	20:35	20:43	20:22	19:38		18:48	29 08:15 (D01)	17:02	16:41
5	07:33	07:15	06:37	07:14 (D01)	06:46	06:02	05:37	05:42	06:08	06:38		07:08	07:46 (D01)	06:43	07:17
	16:53	17:28	18:02	19 07:33 (D01)	19:35	20:07	20:35	20:43	20:21	19:37		18:46	28 08:14 (D01)	17:01	16:40
6	07:33	07:14	06:35	07:12 (D01)	06:44	06:01	05:37	05:42	06:09	06:39		07:09	07:47 (D01)	06:44	07:18
	16:54	17:30	18:03	23 07:35 (D01)	19:37	20:08	20:36	20:43	20:20	19:35		18:45	26 08:13 (D01)	17:00	16:40
7	07:33	07:13	06:34	07:11 (D01)	06:43	06:00	05:37	05:43	06:09	06:40		07:10	07:47 (D01)	06:45	07:18
	16:55	17:31	18:04	25 07:36 (D01)	19:38	20:09	20:37	20:43	20:19	19:33		18:43	24 08:11 (D01)	16:59	16:40
8	07:33	07:12	07:32	08:10 (D01)	06:41	05:59	05:36	05:44	06:10	06:41		07:11	07:49 (D01)	06:46	07:19
	16:56	17:32	19:05	27 08:37 (D01)	19:39	20:10	20:37	20:42	20:18	19:32		18:41	21 08:10 (D01)	16:58	16:40
9	07:32	07:11	07:31	08:08 (D01)	06:40	05:57	05:36	05:44	06:11	06:42		07:12	07:50 (D01)	06:47	07:20
	16:57	17:33	19:07	29 08:37 (D01)	19:40	20:11	20:38	20:42	20:16	19:30		18:40	17 08:07 (D01)	16:57	16:40
10	07:32	07:09	07:29	08:07 (D01)	06:38	05:56	05:36	05:45	06:12	06:43		07:13	07:53 (D01)	06:49	07:21
	16:58	17:35	19:08	30 08:37 (D01)	19:41	20:12	20:38	20:42	20:15	19:28		18:38	11 08:04 (D01)	16:56	16:40
11	07:32	07:08	07:27	08:07 (D01)	06:36	05:55	05:36	05:46	06:13	06:44		07:14		06:50	07:22
	16:59	17:36	19:09	31 08:38 (D01)	19:42	20:13	20:39	20:41	20:14	19:27		18:36		16:55	16:40
12	07:32	07:07	07:26	08:06 (D01)	06:35	05:54	05:36	05:46	06:14	06:45		07:15		06:51	07:23
	17:00	17:37	19:10	32 08:38 (D01)	19:43	20:14	20:39	20:41	20:13	19:25		18:35		16:54	16:40
13	07:32	07:06	07:24	08:06 (D01)	06:33	05:53	05:36	05:47	06:15	06:46		07:17		06:52	07:24
	17:01	17:38	19:11	31 08:37 (D01)	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	08:06 (D01)	06:32	05:52	05:36	05:48	06:16	06:47		07:18		06:53	07:24
	17:02	17:40	19:12	31 08:37 (D01)	19:45	20:16	20:40	20:40	20:10	19:22		18:32		16:52	16:40
15	07:31	07:03	07:21	08:06 (D01)	06:30	05:51	05:36	05:49	06:17	06:48		07:19		06:55	07:25
	17:03	17:41	19:13	30 08:36 (D01)	19:46	20:17	20:41	20:39	20:09	19:20		18:30		16:51	16:41
16	07:30	07:02	07:19	08:05 (D01)	06:29	05:50	05:36	05:49	06:18	06:49		07:20		06:56	07:26
	17:04	17:42	19:14	30 08:35 (D01)	19:47	20:18	20:41	20:39	20:07	19:18		18:29		16:50	16:41
17	07:30	07:00	07:18	08:06 (D01)	06:27	05:49	05:36	05:50	06:19	06:50		07:21		06:57	07:26
	17:06	17:43	19:15	29 08:35 (D01)	19:48	20:19	20:42	20:38	20:06	19:16		18:27		16:49	16:41
18	07:29	06:59	07:16	08:07 (D01)	06:26	05:48	05:36	05:51	06:20	06:51		07:22		06:58	07:27
	17:07	17:44	19:16	27 08:34 (D01)	19:49	20:20	20:42	20:38	20:04	19:15		18:26		16:49	16:41
19	07:29	06:58	07:14	08:07 (D01)	06:24	05:48	05:36	05:52	06:21	06:52		07:23		06:59	07:28
	17:08	17:46	19:17	25 08:32 (D01)	19:50	20:21	20:42	20:37	20:03	19:13		18:24		16:48	16:42
20	07:28	06:56	07:13	08:09 (D01)	06:23	05:47	05:36	05:53	06:22	06:53		07:24		07:00	07:28
	17:09	17:47	19:19	22 08:31 (D01)	19:51	20:22	20:43	20:36	20:01	19:11		18:23		16:47	16:42
21	07:28	06:55	07:11	08:10 (D01)	06:21	05:46	05:36	05:54	06:23	06:54	07:59 (D01)	07:25		07:02	07:29
	17:10	17:48	19:20	18 08:28 (D01)	19:52	20:23	20:43	20:35	20:00	19:10	12 08:11 (D01)	18:21		16:46	16:43
22	07:27	06:54	07:09	08:12 (D01)	06:20	05:45	05:37	05:54	06:24	06:55	07:56 (D01)	07:26		07:03	07:29
	17:11	17:49	19:21	13 08:25 (D01)	19:53	20:24	20:43	20:35	19:59	19:08	17 08:13 (D01)	18:20		16:46	16:43
23	07:26	06:52	07:08		06:18	05:44	05:37	05:55	06:25	06:56	07:53 (D01)	07:28		07:04	07:30
	17:13	17:50	19:22		19:54	20:25	20:43	20:34	19:57	19:06	22 08:15 (D01)	18:18		16:45	16:44
24	07:26	06:51	07:06		06:17	05:44	05:37	05:56	06:26	06:57	07:52 (D01)	07:29		07:05	07:30
	17:14	17:52	19:23		19:56	20:26	20:43	20:33	19:56	19:05	24 08:16 (D01)	18:17		16:45	16:44
25	07:25	06:49	07:04		06:15	05:43	05:37	05:57	06:27	06:58	07:50 (D01)	07:30		07:06	07:31
	17:15	17:53	19:24		19:57	20:27	20:44	20:32	19:54	19:03	27 08:17 (D01)	18:15		16:44	16:45
26	07:24	06:48	07:03		06:14	05:42	05:38	05:58	06:28	06:59	07:49 (D01)	07:31		07:07	07:31
	17:16	17:54	19:25		19:58	20:27	20:44	20:31	19:52	19:01	28 08:17 (D01)	18:14		16:43	16:45
27	07:23	06:46	07:01		06:13	05:42	05:38	05:59	06:29	07:00	07:48 (D01)	07:32		07:08	07:31
	17:17	17:55	19:26		19:59	20:28	20:44	20:30	19:51	19:00	30 08:18 (D01)	18:13		16:43	16:46
28	07:23	06:45	06:59		06:11	05:41	05:38	06:00	06:30	07:01	07:47 (D01)	07:33		07:09	07:32
	17:19	17:56	19:27		20:00	20:29	20:44	20:30	19:49	18:58	31 08:18 (D01)	18:11		16:43	16:47
29	07:22		06:58		06:10	05:40	05:39	06:01	06:31	07:02	07:47 (D01)	07:34		07:10	07:32
	17:20		19:28		20:01	20:30	20:44	20:29	19:48	18:56	31 08:18 (D01)	18:10		16:42	16:47
30	07:21		06:56		06:09	05:40	05:39	06:02	06:32	07:03	07:46 (D01)	07:36		07:12	07:32
	17:21		19:29		20:02	20:31	20:44	20:28	19:46	18:54	32 08:18 (D01)	18:09		16:42	16:48
31	07:20		06:54			05:39		06:03	06:33			07:37			07:32
	17:22		19:30			20:32		20:27	19:45			18:07			16:49
Potential sun hours	298	297	369		398	448	452	458	428	375		346		298	288
Total, worst case				490							254		248		
Sun reduction				0.73							0.93		0.84		
Oper. time red.				1.00							1.00		1.00		
Wind dir. red.				0.54							0.54		0.54		
Total reduction				0.40							0.51		0.46		
Total, real				194							128		113		

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 45 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (119)

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	07:33	07:19			06:43		07:20 (D01)	06:53	06:07	05:39	05:40	06:04	06:34			07:04		07:53 (D01)	06:38	07:13
	16:50	17:24			17:57	20	07:40 (D01)	19:31	20:03	20:32	20:44	20:26	19:43			18:53	28	08:21 (D01)	18:06	16:41
2	07:33	07:18			06:42		07:18 (D01)	06:51	06:06	05:38	05:40	06:05	06:35			07:05		07:52 (D01)	06:39	07:14
	16:51	17:25			17:59	23	07:41 (D01)	19:32	20:04	20:33	20:44	20:25	19:41			18:51	29	08:21 (D01)	17:05	16:41
3	07:33	07:17			06:40		07:17 (D01)	06:49	06:05	05:38	05:41	06:06	06:36			07:06		07:51 (D01)	06:40	07:15
	16:51	17:26			18:00	26	07:43 (D01)	19:33	20:05	20:34	20:44	20:23	19:40			18:49	30	08:21 (D01)	17:04	16:41
4	07:33	07:16			06:39		07:15 (D01)	06:48	06:03	05:38	05:41	06:07	06:37			07:07		07:50 (D01)	06:42	07:16
	16:52	17:27			18:01	28	07:43 (D01)	19:34	20:06	20:35	20:43	20:22	19:38			18:48	31	08:21 (D01)	17:02	16:41
5	07:33	07:15			06:37		07:14 (D01)	06:46	06:02	05:37	05:42	06:08	06:38			07:08		07:50 (D01)	06:43	07:17
	16:53	17:28			18:02	29	07:43 (D01)	19:35	20:07	20:35	20:43	20:21	19:37			18:46	31	08:21 (D01)	17:01	16:40
6	07:33	07:14			06:35		07:14 (D01)	06:44	06:01	05:37	05:42	06:09	06:39			07:09		07:50 (D01)	06:44	07:18
	16:54	17:30			18:03	30	07:44 (D01)	19:37	20:08	20:36	20:43	20:20	19:35			18:45	30	08:20 (D01)	17:00	16:40
7	07:33	07:13			06:34		07:13 (D01)	06:43	06:00	05:37	05:43	06:09	06:40			07:10		07:50 (D01)	06:45	07:18
	16:55	17:31			18:04	31	07:44 (D01)	19:38	20:09	20:37	20:43	20:19	19:33			18:43	30	08:20 (D01)	16:59	16:40
8	07:33	07:12			07:32		08:13 (D01)	06:41	05:59	05:36	05:44	06:10	06:41			07:11		07:50 (D01)	06:46	07:19
	16:56	17:32			19:05	31	08:44 (D01)	19:39	20:10	20:37	20:42	20:18	19:32			18:41	29	08:19 (D01)	16:58	16:40
9	07:32	07:11			07:31		08:13 (D01)	06:40	05:57	05:36	05:44	06:11	06:42			07:12		07:50 (D01)	06:47	07:20
	16:57	17:33			19:07	30	08:43 (D01)	19:40	20:11	20:38	20:42	20:16	19:30			18:40	28	08:18 (D01)	16:57	16:40
10	07:32	07:09			07:29		08:12 (D01)	06:38	05:56	05:36	05:45	06:12	06:43			07:13		07:50 (D01)	06:49	07:21
	16:58	17:35			19:08	31	08:43 (D01)	19:41	20:12	20:38	20:42	20:15	19:28			18:38	27	08:17 (D01)	16:56	16:40
11	07:32	07:08			07:27		08:13 (D01)	06:36	05:55	05:36	05:46	06:13	06:44			07:14		07:51 (D01)	06:50	07:22
	16:59	17:36			19:09	30	08:43 (D01)	19:42	20:13	20:39	20:41	20:14	19:27			18:36	25	08:16 (D01)	16:55	16:40
12	07:32	07:07			07:26		08:13 (D01)	06:35	05:54	05:36	05:46	06:14	06:45			07:15		07:52 (D01)	06:51	07:23
	17:00	17:37			19:10	28	08:41 (D01)	19:43	20:14	20:39	20:41	20:13	19:25			18:35	22	08:14 (D01)	16:54	16:40
13	07:32	07:06			07:24		08:13 (D01)	06:33	05:53	05:36	05:47	06:15	06:46			07:17		07:53 (D01)	06:52	07:24
	17:01	17:38			19:11	27	08:40 (D01)	19:44	20:15	20:40	20:40	20:11	19:23			18:33	19	08:12 (D01)	16:53	16:40
14	07:31	07:04			07:22		08:14 (D01)	06:32	05:52	05:36	05:48	06:16	06:47			07:18		07:56 (D01)	06:53	07:24
	17:02	17:40			19:12	25	08:39 (D01)	19:45	20:16	20:40	20:40	20:10	19:22			18:32	14	08:10 (D01)	16:52	16:40
15	07:31	07:03			07:21		08:15 (D01)	06:30	05:51	05:36	05:49	06:17	06:48			07:19		08:00 (D01)	06:55	07:25
	17:03	17:41			19:13	22	08:37 (D01)	19:46	20:17	20:41	20:39	20:09	19:20			18:30	6	08:06 (D01)	16:51	16:41
16	07:30	07:02			07:19		08:16 (D01)	06:29	05:50	05:36	05:49	06:18	06:49			07:20			06:56	07:26
	17:04	17:42			19:14	19	08:35 (D01)	19:47	20:18	20:41	20:39	20:07	19:18			18:29			16:50	16:41
17	07:30	07:00			07:18		08:18 (D01)	06:27	05:49	05:36	05:50	06:19	06:50			07:21			06:57	07:26
	17:06	17:43			19:15	15	08:33 (D01)	19:48	20:19	20:42	20:38	20:06	19:16			18:27			16:49	16:41
18	07:29	06:59			07:16		08:22 (D01)	06:26	05:48	05:36	05:51	06:20	06:51			07:22			06:58	07:27
	17:07	17:44			19:16	6	08:28 (D01)	19:49	20:20	20:42	20:38	20:04	19:15			18:26			16:49	16:41
19	07:29	06:58			07:14			06:24	05:48	05:36	05:52	06:21	06:52			07:23			06:59	07:28
	17:08	17:46			19:17			19:50	20:21	20:42	20:37	20:03	19:13			18:24			16:48	16:42
20	07:28	06:56			07:13			06:23	05:47	05:36	05:53	06:22	06:53			07:24			07:00	07:28
	17:09	17:47			19:19			19:51	20:22	20:43	20:36	20:01	19:11			18:23			16:47	16:42
21	07:28	06:55			07:11			06:21	05:46	05:36	05:54	06:23	06:54			07:25			07:02	07:29
	17:10	17:48			19:20			19:52	20:23	20:43	20:35	20:00	19:10			18:21			16:46	16:43
22	07:27	06:54			07:09			06:20	05:45	05:37	05:54	06:24	06:55			07:26			07:03	07:29
	17:11	17:49			19:21			19:53	20:24	20:43	20:35	19:59	19:08			18:20			16:46	16:43
23	07:26	06:52			07:08			06:18	05:44	05:37	05:55	06:25	06:56			07:28			07:04	07:30
	17:13	17:50			19:22			19:54	20:25	20:43	20:34	19:57	19:06			18:18			16:45	16:44
24	07:26	06:51			07:06			06:17	05:44	05:37	05:56	06:26	06:57			07:29			07:05	07:30
	17:14	17:52			19:23			19:56	20:26	20:43	20:33	19:56	19:05			18:17			16:45	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	07:31
	17:15	17:53			19:24			19:57	20:27	20:44	20:32	19:54	19:03			18:15			16:44	16:45
26	07:24	06:48			07:03			06:14	05:42	05:38	05:58	06:28	06:59		08:02 (D01)	07:31			07:07	07:31
	17:16	17:54			19:25			19:58	20:27	20:44	20:31	19:52	19:01	13	08:15 (D01)	18:14			16:43	16:45
27	07:23	06:46		07:25 (D01)	07:01			06:13	05:42	05:38	05:59	06:29	07:00		07:59 (D01)	07:32			07:08	07:31
	17:17	17:55	10	07:35 (D01)	19:26			19:59	20:28	20:44	20:30	19:51	19:00	18	08:17 (D01)	18:13			16:43	16:46
28	07:23	06:45		07:22 (D01)	06:59			06:11	05:41	05:38	06:00	06:30	07:01		07:57 (D01)	07:33			07:09	07:32
	17:19	17:56	16	07:38 (D01)	19:27			20:00	20:29	20:44	20:30	19:49	18:58	21	08:18 (D01)	18:11			16:43	16:47
29	07:22				06:58			06:10	05:40	05:39	06:01	06:31	07:02		07:55 (D01)	07:34			07:10	07:32
	17:20				19:28			20:01	20:30	20:44	20:29	19:48	18:56	24	08:19 (D01)	18:10			16:42	16:47
30	07:21				06:56			06:09	05:40	05:39	06:02	06:32	07:03		07:54 (D01)	07:36			07:12	07:32
	17:21				19:29			20:02	20:31	20:44	20:28	19:46	18:54	26	08:20 (D01)	18:09			16:42	16:48
31	07:20				06:54				05:39		06:03	06:33				07:37				07:32
	17:22				19:30				20:32		20:27	19:45				18:07				16:49
Potential sun hours	298	297			369			398	448	452	458	428	375			346			298	288
Total, worst case			26			451								102			379			
Sun reduction			0.62			0.73								0.93			0.84			
Oper. time red.			1.00			1.00								1.00			1.00			
Wind dir. red.			0.53			0.53								0.53			0.53			
Total reduction			0.33			0.39								0.49			0.45			
Total, real			9			175								50			169			

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)

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Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 46 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (120)

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	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	06:10	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:39	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	19:40	20:11	20:38	20:42	20:16	19:30	18:40	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	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40
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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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
	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	17:14	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	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	07:31
	17:15	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
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
	17:16	17:54	19:25	19:57	20:27	20:44	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	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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)

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Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 47 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (121)

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		15:41 (D04)	07:19	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38	07:12		
	16:50	14	15:55 (D04)	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		15:42 (D04)	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13		
	16:50	13	15:55 (D04)	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41		
3	07:33		15:44 (D04)	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14		
	16:51	11	15:55 (D04)	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41		
4	07:33		15:45 (D04)	07:16	06:38	06:48	06:03	05:38	05:41	06:06	06:37	07:07	06:41	07:15		
	16:52	9	15:54 (D04)	17:27	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:02	16:40		
5	07:33		15:47 (D04)	07:15	06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:43	07:16		
	16:53	6	15:53 (D04)	17:28	18:02	19:35	20:07	20:35	20:43	20:21	19:36	18:46	17:01	16:40		
6	07:33			07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17		
	16:54			17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40		
7	07:33			07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18		15:35 (D04)
	16:55			17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40	5	15:40 (D04)
8	07:32			07:12	07:32	06:41	05:59	05:36	05:44	06:10	06:41	07:11	06:46	07:19		15:32 (D04)
	16:56			17:32	19:05	19:39	20:10	20:37	20:42	20:17	19:31	18:41	16:58	16:40	9	15:41 (D04)
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		15:32 (D04)
	16:57			17:33	19:06	19:40	20:11	20:38	20:42	20:16	19:30	18:40	16:57	16:40	11	15:43 (D04)
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		15:31 (D04)
	16:58			17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40	13	15:44 (D04)
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		15:31 (D04)
	16:59			17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40	14	15:45 (D04)
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		15:31 (D04)
	17:00			17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40	15	15:46 (D04)
13	07:31			07:06	07:24	06:33	05:53	05:36	05:47	06:15	06:46	07:16	06:52	07:23		15:32 (D04)
	17:01			17:38	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53	16:40	16	15:48 (D04)
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		15:31 (D04)
	17:02			17:39	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52	16:40	17	15:48 (D04)
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		15:31 (D04)
	17:03			17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41	18	15:49 (D04)
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		15:32 (D04)
	17:04			17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41	18	15:50 (D04)
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		15:31 (D04)
	17:05			17:43	19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	16:49	16:41	19	15:50 (D04)
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		15:32 (D04)
	17:07			17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41	19	15:51 (D04)
19	07:29			06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28		15:33 (D04)
	17:08			17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42	19	15:52 (D04)
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		15:33 (D04)
	17:09			17:47	19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	16:42	19	15:52 (D04)
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		15:34 (D04)
	17:10			17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43	19	15:53 (D04)
22	07:27			06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29		15:34 (D04)
	17:11			17:49	19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:20	16:46	16:43	19	15:53 (D04)
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		15:35 (D04)
	17:12			17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43	19	15:54 (D04)
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		15:35 (D04)
	17:14			17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	16:44	16:44	19	15:54 (D04)
25	07:25			06:49	07:04	06:15	05:43	05:37	05:57	06:27	06:58	07:30	07:06	07:31		15:35 (D04)
	17:15			17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45	19	15:54 (D04)
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		15:36 (D04)
	17:16			17:54	19:25	19:57	20:27	20:44	20:31	19:52	19:01	18:14	16:43	16:45	19	15:55 (D04)
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		15:37 (D04)
	17:17			17:55	19:26	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46	18	15:55 (D04)
28	07:22			06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32		15:37 (D04)
	17:18			17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46	18	15:55 (D04)
29	07:22				06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32		15:38 (D04)
	17:20				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47	17	15:55 (D04)
30	07:21				06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32		15:39 (D04)
	17:21				19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48	17	15:56 (D04)
31	07:20				06:54		05:39		06:03	06:33		07:37		07:32		15:40 (D04)
	17:22				19:30		20:31		20:26	19:45		18:07		16:49	16	15:56 (D04)
Potential sun hours	298			297	369	398	448	452	458	428	375	346	298	288		
Total, worst case		53													412	
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		21													173	

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)

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Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 48 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (122)

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	07:33	07:19	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	06:10	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:39	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	19:40	20:11	20:38	20:42	20:16	19:30	18:40	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	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40
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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:49	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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
	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
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
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	17:14	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	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	07:31
	17:15	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
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
	17:16	17:54	19:25	19:57	20:27	20:44	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	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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)

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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 49 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (123)

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	07:33	07:19	06:43	06:52	06:07	05:39	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	06:10	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:39	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	19:40	20:11	20:38	20:42	20:16	19:30	18:40	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	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40
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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:49	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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
	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
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
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	17:14	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	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	07:31
	17:15	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
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
	17:16	17:54	19:25	19:57	20:27	20:44	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	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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:
EDR
217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 50 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (124)

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	18:46 (D03)	05:39	19:36 (D02)	05:40	19:07 (D03)	06:34	07:04	06:38	07:12
	16:50	17:23	17:57	19:31	20:03 37	19:23 (D03)	20:32 10	19:46 (D02)	20:44	20:25 37	20:01 (D02)	19:43	18:53	18:06	16:41
2	07:33	07:18	06:41	06:51	06:06	18:47 (D03)	05:38	19:38 (D02)	05:40	19:05 (D03)	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04 35	19:22 (D03)	20:33 7	19:45 (D02)	20:44	20:24 39	20:00 (D02)	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	18:47 (D03)	05:38		05:41	19:03 (D03)	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05 34	19:21 (D03)	20:34		20:43	20:23 42	19:59 (D02)	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	18:47 (D03)	05:38		05:41	19:02 (D03)	06:37	07:07	06:41	07:15
	16:52	17:27	18:01	19:34	20:06 34	19:21 (D03)	20:34		20:43	20:22 42	19:58 (D02)	19:38	18:48	17:02	16:40
5	07:33	07:15	06:37	06:46	06:02	18:48 (D03)	05:37		05:42	19:00 (D03)	06:38	07:08	06:43	07:16
	16:53	17:28	18:02	19:35	20:07 40	19:44 (D02)	20:35		20:43	20:21 43	19:57 (D02)	19:36	18:46	17:01	16:40
6	07:33	07:14	06:35	06:44	06:01	18:49 (D03)	05:37		05:42	19:00 (D03)	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08 42	19:46 (D02)	20:36		20:43	20:20 43	19:56 (D02)	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	18:50 (D03)	05:37		05:43	18:58 (D03)	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09 43	19:47 (D02)	20:36		20:43	20:19 42	19:55 (D02)	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	18:51 (D03)	05:36		05:44	06:10	18:58 (D03)	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:38	20:10 43	19:48 (D02)	20:37		20:42	20:17 39	19:54 (D02)	19:31	18:41	16:58	16:40
9	07:32	07:10	07:30	06:39	05:57	18:53 (D03)	05:36		05:44	06:11	18:57 (D03)	06:42	07:12	06:47	07:20
	16:57	17:33	19:06	19:40	20:11 42	19:49 (D02)	20:38		20:42	20:16 33	19:30 (D03)	19:30	18:39	16:57	16:40
10	07:32	07:09	07:29	06:38	05:56	18:53 (D03)	05:36		05:45	19:47 (D02)	06:12	18:56 (D03)	06:43	07:13	06:48	07:21
	16:58	17:35	19:07	19:41	20:12 41	19:49 (D02)	20:38		20:42 4	19:51 (D02)	20:15 35	19:31 (D03)	19:28	18:38	16:56	16:40
11	07:32	07:08	07:27	06:36	05:55	18:55 (D03)	05:36		05:46	19:45 (D02)	06:13	18:56 (D03)	06:44	07:14	06:50	07:22
	16:59	17:36	19:09	19:42	20:13 39	19:50 (D02)	20:39		20:41 9	19:54 (D02)	20:14 35	19:31 (D03)	19:26	18:36	16:55	16:40
12	07:32	07:07	07:26	06:35	05:54	18:58 (D03)	05:36		05:46	19:44 (D02)	06:14	18:55 (D03)	06:45	07:15	06:51	07:23
	17:00	17:37	19:10	19:43	20:14 35	19:51 (D02)	20:39		20:41 12	19:56 (D02)	20:12 37	19:32 (D03)	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	19:27 (D02)	05:36		05:47	19:42 (D02)	06:15	18:54 (D03)	06:46	07:16	06:52	07:23
	17:01	17:38	19:11	19:44	20:15 25	19:52 (D02)	20:40		20:40 14	19:56 (D02)	20:11 37	19:31 (D03)	19:23	18:33	16:53	16:40
14	07:31	07:04	07:22	06:32 19:01 (D03)	05:52	19:28 (D02)	05:36		05:48	19:42 (D02)	06:16	18:53 (D03)	06:47	07:17	06:53	07:24
	17:02	17:39	19:12	19:45 14 19:15 (D03)	20:16 25	19:53 (D02)	20:40		20:40 16	19:58 (D02)	20:10 38	19:31 (D03)	19:21	18:32	16:52	16:40
15	07:31	07:03	07:21	06:30 18:57 (D03)	05:51	19:27 (D02)	05:36		05:49	19:41 (D02)	06:17	18:53 (D03)	06:48	07:19	06:54	07:25
	17:03	17:41	19:13	19:46 20 19:17 (D03)	20:17 27	19:54 (D02)	20:41		20:39 18	19:59 (D02)	20:08 38	19:31 (D03)	19:20	18:30	16:51	16:41
16	07:30	07:02	07:19	06:28 18:56 (D03)	05:50	19:27 (D02)	05:36		05:49	19:41 (D02)	06:18	18:53 (D03)	06:49	07:20	06:56	07:26
	17:04	17:42	19:14	19:47 23 19:19 (D03)	20:18 27	19:54 (D02)	20:41		20:39 19	20:00 (D02)	20:07 38	19:31 (D03)	19:18	18:28	16:50	16:41
17	07:30	07:00	07:17	06:27 18:53 (D03)	05:49	19:27 (D02)	05:36		05:50	19:40 (D02)	06:19	18:53 (D03)	06:50	07:21	06:57	07:26
	17:05	17:43	19:15	19:48 27 19:20 (D03)	20:19 26	19:53 (D02)	20:41		20:38 20	20:00 (D02)	20:06 38	19:31 (D03)	19:16	18:27	16:49	16:41
18	07:29	06:59	07:16	06:25 18:52 (D03)	05:48	19:27 (D02)	05:36		05:51	19:39 (D02)	06:20	18:52 (D03)	06:51	07:22	06:58	07:27
	17:07	17:44	19:16	19:49 30 19:22 (D03)	20:20 26	19:53 (D02)	20:42		20:37 22	20:01 (D02)	20:04 38	19:30 (D03)	19:15	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24 18:50 (D03)	05:47	19:27 (D02)	05:36		05:52	19:39 (D02)	06:21	18:52 (D03)	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50 32 19:22 (D03)	20:21 26	19:53 (D02)	20:42		20:37 23	20:02 (D02)	20:03 38	19:30 (D03)	19:13	18:24	16:48	16:42
20	07:28	06:56	07:12	06:22 18:50 (D03)	05:47	19:27 (D02)	05:36		05:53	19:39 (D02)	06:22	18:53 (D03)	06:53	07:24	07:00	07:28
	17:09	17:47	19:18	19:51 33 19:23 (D03)	20:22 26	19:53 (D02)	20:42		20:36 23	20:02 (D02)	20:01 36	19:29 (D03)	19:11	18:22	16:47	16:42
21	07:28	06:55	07:11	06:21 18:48 (D03)	05:46	19:28 (D02)	05:36		05:54	19:39 (D02)	06:23	18:53 (D03)	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52 35 19:23 (D03)	20:23 25	19:53 (D02)	20:43		20:35 24	20:03 (D02)	20:00 36	19:29 (D03)	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19 18:48 (D03)	05:45	19:28 (D02)	05:36		05:54	19:38 (D02)	06:24	18:53 (D03)	06:55	07:26	07:03	07:29
	17:11	17:49	19:21	19:53 36 19:24 (D03)	20:24 25	19:53 (D02)	20:43		20:35 24	20:02 (D02)	19:58 35	19:28 (D03)	19:08	18:20	16:46	16:43
23	07:26	06:52	07:07	06:18 18:47 (D03)	05:44	19:28 (D02)	05:37		05:55	19:38 (D02)	06:25	18:54 (D03)	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54 37 19:24 (D03)	20:25 24	19:52 (D02)	20:43		20:34 25	20:03 (D02)	19:57 33	19:27 (D03)	19:06	18:18	16:45	16:43
24	07:26	06:50	07:06	06:17 18:47 (D03)	05:43	19:30 (D02)	05:37		05:56	19:38 (D02)	06:26	18:54 (D03)	06:57	07:29	07:05	07:30
	17:14	17:51	19:23	19:55 37 19:24 (D03)	20:26 22	19:52 (D02)	20:43		20:33 25	20:03 (D02)	19:55 32	19:26 (D03)	19:04	18:17	16:44	16:44
25	07:25	06:49	07:04	06:15 18:47 (D03)	05:43	19:30 (D02)	05:37		05:57	19:38 (D02)	06:27	18:55 (D03)	06:58	07:30	07:06	07:31
	17:15	17:53	19:24	19:56 37 19:24 (D03)	20:26 22	19:52 (D02)	20:43		20:32 26	20:04 (D02)	19:54 30	19:25 (D03)	19:03	18:15	16:44	16:45
26	07:24	06:48	07:02	06:14 18:46 (D03)	05:42	19:30 (D02)	05:38		05:58	19:38 (D02)	06:28	18:56 (D03)	06:59	07:31	07:07	07:31
	17:16	17:54	19:25	19:57 38 19:24 (D03)	20:27 21	19:51 (D02)	20:44		20:31 26	20:04 (D02)	19:52 27	19:23 (D03)	19:01	18:14	16:43	16:45
27	07:23	06:46	07:01	06:12 18:46 (D03)	05:41	19:31 (D02)	05:38		05:59	19:38 (D02)	06:29	18:58 (D03)	07:00	07:32	07:08	07:31
	17:17	17:55	19:26	19:59 38 19:24 (D03)	20:28 20	19:51 (D02)	20:44		20:30 26	20:04 (D02)	19:51 23	19:21 (D03)	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11 18:46 (D03)	05:41	19:32 (D02)	05:38		06:00	19:38 (D02)	06:30	18:59 (D03)	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00 38 19:24 (D03)	20:29 18	19:50 (D02)	20:44		20:29 26	20:04 (D02)	19:49 20	19:19 (D03)	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10 18:46 (D03)	05:40	19:33 (D02)	05:39		06:01	19:37 (D02)	06:31	19:02 (D03)	07:02	07:34	07:10	07:32
	17:20		19:28	20:01 37 19:23 (D03)	20:30 17	19:50 (D02)	20:44		20:28 26	20:03 (D02)	19:48 14	19:16 (D03)	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08 18:46 (D03)	05:40	19:34 (D02)	05:39		06:02	19:37 (D02)	06:32		07:03	07:35	07:11	07:32
	17:21		19:29	20:02 37 19:23 (D03)	20:31 14	19:48 (D02)	20:44		20:27 26	20:03 (D02)	19:46		18:54	18:09	16:42	16:48
31	07:20		06:54		05:39	19:35 (D02)			06:03	19:11 (D03)	06:33			07:37		07:32
	17:22		19:30		20:31 13	19:48 (D02)			20:26 30	20:02 (D02)	19:45			18:07		16:49
Potential sun hours	298	297	369	398	448		452		458		428		375	346	298	288
Total, worst case				549	894		17		464		1018					
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.				0.57	0.52		0.50		0.50		0.56					
Total reduction				0.46	0.48		0.47		0.48		0.53					
Total, real				255	430		8		224		544					

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 51 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (125)

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	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
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	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	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	19:40	20:11	20:38	20:42	20:16	19:30	18:39	16:57	16:40
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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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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
	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	17:14	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	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	07:31
	17:15	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
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
	17:16	17:54	19:25	19:57	20:27	20:44	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	19:59	20:28	20:44	20:30	19:51	18:59	18:13	16:43	16:46
28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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)

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217 Montgomery St., Suite 1000
US-SYRACUSE, NY 13202
(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 52 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (126)

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	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	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	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	05:43	06:09	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:37	20:09	20:36	20:43	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	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	19:40	20:11	20:38	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	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	16:40
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
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53	05:36	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	06:32	05:52	05:36	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	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:48	16:41
19	07:29	06:58	07:14	06:24	05:47	05:36	05:52	06:21	06:52	07:23	06:59	07:28
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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	17:09	17:47	19:18	19:51	20:22	20:42	20:36	20:01	19:11	18:22	16:47	16:42
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	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
22	07:27	06:53	07:09	06:19	05:45	05:36	05:54	06:24	06:55	07:26	07:03	07:29
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	17:14	17:51	19:23	19:55	20:26	20:43	20:33	19:55	19:04	18:17	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	07:31
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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
	17:16	17:54	19:25	19:57	20:27	20:44	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
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28	07:22	06:45	06:59	06:11	05:41	05:38	06:00	06:30	07:01	07:33	07:09	07:32
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:45		18:07		16:49
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:
EDR
217 Montgomery St., Suite 1000
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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 53 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (127)

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		18:23 (D03)	06:07	19:09 (D02)	05:39	05:40	06:04		06:34	18:30 (D03)	07:04	06:38	07:12
	16:50	17:23	17:57		19:31	33	18:56 (D03)	20:03	10 19:19 (D02)	20:32	20:44	20:25		19:43	12 18:42 (D03)	18:53	18:06	16:41
2	07:33	07:18	06:41		06:51		18:24 (D03)	06:06		05:38	05:40	06:05		06:35	18:27 (D03)	07:05	06:39	07:13
	16:50	17:25	17:58		19:32	32	18:56 (D03)	20:04		20:33	20:44	20:24		19:41	17 18:44 (D03)	18:51	17:05	16:41
3	07:33	07:17	06:40		06:49		18:23 (D03)	06:05		05:38	05:41	06:05		06:36	18:25 (D03)	07:06	06:40	07:14
	16:51	17:26	18:00		19:33	32	18:55 (D03)	20:05		20:34	20:43	20:23		19:40	21 18:46 (D03)	18:49	17:04	16:41
4	07:33	07:16	06:38		06:48		18:24 (D03)	06:03		05:38	05:41	06:06		06:37	18:23 (D03)	07:07	06:41	07:15
	16:52	17:27	18:01		19:34	31	18:55 (D03)	20:06		20:34	20:43	20:22		19:38	24 18:47 (D03)	18:48	17:02	16:40
5	07:33	07:15	06:37		06:46		18:24 (D03)	06:02		05:37	05:42	06:07		06:38	18:22 (D03)	07:08	06:43	07:16
	16:53	17:28	18:02		19:35	30	18:54 (D03)	20:07		20:35	20:43	20:21		19:36	26 18:48 (D03)	18:46	17:01	16:40
6	07:33	07:14	06:35		06:44		18:24 (D03)	06:01		05:37	05:42	06:08		06:39	18:20 (D03)	07:09	06:44	07:17
	16:54	17:30	18:03		19:36	28	18:52 (D03)	20:08		20:36	20:43	20:20		19:35	28 18:48 (D03)	18:44	17:00	16:40
7	07:33	07:13	06:34		06:43		18:25 (D03)	06:00		05:37	05:43	06:09		06:40	18:19 (D03)	07:10	06:45	07:18
	16:55	17:31	18:04		19:37	27	18:52 (D03)	20:09		20:36	20:43	20:19		19:33	30 18:49 (D03)	18:43	16:59	16:40
8	07:32	07:12	07:32		06:41		18:26 (D03)	05:59		05:36	05:44	06:10		06:41	18:18 (D03)	07:11	06:46	07:19
	16:56	17:32	19:05		19:38	24	18:50 (D03)	20:10		20:37	20:42	20:17		19:31	31 18:49 (D03)	18:41	16:58	16:40
9	07:32	07:10	07:30		06:39		18:27 (D03)	05:57		05:36	05:44	06:11		06:42	18:18 (D03)	07:12	06:47	07:20
	16:57	17:33	19:06		19:40	21	18:48 (D03)	20:11		20:38	20:42	20:16		19:30	31 18:49 (D03)	18:39	16:57	16:40
10	07:32	07:09	07:29		06:38		18:29 (D03)	05:56		05:36	05:45	06:12		06:43	18:17 (D03)	07:13	06:48	07:21
	16:58	17:35	19:07		19:41	17	18:46 (D03)	20:12		20:38	20:42	20:15		19:28	32 18:49 (D03)	18:38	16:56	16:40
11	07:32	07:08	07:27		06:36		18:31 (D03)	05:55		05:36	05:46	06:13	19:21 (D02)	06:44	18:17 (D03)	07:14	06:50	07:22
	16:59	17:36	19:09		19:42	11	18:42 (D03)	20:13		20:39	20:41	20:14	4 19:25 (D02)	19:26	32 18:49 (D03)	18:36	16:55	16:40
12	07:32	07:07	07:26		06:35			05:54		05:36	05:46	06:14	19:17 (D02)	06:45	18:16 (D03)	07:15	06:51	07:23
	17:00	17:37	19:10		19:43			20:14		20:39	20:41	20:12	12 19:29 (D02)	19:25	32 18:48 (D03)	18:35	16:54	16:40
13	07:31	07:05	07:24		06:33			05:53		05:36	05:47	06:15	19:14 (D02)	06:46	18:16 (D03)	07:16	06:52	07:23
	17:01	17:38	19:11		19:44			20:15		20:40	20:40	20:11	15 19:29 (D02)	19:23	32 18:48 (D03)	18:33	16:53	16:40
14	07:31	07:04	07:22		06:32			05:52		05:36	05:48	06:16	19:13 (D02)	06:47	18:16 (D03)	07:17	06:53	07:24
	17:02	17:39	19:12		19:45			20:16		20:40	20:40	20:10	17 19:30 (D02)	19:21	31 18:47 (D03)	18:32	16:52	16:40
15	07:31	07:03	07:21		06:30		19:12 (D02)	05:51		05:36	05:49	06:17	19:12 (D02)	06:48	18:16 (D03)	07:19	06:54	07:25
	17:03	17:41	19:13		19:46	10	19:22 (D02)	20:17		20:41	20:39	20:08	19 19:31 (D02)	19:20	30 18:46 (D03)	18:30	16:51	16:41
16	07:30	07:02	07:19		06:28		19:10 (D02)	05:50		05:36	05:49	06:18	19:11 (D02)	06:49	18:17 (D03)	07:20	06:56	07:26
	17:04	17:42	19:14		19:47	14	19:24 (D02)	20:18		20:41	20:39	20:07	21 19:32 (D02)	19:18	28 18:45 (D03)	18:28	16:50	16:41
17	07:30	07:00	07:17		06:27		19:08 (D02)	05:49		05:36	05:50	06:19	19:10 (D02)	06:50	18:17 (D03)	07:21	06:57	07:26
	17:05	17:43	19:15		19:48	17	19:25 (D02)	20:19		20:41	20:38	20:06	22 19:32 (D02)	19:16	27 18:44 (D03)	18:27	16:49	16:41
18	07:29	06:59	07:16		06:25		19:07 (D02)	05:48		05:36	05:51	06:20	19:09 (D02)	06:51	18:18 (D03)	07:22	06:58	07:27
	17:07	17:44	19:16		19:49	20	19:27 (D02)	20:20		20:42	20:37	20:04	24 19:33 (D02)	19:15	24 18:42 (D03)	18:25	16:48	16:41
19	07:29	06:58	07:14		06:24		19:05 (D02)	05:47		05:36	05:52	06:21	19:09 (D02)	06:52	18:18 (D03)	07:23	06:59	07:28
	17:08	17:46	19:17		19:50	22	19:27 (D02)	20:21		20:42	20:37	20:03	24 19:33 (D02)	19:13	21 18:39 (D03)	18:24	16:48	16:42
20	07:28	06:56	07:12		06:22		19:05 (D02)	05:47		05:36	05:53	06:22	19:09 (D02)	06:53	18:20 (D03)	07:24	07:00	07:28
	17:09	17:47	19:18		19:51	23	19:28 (D02)	20:22		20:42	20:36	20:01	24 19:33 (D02)	19:11	17 18:37 (D03)	18:22	16:47	16:42
21	07:28	06:55	07:11		06:21		19:04 (D02)	05:46		05:36	05:54	06:23	19:09 (D02)	06:54	18:23 (D03)	07:25	07:01	07:29
	17:10	17:48	19:19		19:52	23	19:27 (D02)	20:23		20:43	20:35	20:00	23 19:32 (D02)	19:10	10 18:33 (D03)	18:21	16:46	16:43
22	07:27	06:53	07:09	18:40 (D03)	06:19		19:04 (D02)	05:45		05:36	05:54	06:24	19:09 (D02)	06:55		07:26	07:03	07:29
	17:11	17:49	19:21	6 18:46 (D03)	19:53	24	19:28 (D02)	20:24		20:43	20:35	19:58	23 19:32 (D02)	19:08		18:20	16:46	16:43
23	07:26	06:52	07:07	18:36 (D03)	06:18		19:03 (D02)	05:44		05:37	05:55	06:25	19:09 (D02)	06:56		07:27	07:04	07:30
	17:12	17:50	19:22	15 18:51 (D03)	19:54	24	19:27 (D02)	20:25		20:43	20:34	19:57	22 19:31 (D02)	19:06		18:18	16:45	16:43
24	07:26	06:50	07:06	18:33 (D03)	06:17		19:03 (D02)	05:43		05:37	05:56	06:26	19:09 (D02)	06:57		07:29	07:05	07:30
	17:14	17:51	19:23	20 18:53 (D03)	19:55	24	19:27 (D02)	20:26		20:43	20:33	19:55	21 19:30 (D02)	19:04		18:17	16:44	16:44
25	07:25	06:49	07:04	18:30 (D03)	06:15		19:04 (D02)	05:43		05:37	05:57	06:27	19:10 (D02)	06:58		07:30	07:06	07:31
	17:15	17:53	19:24	24 18:54 (D03)	19:56	23	19:27 (D02)	20:26		20:43	20:32	19:54	19 19:29 (D02)	19:03		18:15	16:44	16:45
26	07:24	06:48	07:02	18:28 (D03)	06:14		19:03 (D02)	05:42		05:38	05:58	06:28	19:11 (D02)	06:59		07:31	07:07	07:31
	17:16	17:54	19:25	26 18:54 (D03)	19:57	23	19:26 (D02)	20:27		20:44	20:31	19:52	17 19:28 (D02)	19:01		18:14	16:43	16:45
27	07:23	06:46	07:01	18:28 (D03)	06:12		19:04 (D02)	05:41		05:38	05:59	06:29	19:12 (D02)	07:00		07:32	07:08	07:31
	17:17	17:55	19:26	28 18:56 (D03)	19:58	21	19:25 (D02)	20:28		20:44	20:30	19:51	14 19:26 (D02)	18:59		18:13	16:43	16:46
28	07:22	06:45	06:59	18:26 (D03)	06:11		19:05 (D02)	05:41		05:38	06:00	06:30	19:14 (D02)	07:01		07:33	07:09	07:32
	17:18	17:56	19:27	30 18:56 (D03)	20:00	19	19:24 (D02)	20:29		20:44	20:29	19:49	9 19:23 (D02)	18:58		18:11	16:42	16:46
29	07:22		06:57	18:25 (D03)	06:10		19:05 (D02)	05:40		05:39	06:01	06:31		07:02		07:34	07:10	07:32
	17:20		19:28	31 18:56 (D03)	20:01	17	19:22 (D02)	20:30		20:44	20:28	19:48		18:56		18:10	16:42	16:47
30	07:21		06:56	18:25 (D03)	06:08		19:07 (D02)	05:40		05:39	06:02	06:32		07:03		07:35	07:11	07:32
	17:21		19:29	32 18:57 (D03)	20:02	14	19:21 (D02)	20:31		20:44	20:27	19:46		18:54		18:09	16:42	16:48
31	07:20		06:54	18:24 (D03)				05:39			06:03	06:33				07:37		07:32
	17:22		19:30	32 18:56 (D03)				20:31			20:26	19:44				18:07		16:49
Potential sun hours	298	297	369		398		448		452	458	428		375		346	298	288
Total, worst case				244		604		10				330		536			
Sun reduction				0.73		0.82		0.92				0.96		0.93			
Oper. time red.				1.00		1.00		1.00				1.00		1.00			
Wind dir. red.				0.69		0.62		0.56				0.56		0.69			
Total reduction				0.50		0.51		0.52				0.54		0.64			
Total, real				123		307		5				177		343			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 54 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (128)

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	18:23 (D03) 06:07	05:39	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	17:23	17:57	19:31 32	18:55 (D03) 20:03	20:32	20:44	20:25	19:43	18:53	18:06	16:41
2	07:33	07:18	06:41	06:51	18:24 (D03) 06:06	05:38	05:40	06:05	06:35	18:29 (D03) 07:05	06:39	07:13
	16:50	17:25	17:58	19:32 31	18:55 (D03) 20:04	20:33	20:44	20:24	19:41 12	18:41 (D03) 18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	18:23 (D03) 06:05	05:38	05:41	06:05	06:36	18:26 (D03) 07:06	06:40	07:14
	16:51	17:26	18:00	19:33 31	18:54 (D03) 20:05	20:34	20:43	20:23	19:40 17	18:43 (D03) 18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	18:24 (D03) 06:03	05:38	05:41	06:06	06:37	18:24 (D03) 07:07	06:41	07:15
	16:52	17:27	18:01	19:34 30	18:54 (D03) 20:06	20:34	20:43	20:22	19:38 21	18:45 (D03) 18:48	17:02	16:40
5	07:33	07:15	06:37	06:46	18:24 (D03) 06:02	05:37	05:42	06:07	06:38	18:22 (D03) 07:08	06:43	07:16
	16:53	17:28	18:02	19:35 28	18:52 (D03) 20:07	20:35	20:43	20:21	19:36 24	18:46 (D03) 18:46	17:01	16:40
6	07:33	07:14	06:35	06:44	18:25 (D03) 06:01	05:37	05:42	06:08	06:39	18:21 (D03) 07:09	06:44	07:17
	16:54	17:30	18:03	19:36 26	18:51 (D03) 20:08	20:36	20:43	20:20	19:35 26	18:47 (D03) 18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	18:26 (D03) 06:00	05:37	05:43	06:09	06:40	18:19 (D03) 07:10	06:45	07:18
	16:55	17:31	18:04	19:37 24	18:50 (D03) 20:09	20:36	20:43	20:19	19:33 28	18:47 (D03) 18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	18:27 (D03) 05:59	05:36	05:44	06:10	06:41	18:18 (D03) 07:11	06:46	07:19
	16:56	17:32	19:05	19:38 21	18:48 (D03) 20:10	20:37	20:42	20:17	19:31 30	18:48 (D03) 18:41	16:58	16:40
9	07:32	07:10	07:30	06:39	18:28 (D03) 05:57	05:36	05:44	06:11	06:42	18:18 (D03) 07:12	06:47	07:20
	16:57	17:33	19:06	19:40 17	18:45 (D03) 20:11	20:38	20:42	20:16	19:30 30	18:48 (D03) 18:39	16:57	16:40
10	07:32	07:09	07:29	06:38	18:31 (D03) 05:56	05:36	05:45	06:12	06:43	18:17 (D03) 07:13	06:48	07:21
	16:58	17:35	19:07	19:41 12	18:43 (D03) 20:12	20:38	20:42	20:15	19:28 31	18:48 (D03) 18:38	16:56	16:40
11	07:32	07:08	07:27	06:36	05:55	05:36	05:46	06:13	06:44	18:16 (D03) 07:14	06:50	07:22
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26 32	18:48 (D03) 18:36	16:55	16:40
12	07:32	07:07	07:26	06:35	05:54	05:36	05:46	06:14 19:20 (D02)	06:45	18:16 (D03) 07:15	06:51	07:23
	17:00	17:37	19:10	19:43	20:14	20:39	20:41	20:12 4 19:24 (D02)	19:25 32	18:48 (D03) 18:35	16:54	16:40
13	07:31	07:05	07:24	06:33	05:53	05:36	05:47	06:15 19:15 (D02)	06:46	18:16 (D03) 07:16	06:52	07:23
	17:01	17:38	19:11	19:44	20:15	20:40	20:40	20:11 11 19:26 (D02)	19:23 31	18:47 (D03) 18:33	16:53	16:40
14	07:31	07:04	07:22	06:32 19:13 (D02)	05:52	05:36	05:48	06:16 19:13 (D02)	06:47	18:16 (D03) 07:17	06:53	07:24
	17:02	17:39	19:12	19:45 7 19:20 (D02)	20:16	20:40	20:40	20:10 15 19:28 (D02)	19:21 31	18:47 (D03) 18:32	16:52	16:40
15	07:31	07:03	07:21	06:30 19:09 (D02)	05:51	05:36	05:49	06:17 19:12 (D02)	06:48	18:16 (D03) 07:19	06:54	07:25
	17:03	17:41	19:13	19:46 14 19:23 (D02)	20:17	20:41	20:39	20:08 17 19:29 (D02)	19:20 30	18:46 (D03) 18:30	16:51	16:41
16	07:30	07:02	07:19	06:28 19:08 (D02)	05:50	05:36	05:49	06:18 19:11 (D02)	06:49	18:16 (D03) 07:20	06:56	07:26
	17:04	17:42	19:14	19:47 17 19:25 (D02)	20:18	20:41	20:39	20:07 19 19:30 (D02)	19:18 29	18:45 (D03) 18:28	16:50	16:41
17	07:30	07:00	07:17	06:27 19:06 (D02)	05:49	05:36	05:50	06:19 19:10 (D02)	06:50	18:16 (D03) 07:21	06:57	07:26
	17:05	17:43	19:15	19:48 19 19:25 (D02)	20:19	20:41	20:38	20:06 21 19:31 (D02)	19:16 28	18:44 (D03) 18:27	16:49	16:41
18	07:29	06:59	07:16	06:25 19:05 (D02)	05:48	05:36	05:51	06:20 19:09 (D02)	06:51	18:17 (D03) 07:22	06:58	07:27
	17:07	17:44	19:16	19:49 21 19:26 (D02)	20:20	20:42	20:37	20:04 22 19:31 (D02)	19:15 25	18:42 (D03) 18:25	16:48	16:41
19	07:29	06:58	07:14	06:24 19:04 (D02)	05:47	05:36	05:52	06:21 19:08 (D02)	06:52	18:17 (D03) 07:23	06:59	07:28
	17:08	17:46	19:17	19:50 22 19:26 (D02)	20:21	20:42	20:37	20:03 23 19:31 (D02)	19:13 23	18:40 (D03) 18:24	16:48	16:42
20	07:28	06:56	07:12	06:22 19:04 (D02)	05:47	05:36	05:53	06:22 19:08 (D02)	06:53	18:18 (D03) 07:24	07:00	07:28
	17:09	17:47	19:18	19:51 23 19:27 (D02)	20:22	20:42	20:36	20:01 23 19:31 (D02)	19:11 19	18:37 (D03) 18:22	16:47	16:42
21	07:28	06:55	07:11	06:21 19:03 (D02)	05:46	05:36	05:53	06:23 19:08 (D02)	06:54	18:21 (D03) 07:25	07:01	07:29
	17:10	17:48	19:19	19:52 23 19:26 (D02)	20:23	20:43	20:35	20:00 23 19:31 (D02)	19:10 14	18:35 (D03) 18:21	16:46	16:42
22	07:27	06:53	07:09 18:36 (D03)	06:19 19:03 (D02)	05:45	05:36	05:54	06:24 19:08 (D02)	06:55	18:26 (D03) 07:26	07:03	07:29
	17:11	17:49	19:21 12 18:48 (D03)	19:53 24 19:27 (D02)	20:24	20:43	20:35	19:58 23 19:31 (D02)	19:08 3	18:29 (D03) 18:20	16:46	16:43
23	07:26	06:52	07:07 18:34 (D03)	06:18 19:02 (D02)	05:44	05:37	05:55	06:25 19:08 (D02)	06:56	07:27	07:04	07:30
	17:12	17:50	19:22 18 18:52 (D03)	19:54 24 19:26 (D02)	20:25	20:43	20:34	19:57 23 19:31 (D02)	19:06	18:18	16:45	16:43
24	07:26	06:50	07:06 18:31 (D03)	06:17 19:03 (D02)	05:43	05:37	05:56	06:26 19:08 (D02)	06:57	07:29	07:05	07:30
	17:14	17:51	19:23 22 18:53 (D03)	19:55 23 19:26 (D02)	20:26	20:43	20:33	19:55 22 19:30 (D02)	19:04	18:17	16:44	16:44
25	07:25	06:49	07:04 18:29 (D03)	06:15 19:03 (D02)	05:43	05:37	05:57	06:27 19:08 (D02)	06:58	07:30	07:06	07:31
	17:15	17:53	19:24 25 18:54 (D03)	19:56 22 19:25 (D02)	20:26	20:43	20:32	19:54 21 19:29 (D02)	19:03	18:15	16:44	16:45
26	07:24	06:48	07:02 18:27 (D03)	06:14 19:03 (D02)	05:42	05:38	05:58	06:28 19:09 (D02)	06:59	07:31	07:07	07:31
	17:16	17:54	19:25 27 18:54 (D03)	19:57 21 19:24 (D02)	20:27	20:44	20:31	19:52 19 19:28 (D02)	19:01	18:14	16:43	16:45
27	07:23	06:46	07:01 18:27 (D03)	06:12 19:04 (D02)	05:41	05:38	05:59	06:29 19:10 (D02)	07:00	07:32	07:08	07:31
	17:17	17:55	19:26 28 18:55 (D03)	19:58 19 19:23 (D02)	20:28	20:44	20:30	19:51 16 19:26 (D02)	18:59	18:12	16:43	16:46
28	07:22	06:45	06:59 18:25 (D03)	06:11 19:05 (D02)	05:41	05:38	06:00	06:30 19:11 (D02)	07:01	07:33	07:09	07:32
	17:18	17:56	19:27 30 18:55 (D03)	20:00 17 19:22 (D02)	20:29	20:44	20:29	19:49 13 19:24 (D02)	18:58	18:11	16:42	16:46
29	07:22		06:57 18:24 (D03)	06:10 19:06 (D02)	05:40	05:39	06:01	06:31 19:14 (D02)	07:02	07:34	07:10	07:32
	17:20		19:28 31 18:55 (D03)	20:01 14 19:20 (D02)	20:30	20:44	20:28	19:48 7 19:21 (D02)	18:56	18:10	16:42	16:47
30	07:21		06:56 18:25 (D03)	06:08 19:08 (D02)	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29 31 18:56 (D03)	20:02 10 19:18 (D02)	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54 18:24 (D03)		05:39		06:03	06:33		07:37		07:32
	17:22		19:30 31 18:55 (D03)		20:31		20:26	19:44		18:07		16:49
Potential sun hours	298	297	369	398	448	452	458	428	375	346	298	288
Total, worst case			255	572				322	516			
Sun reduction			0.73	0.82				0.96	0.93			
Oper. time red.			1.00	1.00				1.00	1.00			
Wind dir. red.			0.69	0.62				0.56	0.69			
Total reduction			0.50	0.51				0.54	0.64			
Total, real			129	291				174	331			

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)

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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 57 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (129)

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	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	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	07:18	06:41	06:51	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32	20:04	20:33	20:43	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05	05:38	05:41	06:06	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	06:03	05:38	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	18:48	17:02	16:41
5	07:33	07:15	06:37	06:46	06:02	05:37	05:42	06:07	06:38	07:08	06:43	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	07:33	07:14	06:35	06:44	06:01	05:37	05:42	06:08	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:36	20:08	20:36	20:43	20:20	19:35	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	06:00	05:37	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	20:19	19:33	18:43	16:59	16:40
8	07:32	07:11	07:32	06:41	05:59	05:36	05:44	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	19:40	20:11	20:38	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	17:35	19:07	19:41	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	05:46	06:13	06:44	07:14	06:50	07:22
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26	18:36	16:55	16:40
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
	17:00	17:37	19:10	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	05:36	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	06:32	05:52	05:36	05:48	06:16	06:47	07:17	06:53	07:24
	17:02	17:40	19:12	19:45	20:16	20:40	20:40	20:10	19:21	18:32	16:52	16:40
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
	17:03	17:41	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	16:51	16:41
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
	17:04	17:42	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:28	16:50	16:41
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
	17:05	17:43	19:15	19:48	20:19	20:41	20:38	20:06	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
	17:07	17:44	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:25	16:49	16:41
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
	17:08	17:46	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	16:48	16:42
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
	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	07:28	06:55	07:11	06:21	05:46	05:36	05:54	06:23	06:54	07:25	07:01	07:29
	17:10	17:48	19:19	19:52	20:23	20:43	20:35	20:00	19:10	18:21	16:46	16:43
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
	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	07:26	06:52	07:07	06:18	05:44	05:37	05:55	06:25	06:56	07:27	07:04	07:30
	17:12	17:50	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	16:45	16:43
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
	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	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	17:53	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	16:44	16:45
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
	17:16	17:54	19:25	19:57	20:27	20:44	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	20:44	20:30	19:51	18:59	18:13	16:43	16:46
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
	17:18	17:56	19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	16:42	16:46
29	07:22		06:57	06:10	05:40	05:39	06:01	06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	16:42	16:47
30	07:21		06:56	06:08	05:40	05:39	06:02	06:32	07:03	07:35	07:11	07:32
	17:21		19:29	20:02	20:31	20:44	20:27	19:46	18:54	18:09	16:42	16:48
31	07:20		06:54		05:39		06:03	06:33		07:37		07:32
	17:22		19:30		20:31		20:26	19:44		18:07		16:49
Potential sun hours	298	297	369	398	448	451	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:
EDR
217 Montgomery St., Suite 1000
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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 58 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (130)

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		
1	07:32		08:19 (N05)	07:19		16:50 (N02)	06:43	06:53			06:07		06:48 (M10)	05:39		19:18 (M08)
	16:50	26	08:45 (N05)	17:24	11	17:01 (N02)	17:57	19:31			20:03	27	07:15 (M10)	20:32	50	20:08 (M08)
2	07:32		08:19 (N05)	07:18		16:50 (N02)	06:41	06:51			06:06		06:48 (M10)	05:39		19:17 (M08)
	16:51	26	08:45 (N05)	17:25	12	17:02 (N02)	17:59	19:32			20:04	27	07:15 (M10)	20:33	51	20:08 (M08)
3	07:32		08:20 (N05)	07:17		16:49 (N02)	06:40	06:49			06:05		06:47 (M10)	05:38		19:18 (M08)
	16:52	26	08:46 (N05)	17:26	14	17:03 (N02)	18:00	19:33			20:05	28	19:42 (M08)	20:33	51	20:09 (M08)
4	07:32		08:20 (N05)	07:16		16:49 (N02)	06:38	06:48			06:03		06:48 (M10)	05:38		19:17 (M08)
	16:52	26	08:46 (N05)	17:27	16	17:05 (N02)	18:01	19:34			20:06	31	19:43 (M08)	20:34	52	20:09 (M08)
5	07:32		08:20 (N05)	07:15		16:49 (N02)	06:37	06:46			06:02		06:49 (M10)	05:37		19:18 (M08)
	16:53	26	08:46 (N05)	17:29	17	17:06 (N02)	18:02	19:35			20:07	33	19:44 (M08)	20:35	52	20:10 (M08)
6	07:32		08:20 (N05)	07:14		16:50 (N02)	06:35	06:44			06:01		06:49 (M10)	05:37		19:18 (M08)
	16:54	26	08:46 (N05)	17:30	18	17:08 (N02)	18:03	19:36			20:08	36	19:45 (M08)	20:35	53	20:11 (M08)
7	07:32		08:21 (N05)	07:12		16:50 (N02)	06:34	06:43			06:00		06:50 (M10)	05:37		19:19 (M08)
	16:55	26	08:47 (N05)	17:31	19	17:09 (N02)	18:04	19:37			20:09	37	19:46 (M08)	20:36	53	20:12 (M08)
8	07:32		08:22 (N05)	07:11		16:49 (N02)	07:32	06:41			05:59		06:52 (M10)	05:37		19:18 (M08)
	16:56	25	08:47 (N05)	17:32	21	17:10 (N02)	19:05	19:38			20:10	36	19:47 (M08)	20:37	54	20:12 (M08)
9	07:32		08:23 (N05)	07:10		16:50 (N02)	07:30	06:40			05:58		06:53 (M10)	05:36		19:18 (M08)
	16:57	25	08:48 (N05)	17:33	21	17:11 (N02)	19:06	19:39			20:11	35	19:48 (M08)	20:37	54	20:12 (M08)
10	07:32		08:24 (N05)	07:09		16:50 (N02)	07:29	06:38			05:56		06:55 (M10)	05:36		19:19 (M08)
	16:58	24	08:48 (N05)	17:35	23	17:13 (N02)	19:08	19:41			20:12	34	19:49 (M08)	20:38	54	20:13 (M08)
11	07:32		08:24 (N05)	07:08		16:51 (N02)	07:27	06:36			05:55		06:59 (M10)	05:36		19:19 (M08)
	16:59	23	08:47 (N05)	17:36	23	17:14 (N02)	19:09	19:42			20:13	28	19:50 (M08)	20:38	55	20:14 (M08)
12	07:31		08:25 (N05)	07:07		16:52 (N02)	07:26	06:35			05:54		19:24 (M08)	05:36		19:19 (M08)
	17:00	23	08:48 (N05)	17:37	24	17:16 (N02)	19:10	19:43			20:14	27	19:51 (M08)	20:39	55	20:14 (M08)
13	07:31		08:26 (N05)	07:05		16:52 (N02)	07:24	06:33			05:53		19:23 (M08)	05:36		19:19 (M08)
	17:01	22	08:48 (N05)	17:38	24	17:16 (N02)	19:11	19:44			20:15	29	19:52 (M08)	20:40	56	20:15 (M08)
14	07:31		08:26 (N05)	07:04		16:54 (N02)	07:22	06:32			05:52		19:22 (M08)	05:36		19:20 (M08)
	17:02	21	08:47 (N05)	17:40	23	17:17 (N02)	19:12	19:45			20:16	31	19:53 (M08)	20:40	55	20:15 (M08)
15	07:30		08:27 (N05)	07:03		16:55 (N02)	07:21	06:30			05:51		19:22 (M08)	05:36		19:20 (M08)
	17:03	20	08:47 (N05)	17:41	21	17:16 (N02)	19:13	19:46			20:17	32	19:54 (M08)	20:40	55	20:15 (M08)
16	07:30		08:28 (N05)	07:02		16:57 (N02)	07:19	06:29			05:50		19:21 (M08)	05:36		19:20 (M08)
	17:05	19	08:47 (N05)	17:42	17	17:14 (N02)	19:14	19:47			20:18	34	19:55 (M08)	20:41	56	20:16 (M08)
17	07:30		08:30 (N05)	07:00		17:00 (N02)	07:17	06:27			05:49		19:20 (M08)	05:36		19:20 (M08)
	17:06	17	08:47 (N05)	17:43	11	17:11 (N02)	19:15	19:48			20:19	35	19:55 (M08)	20:41	56	20:16 (M08)
18	07:29		08:31 (N05)	06:59			07:16	06:26			05:49		19:20 (M08)	05:36		19:20 (M08)
	17:07	14	08:45 (N05)	17:44			19:16	19:49			20:20	36	19:56 (M08)	20:42	56	20:16 (M08)
19	07:29		08:33 (N05)	06:57			07:14	06:24		07:02 (M10)	05:48		19:19 (M08)	05:36		19:20 (M08)
	17:08	12	08:45 (N05)	17:46			19:17	19:50	2	07:04 (M10)	20:21	38	19:57 (M08)	20:42	56	20:16 (M08)
20	07:28		08:35 (N05)	06:56			07:12	06:23		06:57 (M10)	05:47		19:19 (M08)	05:36		19:20 (M08)
	17:09	7	08:42 (N05)	17:47			19:18	19:51	13	07:10 (M10)	20:22	40	19:59 (M08)	20:42	56	20:16 (M08)
21	07:27			06:55			07:11	06:21		06:54 (M10)	05:46		19:19 (M08)	05:36		19:21 (M08)
	17:10			17:48			19:19	19:52	17	07:11 (M10)	20:23	40	19:59 (M08)	20:42	57	20:18 (M08)
22	07:27			06:53			07:09	06:20		06:53 (M10)	05:45		19:18 (M08)	05:37		19:21 (M08)
	17:11			17:49			19:21	19:53	20	07:13 (M10)	20:23	42	20:00 (M08)	20:43	56	20:17 (M08)
23	07:26			06:52			07:07	06:18		06:52 (M10)	05:44		19:18 (M08)	05:37		19:21 (M08)
	17:13			17:50			19:22	19:54	22	07:14 (M10)	20:24	42	20:00 (M08)	20:43	56	20:17 (M08)
24	07:25			06:50			07:06	06:17		06:50 (M10)	05:44		19:18 (M08)	05:37		19:21 (M08)
	17:14			17:52			19:23	19:55	24	07:14 (M10)	20:25	44	20:02 (M08)	20:43	56	20:17 (M08)
25	07:25			06:49			07:04	06:15		06:50 (M10)	05:43		19:18 (M08)	05:37		19:22 (M08)
	17:15			17:53			19:24	19:56	25	07:15 (M10)	20:26	44	20:02 (M08)	20:43	56	20:18 (M08)
26	07:24			06:47			07:02	06:14		06:48 (M10)	05:42		19:17 (M08)	05:38		19:22 (M08)
	17:16			17:54			19:25	19:57	27	07:15 (M10)	20:27	46	20:03 (M08)	20:43	56	20:18 (M08)
27	07:23			06:46			07:01	06:13		06:48 (M10)	05:42		19:18 (M08)	05:38		19:22 (M08)
	17:17			17:55			19:26	19:58	27	07:15 (M10)	20:28	46	20:04 (M08)	20:43	56	20:18 (M08)
28	07:22		16:53 (N02)	06:44			06:59	06:11		06:48 (M10)	05:41		19:17 (M08)	05:39		19:23 (M08)
	17:19	2	16:55 (N02)	17:56			19:27	19:59	28	07:16 (M10)	20:29	47	20:04 (M08)	20:43	55	20:18 (M08)
29	07:21		16:52 (N02)				06:57	06:10		06:47 (M10)	05:41		19:18 (M08)	05:39		19:22 (M08)
	17:20	5	16:57 (N02)				19:28	20:00	28	07:15 (M10)	20:30	48	20:06 (M08)	20:43	56	20:18 (M08)
30	07:21		16:51 (N02)				06:56	06:09		06:47 (M10)	05:40		19:17 (M08)	05:39		19:23 (M08)
	17:21	7	16:58 (N02)				19:29	20:02	28	07:15 (M10)	20:30	49	20:06 (M08)	20:43	55	20:18 (M08)
31	07:20		16:50 (N02)				06:54				05:39		19:17 (M08)			
	17:22	9	16:59 (N02)				19:30				20:31	50	20:07 (M08)			
Potential sun hours	298			297			369	398			447			451		
Total, worst case		457			315				261			1152			1639	
Sun reduction		0.45			0.62				0.82			0.92			0.94	
Oper. time red.		1.00			1.00				1.00			1.00			1.00	
Wind dir. red.		0.41			0.85				0.76			0.52			0.47	
Total reduction		0.18			0.52				0.62			0.48			0.43	
Total, real		83			164				162			549			712	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 58 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (130)

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

	July			August			September	October			November			December		
1	05:40		19:23 (M08)	06:04		19:34 (M08)	06:34	07:04			06:38		16:20 (N02)	07:12		08:06 (N05)
	20:43	55	20:18 (M08)	20:25	27	20:01 (M08)	19:43	18:53			18:06	22	16:42 (N02)	16:41	23	08:29 (N05)
2	05:40		19:24 (M08)	06:05		07:07 (M10)	06:35	07:05			06:39		16:19 (N02)	07:13		08:06 (N05)
	20:43	54	20:18 (M08)	20:24	32	20:00 (M08)	19:41	18:51			17:05	22	16:41 (N02)	16:41	24	08:30 (N05)
3	05:41		19:23 (M08)	06:06		07:04 (M10)	06:36	07:06			06:40		16:19 (N02)	07:14		08:06 (N05)
	20:43	55	20:18 (M08)	20:23	36	19:59 (M08)	19:40	18:49			17:04	20	16:39 (N02)	16:41	25	08:31 (N05)
4	05:41		19:24 (M08)	06:07		07:02 (M10)	06:37	07:07			06:41		16:19 (N02)	07:15		08:06 (N05)
	20:43	54	20:18 (M08)	20:22	36	19:58 (M08)	19:38	18:48			17:03	19	16:38 (N02)	16:41	25	08:31 (N05)
5	05:42		19:24 (M08)	06:08		07:01 (M10)	06:38	07:08			06:42		16:19 (N02)	07:16		08:06 (N05)
	20:43	53	20:17 (M08)	20:21	37	19:57 (M08)	19:36	18:46			17:01	18	16:37 (N02)	16:41	26	08:32 (N05)
6	05:43		19:24 (M08)	06:09		07:00 (M10)	06:39	07:09			06:44		16:19 (N02)	07:17		08:07 (N05)
	20:43	53	20:17 (M08)	20:20	36	19:56 (M08)	19:35	18:44			17:00	17	16:36 (N02)	16:40	25	08:32 (N05)
7	05:43		19:24 (M08)	06:10		06:59 (M10)	06:40	07:10			06:45		16:19 (N02)	07:18		08:07 (N05)
	20:42	53	20:17 (M08)	20:18	35	19:55 (M08)	19:33	18:43			16:59	15	16:34 (N02)	16:40	26	08:33 (N05)
8	05:44		19:25 (M08)	06:11		06:58 (M10)	06:41	07:11			06:46		16:20 (N02)	07:19		08:07 (N05)
	20:42	52	20:17 (M08)	20:17	32	19:53 (M08)	19:31	18:41			16:58	14	16:34 (N02)	16:40	26	08:33 (N05)
9	05:45		19:25 (M08)	06:12		06:57 (M10)	06:42	07:12			06:47		16:21 (N02)	07:20		08:08 (N05)
	20:42	52	20:17 (M08)	20:16	31	19:52 (M08)	19:30	18:40			16:57	12	16:33 (N02)	16:40	26	08:34 (N05)
10	05:45		19:25 (M08)	06:12		06:57 (M10)	06:43	07:13			06:48		16:21 (N02)	07:21		08:08 (N05)
	20:41	51	20:16 (M08)	20:15	26	07:23 (M10)	19:28	18:38			16:56	10	16:31 (N02)	16:40	27	08:35 (N05)
11	05:46		19:25 (M08)	06:13		06:56 (M10)	06:44	07:14			06:49		16:21 (N02)	07:22		08:09 (N05)
	20:41	51	20:16 (M08)	20:14	28	07:24 (M10)	19:26	18:36			16:55	9	16:30 (N02)	16:40	26	08:35 (N05)
12	05:47		19:26 (M08)	06:14		06:56 (M10)	06:45	07:15			06:51		16:23 (N02)	07:22		08:10 (N05)
	20:40	50	20:16 (M08)	20:12	28	07:24 (M10)	19:25	18:35			16:54	7	16:30 (N02)	16:40	26	08:36 (N05)
13	05:47		19:25 (M08)	06:15		06:56 (M10)	06:46	07:16			06:52		16:24 (N02)	07:23		08:09 (N05)
	20:40	49	20:14 (M08)	20:11	28	07:24 (M10)	19:23	18:33			16:53	5	16:29 (N02)	16:40	26	08:35 (N05)
14	05:48		19:26 (M08)	06:16		06:56 (M10)	06:47	07:17			06:53		16:25 (N02)	07:24		08:10 (N05)
	20:39	48	20:14 (M08)	20:10	28	07:24 (M10)	19:21	18:32			16:52	2	16:27 (N02)	16:41	26	08:36 (N05)
15	05:49		19:26 (M08)	06:17		06:55 (M10)	06:48	07:18			06:54			07:25		08:11 (N05)
	20:39	48	20:14 (M08)	20:08	27	07:22 (M10)	19:20	18:30			16:51			16:41	26	08:37 (N05)
16	05:50		19:27 (M08)	06:18		06:55 (M10)	06:49	07:20			06:55			07:25		08:12 (N05)
	20:38	47	20:14 (M08)	20:07	27	07:22 (M10)	19:18	18:29			16:50			16:41	26	08:38 (N05)
17	05:50		19:26 (M08)	06:19		06:55 (M10)	06:50	07:21			06:57			07:26		08:11 (N05)
	20:38	46	20:12 (M08)	20:05	27	07:22 (M10)	19:16	18:27			16:49			16:41	26	08:37 (N05)
18	05:51		19:27 (M08)	06:20		06:56 (M10)	06:51	07:22			06:58			07:27		08:12 (N05)
	20:37	45	20:12 (M08)	20:04	25	07:21 (M10)	19:15	18:26			16:49			16:42	26	08:38 (N05)
19	05:52		19:27 (M08)	06:21		06:56 (M10)	06:52	07:23			06:59			07:27		08:12 (N05)
	20:37	45	20:12 (M08)	20:03	24	07:20 (M10)	19:13	18:24			16:48			16:42	26	08:38 (N05)
20	05:53		19:28 (M08)	06:22		06:57 (M10)	06:53	07:24			07:00			07:28		08:13 (N05)
	20:36	43	20:11 (M08)	20:01	22	07:19 (M10)	19:11	18:23			16:47			16:42	26	08:39 (N05)
21	05:54		19:28 (M08)	06:23		06:58 (M10)	06:54	07:25			07:01			07:28		08:13 (N05)
	20:35	43	20:11 (M08)	20:00	19	07:17 (M10)	19:10	18:21			16:47			16:43	26	08:39 (N05)
22	05:55		19:29 (M08)	06:24		06:59 (M10)	06:55	07:26			07:02		08:11 (N05)	07:29		08:14 (N05)
	20:34	41	20:10 (M08)	19:58	17	07:16 (M10)	19:08	18:20			16:46	7	08:18 (N05)	16:43	26	08:40 (N05)
23	05:55		19:29 (M08)	06:25		07:02 (M10)	06:56	07:27			07:03		08:09 (N05)	07:29		08:14 (N05)
	20:34	39	20:08 (M08)	19:57	11	07:13 (M10)	19:06	18:18			16:45	12	08:21 (N05)	16:44	26	08:40 (N05)
24	05:56		19:29 (M08)	06:26			06:57	07:28		17:34 (N02)	07:05		08:08 (N05)	07:30		08:15 (N05)
	20:33	39	20:08 (M08)	19:55			19:04	18:17	3	17:37 (N02)	16:45	14	08:22 (N05)	16:44	26	08:41 (N05)
25	05:57		19:30 (M08)	06:27			06:58	07:30		17:28 (N02)	07:06		08:08 (N05)	07:30		08:15 (N05)
	20:32	37	20:07 (M08)	19:54			19:03	18:15	14	17:42 (N02)	16:44	16	08:24 (N05)	16:45	26	08:41 (N05)
26	05:58		19:30 (M08)	06:28			06:59	07:31		17:26 (N02)	07:07		08:07 (N05)	07:31		08:15 (N05)
	20:31	36	20:06 (M08)	19:52			19:01	18:14	18	17:44 (N02)	16:44	19	08:26 (N05)	16:45	26	08:41 (N05)
27	05:59		19:31 (M08)	06:29			07:00	07:32		17:25 (N02)	07:08		08:06 (N05)	07:31		08:16 (N05)
	20:30	35	20:06 (M08)	19:51			18:59	18:13	21	17:46 (N02)	16:43	20	08:26 (N05)	16:46	27	08:43 (N05)
28	06:00		19:32 (M08)	06:30			07:01	07:33		17:23 (N02)	07:09		08:06 (N05)	07:31		08:17 (N05)
	20:29	33	20:05 (M08)	19:49			18:58	18:11	24	17:47 (N02)	16:43	21	08:27 (N05)	16:47	26	08:43 (N05)
29	06:01		19:33 (M08)	06:31			07:02	07:34		17:22 (N02)	07:10		08:06 (N05)	07:32		08:17 (N05)
	20:28	31	20:04 (M08)	19:48			18:56	18:10	24	17:46 (N02)	16:42	22	08:28 (N05)	16:47	26	08:43 (N05)
30	06:02		19:33 (M08)	06:32			07:03	07:35		17:21 (N02)	07:11		08:06 (N05)	07:32		08:17 (N05)
	20:27	30	20:03 (M08)	19:46			18:54	18:09	23	17:44 (N02)	16:42	23	08:29 (N05)	16:48	26	08:43 (N05)
31	06:03		19:33 (M08)	06:33				07:37		17:20 (N02)				07:32		08:17 (N05)
	20:26	28	20:01 (M08)	19:44				18:07	23	17:43 (N02)				16:49	27	08:44 (N05)
Potential sun hours	458			428			375	346			299			288		
Total, worst case		1396			639				150			346			801	
Sun reduction		0.97			0.96				0.84			0.61			0.47	
Oper. time red.		1.00			1.00				1.00			1.00			1.00	
Wind dir. red.		0.47			0.69				0.85			0.64			0.38	
Total reduction		0.45			0.66				0.71			0.39			0.18	
Total, real		626			422				106			134			144	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 59 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (131)

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	07:37 (M04)	05:39	05:40	06:04		06:34	07:04	06:38	07:12
	16:50	17:24	17:58	19:31		20:03	21 07:58 (M04)	20:32	20:44	20:25		19:43	18:53	18:06	16:42
2	07:33	07:18	06:42	06:51		06:06	07:39 (M04)	05:39	05:41	06:05		06:35	07:05	06:39	07:13
	16:51	17:25	17:59	19:32		20:04	18 07:57 (M04)	20:33	20:43	20:24		19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49		06:05	07:40 (M04)	05:38	05:41	06:06		06:36	07:06	06:40	07:14
	16:52	17:26	18:00	19:33		20:05	16 07:56 (M04)	20:34	20:43	20:23		19:40	18:50	17:04	16:41
4	07:33	07:16	06:38	06:48		06:04	07:41 (M04)	05:38	05:42	06:07		06:37	07:07	06:41	07:15
	16:53	17:27	18:01	19:34		20:06	12 07:53 (M04)	20:34	20:43	20:22		19:38	18:48	17:03	16:41
5	07:33	07:15	06:37	06:46		06:02	07:46 (M04)	05:38	05:42	06:08		06:38	07:08	06:43	07:16
	16:53	17:29	18:02	19:35		20:07	3 07:49 (M04)	20:35	20:43	20:21		19:37	18:46	17:01	16:41
6	07:33	07:14	06:35	06:45		06:01		05:37	05:43	06:09		06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:37		20:08		20:36	20:43	20:20		19:35	18:45	17:00	16:40
7	07:33	07:13	06:34	06:43		06:00		05:37	05:43	06:10		06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:38		20:09		20:36	20:43	20:19		19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41		05:59		05:37	05:44	06:11	07:53 (M04)	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:39		20:10		20:37	20:42	20:17	7 08:00 (M04)	19:32	18:41	16:58	16:40
9	07:32	07:10	07:31	06:40		05:58		05:37	05:45	06:12	07:50 (M04)	06:42	07:12	06:47	07:20
	16:57	17:34	19:07	19:40		20:11		20:38	20:42	20:16	13 08:03 (M04)	19:30	18:40	16:57	16:40
10	07:32	07:09	07:29	06:38		05:57		05:36	05:45	06:13	07:48 (M04)	06:43	07:13	06:49	07:21
	16:58	17:35	19:08	19:41		20:12		20:38	20:42	20:15	17 08:05 (M04)	19:28	18:38	16:56	16:40
11	07:32	07:08	07:27	06:37		05:56		05:36	05:46	06:14	07:47 (M04)	06:44	07:14	06:50	07:22
	16:59	17:36	19:09	19:42		20:13		20:39	20:41	20:14	19 08:06 (M04)	19:27	18:37	16:55	16:40
12	07:32	07:07	07:26	06:35		05:54		05:36	05:47	06:15	07:46 (M04)	06:45	07:15	06:51	07:23
	17:00	17:37	19:10	19:43		20:14		20:39	20:41	20:12	21 08:07 (M04)	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33		05:53		05:36	05:47	06:16	07:45 (M04)	06:46	07:17	06:52	07:23
	17:01	17:39	19:11	19:44		20:15		20:40	20:40	20:11	23 08:08 (M04)	19:23	18:33	16:53	16:41
14	07:31	07:04	07:22	06:32		05:52		05:36	05:48	06:17	07:44 (M04)	06:47	07:18	06:53	07:24
	17:02	17:40	19:12	19:45		20:16		20:40	20:40	20:10	25 08:09 (M04)	19:22	18:32	16:52	16:41
15	07:31	07:03	07:21	06:30	07:46 (M04)	05:51		05:36	05:49	06:18	07:44 (M04)	06:48	07:19	06:54	07:25
	17:04	17:41	19:13	19:46	12 07:58 (M04)	20:17		20:41	20:39	20:08	25 08:09 (M04)	19:20	18:30	16:51	16:41
16	07:30	07:02	07:19	06:29	07:44 (M04)	05:50		05:36	05:50	06:19	07:43 (M04)	06:49	07:20	06:56	07:26
	17:05	17:42	19:14	19:47	16 08:00 (M04)	20:18		20:41	20:39	20:07	27 08:10 (M04)	19:18	18:29	16:50	16:41
17	07:30	07:00	07:18	06:27	07:41 (M04)	05:50		05:36	05:51	06:20	07:43 (M04)	06:50	07:21	06:57	07:26
	17:06	17:43	19:15	19:48	20 08:01 (M04)	20:19		20:41	20:38	20:06	27 08:10 (M04)	19:16	18:27	16:50	16:41
18	07:29	06:59	07:16	06:26	07:40 (M04)	05:49		05:36	05:51	06:21	07:41 (M04)	06:51	07:22	06:58	07:27
	17:07	17:45	19:16	19:49	23 08:03 (M04)	20:20		20:42	20:37	20:04	28 08:09 (M04)	19:15	18:26	16:49	16:42
19	07:29	06:58	07:14	06:24	07:38 (M04)	05:48		05:36	05:52	06:22	07:41 (M04)	06:52	07:23	06:59	07:27
	17:08	17:46	19:17	19:50	25 08:03 (M04)	20:21		20:42	20:37	20:03	28 08:09 (M04)	19:13	18:24	16:48	16:42
20	07:28	06:56	07:13	06:23	07:38 (M04)	05:47		05:36	05:53	06:22	07:41 (M04)	06:53	07:24	07:00	07:28
	17:09	17:47	19:19	19:51	26 08:04 (M04)	20:22		20:42	20:36	20:01	28 08:09 (M04)	19:11	18:23	16:47	16:42
21	07:28	06:55	07:11	06:21	07:38 (M04)	05:46		05:37	05:54	06:23	07:41 (M04)	06:54	07:25	07:01	07:29
	17:10	17:48	19:20	19:52	26 08:04 (M04)	20:23		20:43	20:35	20:00	28 08:09 (M04)	19:10	18:21	16:47	16:43
22	07:27	06:53	07:09	06:20	07:36 (M04)	05:45		05:37	05:55	06:24	07:41 (M04)	06:55	07:26	07:03	07:29
	17:12	17:49	19:21	19:53	28 08:04 (M04)	20:24		20:43	20:35	19:58	27 08:08 (M04)	19:08	18:20	16:46	16:43
23	07:26	06:52	07:08	06:18	07:36 (M04)	05:45		05:37	05:56	06:25	07:42 (M04)	06:56	07:28	07:04	07:30
	17:13	17:51	19:22	19:54	28 08:04 (M04)	20:25		20:43	20:34	19:57	25 08:07 (M04)	19:06	18:18	16:45	16:44
24	07:26	06:51	07:06	06:17	07:35 (M04)	05:44		05:37	05:56	06:26	07:42 (M04)	06:57	07:29	07:05	07:30
	17:14	17:52	19:23	19:55	28 08:03 (M04)	20:26		20:43	20:33	19:55	25 08:07 (M04)	19:05	18:17	16:45	16:44
25	07:25	06:49	07:04	06:15	07:36 (M04)	05:43		05:38	05:57	06:27	07:43 (M04)	06:58	07:30	07:06	07:30
	17:15	17:53	19:24	19:56	27 08:03 (M04)	20:26		20:43	20:32	19:54	22 08:05 (M04)	19:03	18:16	16:44	16:45
26	07:24	06:48	07:03	06:14	07:36 (M04)	05:42		05:38	05:58	06:28	07:44 (M04)	06:59	07:31	07:07	07:31
	17:16	17:54	19:25	19:58	27 08:03 (M04)	20:27		20:44	20:31	19:52	20 08:04 (M04)	19:01	18:14	16:44	16:46
27	07:23	06:46	07:01	06:13	07:35 (M04)	05:42		05:38	05:59	06:29	07:46 (M04)	07:00	07:32	07:08	07:31
	17:18	17:55	19:26	19:59	27 08:02 (M04)	20:28		20:44	20:30	19:51	16 08:02 (M04)	19:00	18:13	16:43	16:46
28	07:23	06:45	06:59	06:11	07:36 (M04)	05:41		05:39	06:00	06:30	07:48 (M04)	07:01	07:33	07:09	07:32
	17:19	17:56	19:27	20:00	26 08:02 (M04)	20:29		20:44	20:29	19:49	12 08:00 (M04)	18:58	18:11	16:43	16:47
29	07:22		06:58	06:10	07:37 (M04)	05:41		05:39	06:01	06:31		07:02	07:34	07:10	07:32
	17:20		19:28	20:01	24 08:01 (M04)	20:30		20:44	20:28	19:48		18:56	18:10	16:42	16:47
30	07:21		06:56	06:09	07:36 (M04)	05:40		05:40	06:02	06:32		07:03	07:36	07:11	07:32
	17:21		19:29	20:02	23 07:59 (M04)	20:31		20:44	20:27	19:46		18:55	18:09	16:42	16:48
31	07:20		06:54			05:40			06:03	06:33			07:37		07:32
	17:22		19:30			20:31			20:26	19:45			18:08		16:49
Potential sun hours	298	297	369	398		448		451	458	428		375	346	299	288
Total, worst case					386		70				463				
Sun reduction					0.82		0.92				0.96				
Oper. time red.					1.00		1.00				1.00				
Wind dir. red.					0.70		0.70				0.70				
Total reduction					0.57		0.64				0.67				
Total, real					220		45				309				

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 60 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (132)

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		05:39		06:56 (M03)	05:40	07:02 (M03)	06:04	06:34	07:04	06:38	07:12
	16:50	17:24	17:58	19:31	20:03		20:32	27	07:23 (M03)	20:44	26 07:28 (M03)	20:25	19:43	18:53	18:06	16:42
2	07:33	07:18	06:42	06:51	06:06		05:39		06:55 (M03)	05:41	07:02 (M03)	06:05	06:35	07:05	06:39	07:13
	16:51	17:25	17:59	19:32	20:04		20:33	27	07:22 (M03)	20:43	26 07:28 (M03)	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05		05:38		06:56 (M03)	05:41	07:02 (M03)	06:06	06:36	07:06	06:40	07:14
	16:52	17:26	18:00	19:33	20:05		20:34	27	07:23 (M03)	20:43	26 07:28 (M03)	20:23	19:40	18:50	17:04	16:41
4	07:33	07:16	06:39	06:48	06:04		05:38		06:56 (M03)	05:42	07:02 (M03)	06:07	06:37	07:07	06:41	07:15
	16:53	17:27	18:01	19:34	20:06		20:34	27	07:23 (M03)	20:43	27 07:29 (M03)	20:22	19:38	18:48	17:03	16:41
5	07:33	07:15	06:37	06:46	06:02		05:38		06:56 (M03)	05:42	07:02 (M03)	06:08	06:38	07:08	06:43	07:16
	16:53	17:29	18:02	19:35	20:07		20:35	27	07:23 (M03)	20:43	27 07:29 (M03)	20:21	19:37	18:46	17:01	16:41
6	07:33	07:14	06:35	06:45	06:01		05:37		06:56 (M03)	05:43	07:03 (M03)	06:09	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:37	20:08		20:36	27	07:23 (M03)	20:43	26 07:29 (M03)	20:20	19:35	18:45	17:00	16:41
7	07:33	07:13	06:34	06:43	06:00		05:37		06:57 (M03)	05:43	07:03 (M03)	06:10	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:38	20:09		20:36	26	07:23 (M03)	20:43	27 07:30 (M03)	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59		05:37		06:57 (M03)	05:44	07:03 (M03)	06:11	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:39	20:10		20:37	27	07:24 (M03)	20:42	27 07:30 (M03)	20:17	19:32	18:41	16:58	16:40
9	07:32	07:10	07:31	06:40	05:58		05:37		06:57 (M03)	05:45	07:03 (M03)	06:12	06:42	07:12	06:47	07:20
	16:57	17:34	19:07	19:40	20:11		20:38	26	07:23 (M03)	20:42	27 07:30 (M03)	20:16	19:30	18:40	16:57	16:40
10	07:32	07:09	07:29	06:38	05:57		05:36		06:57 (M03)	05:45	07:04 (M03)	06:13	06:43	07:13	06:49	07:21
	16:58	17:35	19:08	19:41	20:12		20:38	26	07:23 (M03)	20:42	27 07:31 (M03)	20:15	19:28	18:38	16:56	16:40
11	07:32	07:08	07:27	06:37	05:56		05:36		06:57 (M03)	05:46	07:03 (M03)	06:14	06:44	07:14	06:50	07:22
	16:59	17:36	19:09	19:42	20:13		20:39	27	07:24 (M03)	20:41	27 07:30 (M03)	20:14	19:27	18:37	16:55	16:40
12	07:32	07:07	07:26	06:35	05:54		05:36		06:58 (M03)	05:47	07:04 (M03)	06:15	06:45	07:15	06:51	07:23
	17:00	17:37	19:10	19:43	20:14		20:39	26	07:24 (M03)	20:41	27 07:31 (M03)	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53		05:36		06:58 (M03)	05:47	07:04 (M03)	06:16	06:46	07:17	06:52	07:23
	17:01	17:39	19:11	19:44	20:15		20:40	26	07:24 (M03)	20:40	27 07:31 (M03)	20:11	19:23	18:33	16:53	16:41
14	07:31	07:04	07:22	06:32	05:52		05:36		06:58 (M03)	05:48	07:04 (M03)	06:17	06:47	07:18	06:53	07:24
	17:02	17:40	19:12	19:45	20:16		20:40	26	07:24 (M03)	20:40	26 07:30 (M03)	20:10	19:22	18:32	16:52	16:41
15	07:31	07:03	07:21	06:30	05:51		05:36		06:59 (M03)	05:49	07:04 (M03)	06:18	06:48	07:19	06:54	07:25
	17:04	17:41	19:13	19:46	20:17		20:41	25	07:24 (M03)	20:39	26 07:30 (M03)	20:08	19:20	18:30	16:51	16:41
16	07:30	07:02	07:19	06:29	05:50		05:36		06:59 (M03)	05:50	07:05 (M03)	06:19	06:49	07:20	06:56	07:26
	17:05	17:42	19:14	19:47	20:18		20:41	25	07:24 (M03)	20:39	26 07:31 (M03)	20:07	19:18	18:29	16:50	16:41
17	07:30	07:00	07:18	06:27	05:50	07:04 (M03)	05:36		06:59 (M03)	05:51	07:06 (M03)	06:20	06:50	07:21	06:57	07:26
	17:06	17:43	19:15	19:48	20:19	8 07:12 (M03)	20:41	25	07:24 (M03)	20:38	25 07:31 (M03)	20:06	19:16	18:27	16:50	16:41
18	07:29	06:59	07:16	06:26	05:49	07:01 (M03)	05:36		06:59 (M03)	05:51	07:05 (M03)	06:21	06:51	07:22	06:58	07:27
	17:07	17:45	19:16	19:49	20:20	13 07:14 (M03)	20:42	25	07:24 (M03)	20:37	25 07:30 (M03)	20:04	19:15	18:26	16:49	16:42
19	07:29	06:58	07:14	06:24	05:48	07:00 (M03)	05:36		06:59 (M03)	05:52	07:06 (M03)	06:22	06:52	07:23	06:59	07:28
	17:08	17:46	19:18	19:50	20:21	15 07:15 (M03)	20:42	25	07:24 (M03)	20:37	24 07:30 (M03)	20:03	19:13	18:24	16:48	16:42
20	07:28	06:56	07:13	06:23	05:47	06:59 (M03)	05:36		07:00 (M03)	05:53	07:07 (M03)	06:23	06:53	07:24	07:00	07:28
	17:09	17:47	19:19	19:51	20:22	18 07:17 (M03)	20:42	25	07:25 (M03)	20:36	23 07:30 (M03)	20:01	19:11	18:23	16:47	16:42
21	07:28	06:55	07:11	06:21	05:46	06:58 (M03)	05:37		07:00 (M03)	05:54	07:07 (M03)	06:24	06:54	07:25	07:01	07:29
	17:10	17:48	19:20	19:52	20:23	20 07:18 (M03)	20:43	25	07:25 (M03)	20:35	22 07:29 (M03)	20:00	19:10	18:21	16:47	16:43
22	07:27	06:53	07:09	06:20	05:45	06:57 (M03)	05:37		07:00 (M03)	05:55	07:08 (M03)	06:24	06:55	07:26	07:03	07:29
	17:12	17:49	19:21	19:53	20:24	22 07:19 (M03)	20:43	25	07:25 (M03)	20:35	21 07:29 (M03)	19:58	19:08	18:20	16:46	16:43
23	07:26	06:52	07:08	06:18	05:45	06:57 (M03)	05:37		07:00 (M03)	05:56	07:09 (M03)	06:25	06:56	07:28	07:04	07:30
	17:13	17:51	19:22	19:54	20:25	23 07:20 (M03)	20:43	25	07:25 (M03)	20:34	19 07:28 (M03)	19:57	19:06	18:18	16:45	16:44
24	07:26	06:51	07:06	06:17	05:44	06:57 (M03)	05:37		07:01 (M03)	05:56	07:10 (M03)	06:26	06:57	07:29	07:05	07:30
	17:14	17:52	19:23	19:55	20:26	23 07:20 (M03)	20:43	25	07:26 (M03)	20:33	16 07:26 (M03)	19:55	19:05	18:17	16:45	16:44
25	07:25	06:49	07:04	06:15	05:43	06:56 (M03)	05:38		07:01 (M03)	05:57	07:11 (M03)	06:27	06:58	07:30	07:06	07:31
	17:15	17:53	19:24	19:56	20:26	24 07:20 (M03)	20:43	25	07:26 (M03)	20:32	14 07:25 (M03)	19:54	19:03	18:16	16:44	16:45
26	07:24	06:48	07:03	06:14	05:42	06:56 (M03)	05:38		07:01 (M03)	05:58	07:13 (M03)	06:28	06:59	07:31	07:07	07:31
	17:16	17:54	19:25	19:58	20:27	25 07:21 (M03)	20:44	25	07:26 (M03)	20:31	11 07:24 (M03)	19:52	19:01	18:14	16:44	16:46
27	07:23	06:46	07:01	06:13	05:42	06:56 (M03)	05:38		07:02 (M03)	05:59	07:16 (M03)	06:29	07:00	07:32	07:08	07:31
	17:18	17:55	19:26	19:59	20:28	25 07:21 (M03)	20:44	25	07:27 (M03)	20:30	5 07:21 (M03)	19:51	19:00	18:13	16:43	16:46
28	07:23	06:45	06:59	06:11	05:41	06:56 (M03)	05:39		07:01 (M03)	06:00		06:30	07:01	07:33	07:09	07:32
	17:19	17:56	19:27	20:00	20:29	26 07:22 (M03)	20:44	26	07:27 (M03)	20:29		19:49	18:58	18:11	16:43	16:47
29	07:22		06:58	06:10	05:41	06:56 (M03)	05:39		07:01 (M03)	06:01		06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	26 07:22 (M03)	20:44	26	07:27 (M03)	20:28		19:48	18:56	18:10	16:42	16:48
30	07:21		06:56	06:09	05:40	06:56 (M03)	05:40		07:02 (M03)	06:02		06:32	07:03	07:36	07:11	07:32
	17:21		19:29	20:02	20:31	27 07:23 (M03)	20:44	26	07:28 (M03)	20:27		19:46	18:55	18:09	16:42	16:48
31	07:20		06:54		05:40	06:55 (M03)				06:03		06:33		07:37		07:32
	17:22		19:30		20:31	27 07:22 (M03)				20:26		19:45		18:08		16:49
Potential sun hours	298	297	369	398	448		451			458		428	375	346	299	288
Total, worst case					322		775			630						
Sun reduction					0.92		0.94			0.97						
Oper. time red.					1.00		1.00			1.00						
Wind dir. red.					0.80		0.80			0.80						
Total reduction					0.74		0.75			0.78						
Total, real					237		584			490						

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 61 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (133)

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		05:39		06:54 (M03)	05:40	06:59 (M03)	06:04	06:34	07:04	06:38	07:12
	16:50	17:24	17:58	19:31	20:03		20:32	26	07:20 (M03)	20:44	26 07:25 (M03)	20:25	19:43	18:53	18:06	16:42
2	07:33	07:18	06:42	06:51	06:06		05:39		06:54 (M03)	05:41	07:00 (M03)	06:05	06:35	07:05	06:39	07:13
	16:51	17:25	17:59	19:32	20:04		20:33	26	07:20 (M03)	20:43	26 07:26 (M03)	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	06:05		05:38		06:54 (M03)	05:41	07:00 (M03)	06:06	06:36	07:06	06:40	07:14
	16:52	17:26	18:00	19:33	20:05		20:34	26	07:20 (M03)	20:43	26 07:26 (M03)	20:23	19:40	18:50	17:04	16:41
4	07:33	07:16	06:39	06:48	06:04		05:38		06:54 (M03)	05:42	07:00 (M03)	06:07	06:37	07:07	06:41	07:15
	16:53	17:27	18:01	19:34	20:06		20:34	27	07:21 (M03)	20:43	27 07:27 (M03)	20:22	19:38	18:48	17:03	16:41
5	07:33	07:15	06:37	06:46	06:02		05:38		06:54 (M03)	05:42	07:00 (M03)	06:08	06:38	07:08	06:43	07:16
	16:53	17:29	18:02	19:35	20:07		20:35	26	07:20 (M03)	20:43	26 07:26 (M03)	20:21	19:37	18:46	17:01	16:41
6	07:33	07:14	06:35	06:45	06:01		05:37		06:54 (M03)	05:43	07:00 (M03)	06:09	06:39	07:09	06:44	07:17
	16:54	17:30	18:03	19:37	20:08		20:36	27	07:21 (M03)	20:43	27 07:27 (M03)	20:20	19:35	18:45	17:00	16:41
7	07:33	07:13	06:34	06:43	06:00		05:37		06:55 (M03)	05:43	07:01 (M03)	06:10	06:40	07:10	06:45	07:18
	16:55	17:31	18:04	19:38	20:09		20:36	26	07:21 (M03)	20:43	27 07:28 (M03)	20:19	19:33	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59		05:37		06:55 (M03)	05:44	07:01 (M03)	06:11	06:41	07:11	06:46	07:19
	16:56	17:32	19:05	19:39	20:10		20:37	27	07:22 (M03)	20:42	26 07:27 (M03)	20:17	19:32	18:41	16:58	16:40
9	07:32	07:10	07:31	06:40	05:58		05:37		06:54 (M03)	05:45	07:01 (M03)	06:12	06:42	07:12	06:47	07:20
	16:57	17:34	19:07	19:40	20:11		20:38	27	07:21 (M03)	20:42	27 07:28 (M03)	20:16	19:30	18:40	16:57	16:40
10	07:32	07:09	07:29	06:38	05:57		05:36		06:55 (M03)	05:45	07:02 (M03)	06:13	06:43	07:13	06:49	07:21
	16:58	17:35	19:08	19:41	20:12		20:38	26	07:21 (M03)	20:42	26 07:28 (M03)	20:15	19:28	18:38	16:56	16:40
11	07:32	07:08	07:27	06:37	05:56		05:36		06:55 (M03)	05:46	07:01 (M03)	06:14	06:44	07:14	06:50	07:22
	16:59	17:36	19:09	19:42	20:13		20:39	26	07:21 (M03)	20:41	27 07:28 (M03)	20:14	19:27	18:37	16:55	16:40
12	07:32	07:07	07:26	06:35	05:54		05:36		06:56 (M03)	05:47	07:02 (M03)	06:15	06:45	07:15	06:51	07:23
	17:00	17:37	19:10	19:43	20:14		20:39	26	07:22 (M03)	20:41	26 07:28 (M03)	20:12	19:25	18:35	16:54	16:40
13	07:31	07:06	07:24	06:33	05:53		05:36		06:56 (M03)	05:47	07:02 (M03)	06:16	06:46	07:17	06:52	07:23
	17:01	17:39	19:11	19:44	20:15		20:40	26	07:22 (M03)	20:40	26 07:28 (M03)	20:11	19:23	18:33	16:53	16:41
14	07:31	07:04	07:22	06:32	05:52		05:36		06:56 (M03)	05:48	07:02 (M03)	06:17	06:47	07:18	06:53	07:24
	17:02	17:40	19:12	19:45	20:16		20:40	26	07:22 (M03)	20:40	26 07:28 (M03)	20:10	19:22	18:32	16:52	16:41
15	07:31	07:03	07:21	06:30	05:51		05:36		06:56 (M03)	05:49	07:03 (M03)	06:18	06:48	07:19	06:54	07:25
	17:04	17:41	19:13	19:46	20:17		20:41	26	07:22 (M03)	20:39	25 07:28 (M03)	20:08	19:20	18:30	16:51	16:41
16	07:30	07:02	07:19	06:29	05:50		05:36		06:57 (M03)	05:50	07:03 (M03)	06:19	06:49	07:20	06:56	07:26
	17:05	17:42	19:14	19:47	20:18		20:41	25	07:22 (M03)	20:39	25 07:28 (M03)	20:07	19:18	18:29	16:50	16:41
17	07:30	07:00	07:18	06:27	05:50		05:36		06:57 (M03)	05:51	07:04 (M03)	06:20	06:50	07:21	06:57	07:26
	17:06	17:43	19:15	19:48	20:19		20:41	25	07:22 (M03)	20:38	24 07:28 (M03)	20:06	19:16	18:27	16:50	16:41
18	07:29	06:59	07:16	06:26	05:49		07:02 (M03)	05:36	06:57 (M03)	05:51	07:04 (M03)	06:21	06:51	07:22	06:58	07:27
	17:07	17:45	19:16	19:49	20:20	7	07:09 (M03)	20:42	25 07:22 (M03)	20:37	23 07:27 (M03)	20:04	19:15	18:26	16:49	16:42
19	07:29	06:58	07:14	06:24	05:48		06:59 (M03)	05:36	06:57 (M03)	05:52	07:04 (M03)	06:22	06:52	07:23	06:59	07:28
	17:08	17:46	19:18	19:50	20:21	12	07:11 (M03)	20:42	25 07:22 (M03)	20:37	23 07:27 (M03)	20:03	19:13	18:24	16:48	16:42
20	07:28	06:56	07:13	06:23	05:47		06:59 (M03)	05:36	06:58 (M03)	05:53	07:05 (M03)	06:23	06:53	07:24	07:00	07:28
	17:09	17:47	19:19	19:51	20:22	15	07:14 (M03)	20:42	25 07:23 (M03)	20:36	21 07:26 (M03)	20:01	19:11	18:23	16:47	16:42
21	07:28	06:55	07:11	06:21	05:46		06:57 (M03)	05:37	06:58 (M03)	05:54	07:06 (M03)	06:24	06:54	07:25	07:01	07:29
	17:10	17:48	19:20	19:52	20:23	18	07:15 (M03)	20:43	25 07:23 (M03)	20:35	20 07:26 (M03)	20:00	19:10	18:21	16:47	16:43
22	07:27	06:53	07:09	06:20	05:45		06:56 (M03)	05:37	06:58 (M03)	05:55	07:07 (M03)	06:24	06:55	07:26	07:03	07:29
	17:12	17:49	19:21	19:53	20:24	19	07:15 (M03)	20:43	25 07:23 (M03)	20:35	18 07:25 (M03)	19:58	19:08	18:20	16:46	16:43
23	07:26	06:52	07:08	06:18	05:45		06:56 (M03)	05:37	06:58 (M03)	05:56	07:09 (M03)	06:25	06:56	07:28	07:04	07:30
	17:13	17:51	19:22	19:54	20:25	21	07:17 (M03)	20:43	25 07:23 (M03)	20:34	16 07:25 (M03)	19:57	19:06	18:18	16:45	16:44
24	07:26	06:51	07:06	06:17	05:44		06:55 (M03)	05:37	06:59 (M03)	05:56	07:09 (M03)	06:26	06:57	07:29	07:05	07:30
	17:14	17:52	19:23	19:55	20:26	22	07:17 (M03)	20:43	25 07:24 (M03)	20:33	14 07:23 (M03)	19:55	19:05	18:17	16:45	16:44
25	07:25	06:49	07:04	06:15	05:43		06:55 (M03)	05:38	06:59 (M03)	05:57	07:11 (M03)	06:27	06:58	07:30	07:06	07:31
	17:15	17:53	19:24	19:56	20:26	22	07:17 (M03)	20:43	25 07:24 (M03)	20:32	10 07:21 (M03)	19:54	19:03	18:16	16:44	16:45
26	07:24	06:48	07:03	06:14	05:42		06:55 (M03)	05:38	06:59 (M03)	05:58	07:15 (M03)	06:28	06:59	07:31	07:07	07:31
	17:16	17:54	19:25	19:58	20:27	23	07:18 (M03)	20:44	25 07:24 (M03)	20:31	2 07:17 (M03)	19:52	19:01	18:14	16:44	16:46
27	07:23	06:46	07:01	06:13	05:42		06:54 (M03)	05:38	06:59 (M03)	05:59		06:29	07:00	07:32	07:08	07:31
	17:18	17:55	19:26	19:59	20:28	24	07:18 (M03)	20:44	26 07:25 (M03)	20:30		19:51	19:00	18:13	16:43	16:46
28	07:23	06:45	06:59	06:11	05:41		06:54 (M03)	05:39	06:59 (M03)	06:00		06:30	07:01	07:33	07:09	07:32
	17:19	17:56	19:27	20:00	20:29	25	07:19 (M03)	20:44	26 07:25 (M03)	20:29		19:49	18:58	18:11	16:43	16:47
29	07:22		06:58	06:10	05:41		06:54 (M03)	05:39	06:59 (M03)	06:01		06:31	07:02	07:34	07:10	07:32
	17:20		19:28	20:01	20:30	25	07:19 (M03)	20:44	26 07:25 (M03)	20:28		19:48	18:56	18:10	16:42	16:48
30	07:21		06:56	06:09	05:40		06:54 (M03)	05:40	07:00 (M03)	06:02		06:32	07:03	07:36	07:11	07:32
	17:21		19:29	20:02	20:31	26	07:20 (M03)	20:44	26 07:26 (M03)	20:27		19:46	18:55	18:09	16:42	16:48
31	07:20		06:54		05:40		06:54 (M03)			06:03		06:33		07:37		07:32
	17:22		19:30		20:31	26	07:20 (M03)			20:26		19:45		18:08		16:49
Potential sun hours	298	297	369	398	448			451		458		428	375	346	299	288
Total, worst case						285		773		590						
Sun reduction						0.92		0.94		0.97						
Oper. time red.						1.00		1.00		1.00						
Wind dir. red.						0.80		0.80		0.80						
Total reduction						0.74		0.76		0.78						
Total, real						211		585		461						

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 62 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (134)

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		08:41 (M04)	06:43	06:53	06:07	05:39	05:40	06:04	06:34	07:04	06:38	08:03 (M03)	07:12
	16:50		17:24	23	09:04 (M04)	17:58	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06	28 08:31 (M03)	16:42
2	07:33		07:18		08:42 (M04)	06:42	06:51	06:06	05:39	05:40	06:05	06:35	07:05	06:39	08:04 (M03)	07:13
	16:51		17:25	22	09:04 (M04)	17:59	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	26 08:30 (M03)	16:41
3	07:33		07:17		08:42 (M04)	06:40	06:49	06:05	05:38	05:41	06:06	06:36	07:06	06:40	08:05 (M03)	07:14
	16:52		17:26	21	09:03 (M04)	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:50	17:04	24 08:29 (M03)	16:41
4	07:33		07:16		08:43 (M04)	06:38	06:48	06:04	05:38	05:42	06:07	06:37	07:07	06:41	08:07 (M03)	07:15
	16:52		17:27	20	09:03 (M04)	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:03	22 08:29 (M04)	16:41
5	07:33		07:15		08:40 (M03)	06:37	06:46	06:02	05:38	05:42	06:08	06:38	07:08	06:43	08:08 (M03)	07:16
	16:53		17:29	22	09:02 (M04)	18:02	19:35	20:07	20:35	20:43	20:21	19:37	18:46	17:01	23 08:31 (M04)	16:41
6	07:33		07:14		08:38 (M03)	06:35	06:44	06:01	05:37	05:43	06:09	06:39	07:09	06:44	08:11 (M03)	07:17
	16:54		17:30	23	09:01 (M04)	18:03	19:37	20:08	20:36	20:43	20:20	19:35	18:45	17:00	21 08:32 (M04)	16:40
7	07:33		07:13		08:37 (M03)	06:34	06:43	06:00	05:37	05:43	06:10	06:40	07:10	06:45	08:13 (M04)	07:18
	16:55		17:31	22	08:59 (M03)	18:04	19:38	20:09	20:36	20:43	20:19	19:33	18:43	16:59	20 08:33 (M04)	16:40
8	07:32		07:12		08:36 (M03)	07:32	06:41	05:59	05:37	05:44	06:11	06:41	07:11	06:46	08:13 (M04)	07:19
	16:56		17:32	24	09:00 (M03)	19:05	19:39	20:10	20:37	20:42	20:17	19:32	18:41	16:58	21 08:34 (M04)	16:40
9	07:32		07:10		08:34 (M03)	07:31	06:40	05:58	05:36	05:45	06:12	06:42	07:12	06:47	08:13 (M04)	07:20
	16:57		17:34	26	09:00 (M03)	19:07	19:40	20:11	20:38	20:42	20:16	19:30	18:40	16:57	22 08:35 (M04)	16:40
10	07:32		07:09		08:33 (M03)	07:29	06:38	05:57	05:36	05:45	06:13	06:43	07:13	06:49	08:12 (M04)	07:21
	16:58		17:35	29	09:02 (M03)	19:08	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	23 08:35 (M04)	16:40
11	07:32		07:08		08:33 (M03)	07:27	06:36	05:55	05:36	05:46	06:14	06:44	07:14	06:50	08:13 (M04)	07:22
	16:59		17:36	30	09:03 (M03)	19:09	19:42	20:13	20:39	20:41	20:14	19:27	18:36	16:55	23 08:36 (M04)	16:40
12	07:32		07:07		08:32 (M03)	07:26	06:35	05:54	05:36	05:47	06:15	06:45	07:15	06:51	08:12 (M04)	07:23
	17:00		17:37	31	09:03 (M03)	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	24 08:36 (M04)	16:40
13	07:31		07:06		08:31 (M03)	07:24	06:33	05:53	05:36	05:47	06:16	06:46	07:17	06:52	08:12 (M04)	07:23
	17:01		17:39	32	09:03 (M03)	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53	24 08:36 (M04)	16:41
14	07:31		07:04		08:31 (M03)	07:22	06:32	05:52	05:36	05:48	06:17	06:47	07:18	06:53	08:12 (M04)	07:24
	17:02		17:40	33	09:04 (M03)	19:12	19:45	20:16	20:40	20:40	20:10	19:22	18:32	16:52	24 08:36 (M04)	16:41
15	07:31		07:03		08:31 (M03)	07:21	06:30	05:51	05:36	05:49	06:18	06:48	07:19	09:13 (M03)	06:54	08:14 (M04)	07:25
	17:04		17:41	33	09:04 (M03)	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	10 09:23 (M03)	16:51	23 08:37 (M04)	16:41
16	07:30		07:02		08:31 (M03)	07:19	06:29	05:50	05:36	05:50	06:19	06:49	07:20	09:09 (M03)	06:56	08:14 (M04)	07:26
	17:05		17:42	33	09:04 (M03)	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:29	17 09:26 (M03)	16:50	22 08:36 (M04)	16:41
17	07:30		07:00		08:31 (M03)	07:18	06:27	05:49	05:36	05:51	06:20	06:50	07:21	09:07 (M03)	06:57	08:14 (M04)	07:26
	17:06		17:43	33	09:04 (M03)	19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	21 09:28 (M03)	16:50	22 08:36 (M04)	16:41
18	07:29	08:46 (M04)	06:59		08:31 (M03)	07:16	06:26	05:49	05:36	05:51	06:21	06:51	07:22	09:05 (M03)	06:58	08:15 (M04)	07:27
	17:07	7 08:53 (M04)	17:45	33	09:04 (M03)	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:26	24 09:29 (M03)	16:49	21 08:36 (M04)	16:42
19	07:29	08:45 (M04)	06:58		08:31 (M03)	07:14	06:24	05:48	05:36	05:52	06:21	06:52	07:23	09:04 (M03)	06:59	08:16 (M04)	07:28
	17:08	11 08:56 (M04)	17:46	32	09:03 (M03)	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	26 09:30 (M03)	16:48	20 08:36 (M04)	16:42
20	07:28	08:43 (M04)	06:56		08:31 (M03)	07:13	06:23	05:47	05:36	05:53	06:22	06:53	07:24	09:03 (M03)	07:00	08:17 (M04)	07:28
	17:09	14 08:57 (M04)	17:47	31	09:02 (M03)	19:19	19:51	20:22	20:42	20:36	20:01	19:11	18:23	28 09:31 (M03)	16:47	18 08:35 (M04)	16:42
21	07:28	08:43 (M04)	06:55		08:32 (M03)	07:11	06:21	05:46	05:37	05:54	06:23	06:54	07:25	09:03 (M03)	07:01	08:18 (M04)	07:29
	17:10	16 08:59 (M04)	17:48	30	09:02 (M03)	19:20	19:52	20:23	20:43	20:35	20:00	19:10	18:21	30 09:33 (M03)	16:47	16 08:34 (M04)	16:43
22	07:27	08:42 (M04)	06:53		08:32 (M03)	07:09	06:20	05:45	05:37	05:55	06:24	06:55	07:26	09:02 (M03)	07:03	08:19 (M04)	07:29
	17:12	18 09:00 (M04)	17:49	28	09:00 (M03)	19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:20	31 09:33 (M03)	16:46	14 08:33 (M04)	16:43
23	07:26	08:41 (M04)	06:52		08:34 (M03)	07:08	06:18	05:45	05:37	05:56	06:25	06:56	07:28	09:01 (M03)	07:04	08:21 (M04)	07:30
	17:13	20 09:01 (M04)	17:51	26	09:00 (M03)	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	32 09:33 (M03)	16:45	11 08:32 (M04)	16:44
24	07:26	08:41 (M04)	06:51		08:34 (M03)	07:06	06:17	05:44	05:37	05:56	06:26	06:57	07:29	09:01 (M03)	07:05	08:24 (M04)	07:30
	17:14	21 09:02 (M04)	17:52	23	08:57 (M03)	19:23	19:55	20:26	20:43	20:33	19:55	19:05	18:17	32 09:33 (M03)	16:45	7 08:31 (M04)	16:44
25	07:25	08:41 (M04)	06:49		08:36 (M03)	07:04	06:15	05:43	05:38	05:57	06:27	06:58	07:30	09:00 (M03)	07:06		07:31
	17:15	22 09:03 (M04)	17:53	20	08:56 (M03)	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	33 09:33 (M03)	16:44		16:45
26	07:24	08:41 (M04)	06:48		08:38 (M03)	07:03	06:14	05:42	05:38	05:58	06:28	06:59	07:31	09:01 (M03)	07:07		07:31
	17:16	23 09:04 (M04)	17:54	15	08:53 (M03)	19:25	19:58	20:27	20:44	20:31	19:52	19:01	18:14	33 09:34 (M03)	16:44		16:45
27	07:23	08:41 (M04)	06:46		08:42 (M03)	07:01	06:13	05:42	05:38	05:59	06:29	07:00	07:32	09:01 (M03)	07:08		07:31
	17:18	23 09:04 (M04)	17:55	7	08:49 (M03)	19:26	19:59	20:28	20:44	20:30	19:51	19:00	18:13	33 09:34 (M03)	16:43		16:46
28	07:23	08:40 (M04)	06:45			06:59	06:11	05:41	05:39	06:00	06:30	07:01	07:33	09:01 (M03)	07:09		07:32
	17:19	24 09:04 (M04)	17:56			19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	32 09:33 (M03)	16:43		16:47
29	07:22	08:40 (M04)				06:58	06:10	05:41	05:39	06:01	06:31	07:02	07:34	09:01 (M03)	07:10		07:32
	17:20	24 09:04 (M04)				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	32 09:33 (M03)	16:42		16:47
30	07:21	08:41 (M04)				06:56	06:09	05:40	05:40	06:02	06:32	07:03	07:36	09:01 (M03)	07:11		07:32
	17:21	23 09:04 (M04)				19:29	20:02	20:31	20:44	20:27	19:46	18:55	18:09	31 09:32 (M03)	16:42		16:48
31	07:20	08:41 (M04)				06:54		05:40		06:03	06:33		07:37	09:03 (M03)			07:32
	17:22	23 09:04 (M04)				19:30		20:31		20:26	19:45		18:08	29 09:32 (M03)			16:49
Potential sun hours	298		297			369	398	448	451	458	428	375	346		299		288
Total, worst case		269		702										474		499	
Sun reduction		0.45		0.62										0.84		0.61	
Oper. time red.		1.00		1.00										1.00		1.00	
Wind dir. red.		0.39		0.39										0.39		0.39	
Total reduction		0.17		0.24										0.33		0.24	
Total, real		47		169										155		117	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 63 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (135)

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		08:39 (M04)	06:43	08:26 (M03)	06:53	06:07	05:39	05:40	06:04	06:34	07:04		06:38	08:11 (M04)	07:12
	16:50		17:24	24	09:03 (M04)	17:58	33	08:59 (M03)	19:31	20:03	20:32	20:44	20:25	19:43	18:53		18:06	21	08:32 (M04)	16:42
2	07:33		07:18		08:39 (M04)	06:42	08:26 (M03)	06:51	06:06	05:39	05:40	06:05	06:35	07:05		06:39	08:10 (M04)	07:13
	16:51		17:25	25	09:04 (M04)	17:59	32	08:58 (M03)	19:32	20:04	20:33	20:44	20:24	19:41	18:51		17:05	23	08:33 (M04)	16:41
3	07:33		07:17		08:39 (M04)	06:40	08:26 (M03)	06:49	06:05	05:38	05:41	06:06	06:36	07:06		06:40	08:09 (M04)	07:14
	16:52		17:26	25	09:04 (M04)	18:00	30	08:56 (M03)	19:33	20:05	20:34	20:43	20:23	19:40	18:50		17:04	24	08:33 (M04)	16:41
4	07:33		07:16		08:39 (M04)	06:38	08:28 (M03)	06:48	06:04	05:38	05:42	06:07	06:37	07:07		06:41	08:10 (M04)	07:15
	16:52		17:27	25	09:04 (M04)	18:01	27	08:55 (M03)	19:34	20:06	20:34	20:43	20:22	19:38	18:48		17:03	24	08:34 (M04)	16:41
5	07:33		07:15		08:39 (M04)	06:37	08:28 (M03)	06:46	06:02	05:38	05:42	06:08	06:38	07:08		06:43	08:09 (M04)	07:16
	16:53		17:29	25	09:04 (M04)	18:02	25	08:53 (M03)	19:35	20:07	20:35	20:43	20:21	19:37	18:46		17:01	25	08:34 (M04)	16:41
6	07:33		07:14		08:39 (M04)	06:35	08:30 (M03)	06:44	06:01	05:37	05:43	06:09	06:39	07:09	09:10 (M03)	06:44	08:09 (M04)	07:17
	16:54		17:30	25	09:04 (M04)	18:03	22	08:52 (M03)	19:37	20:08	20:36	20:43	20:20	19:35	18:45	14	09:24 (M03)	17:00	25	08:34 (M04)	16:40
7	07:33		07:13		08:40 (M04)	06:34	08:32 (M03)	06:43	06:00	05:37	05:43	06:10	06:40	07:10	09:07 (M03)	06:45	08:09 (M04)	07:18
	16:55		17:31	24	09:04 (M04)	18:04	17	08:49 (M03)	19:38	20:09	20:36	20:43	20:19	19:33	18:43	19	09:26 (M03)	16:59	25	08:34 (M04)	16:40
8	07:32		07:12		08:41 (M04)	07:32	09:36 (M03)	06:41	05:59	05:37	05:44	06:11	06:41	07:11	09:05 (M03)	06:46	08:10 (M04)	07:19
	16:56		17:32	23	09:04 (M04)	19:05	9	09:45 (M03)	19:39	20:10	20:37	20:42	20:17	19:32	18:41	23	09:28 (M03)	16:58	25	08:35 (M04)	16:40
9	07:32		07:10		08:41 (M04)	07:31			06:40	05:58	05:36	05:45	06:12	06:42	07:12		09:03 (M03)	06:47		08:10 (M04)	07:20
	16:57		17:34	22	09:03 (M04)	19:07			19:40	20:11	20:38	20:42	20:16	19:30	18:40	26	09:29 (M03)	16:57	25	08:35 (M04)	16:40
10	07:32		07:09		08:42 (M04)	07:29			06:38	05:57	05:36	05:45	06:13	06:43	07:13		09:01 (M03)	06:49		08:10 (M04)	07:21
	16:58		17:35	20	09:02 (M04)	19:08			19:41	20:12	20:38	20:42	20:15	19:28	18:38	29	09:30 (M03)	16:56	24	08:34 (M04)	16:40
11	07:32		07:08		08:43 (M04)	07:27			06:36	05:55	05:36	05:46	06:14	06:44	07:14		09:00 (M03)	06:50		08:11 (M04)	07:22
	16:59		17:36	18	09:01 (M04)	19:09			19:42	20:13	20:39	20:41	20:14	19:27	18:36	31	09:31 (M03)	16:55	24	08:35 (M04)	16:40
12	07:32		07:07		08:45 (M04)	07:26			06:35	05:54	05:36	05:47	06:15	06:45	07:15		08:59 (M03)	06:51		08:12 (M04)	07:23
	17:00		17:37	14	08:59 (M04)	19:10			19:43	20:14	20:39	20:41	20:12	19:25	18:35	33	09:32 (M03)	16:54	22	08:34 (M04)	16:40
13	07:31		07:06		08:38 (M03)	07:24			06:33	05:53	05:36	05:47	06:16	06:46	07:17		08:58 (M03)	06:52		08:12 (M04)	07:23
	17:01		17:39	18	08:56 (M04)	19:11			19:44	20:15	20:40	20:40	20:11	19:23	18:33	34	09:32 (M03)	16:53	21	08:33 (M04)	16:41
14	07:31		07:04		08:36 (M03)	07:22			06:32	05:52	05:36	05:48	06:17	06:47	07:18		08:58 (M03)	06:53		08:13 (M04)	07:24
	17:02		17:40	18	08:54 (M03)	19:12			19:45	20:16	20:40	20:40	20:10	19:22	18:32	34	09:32 (M03)	16:52	19	08:32 (M04)	16:41
15	07:31		07:03		08:34 (M03)	07:21			06:30	05:51	05:36	05:49	06:18	06:48	07:19		08:58 (M03)	06:54		08:15 (M04)	07:25
	17:04		17:41	22	08:56 (M03)	19:13			19:46	20:17	20:41	20:39	20:08	19:20	18:30	36	09:34 (M03)	16:51	17	08:32 (M04)	16:41
16	07:30		07:02		08:32 (M03)	07:19			06:29	05:50	05:36	05:50	06:19	06:49	07:20		08:58 (M03)	06:56		08:17 (M04)	07:26
	17:05		17:42	26	08:58 (M03)	19:14			19:47	20:18	20:41	20:39	20:07	19:18	18:29	36	09:34 (M03)	16:50	13	08:30 (M04)	16:41
17	07:30		07:00		08:30 (M03)	07:18			06:27	05:49	05:36	05:51	06:20	06:50	07:21		08:57 (M03)	06:57		08:19 (M04)	07:26
	17:06		17:43	29	08:59 (M03)	19:15			19:48	20:19	20:41	20:38	20:06	19:16	18:27	36	09:33 (M03)	16:50	9	08:28 (M04)	16:41
18	07:29		06:59		08:30 (M03)	07:16			06:26	05:49	05:36	05:51	06:20	06:51	07:22		08:57 (M03)	06:58			07:27
	17:07		17:45	30	09:00 (M03)	19:16			19:49	20:20	20:42	20:37	20:04	19:15	18:26	36	09:33 (M03)	16:49			16:42
19	07:29		06:58		08:28 (M03)	07:14			06:24	05:48	05:36	05:52	06:21	06:52	07:23		08:57 (M03)	06:59			07:28
	17:08		17:46	32	09:00 (M03)	19:17			19:50	20:21	20:42	20:37	20:03	19:13	18:24	36	09:33 (M03)	16:48			16:42
20	07:28		06:56		08:28 (M03)	07:13			06:23	05:47	05:36	05:53	06:22	06:53	07:24		08:57 (M03)	07:00			07:28
	17:09		17:47	33	09:01 (M03)	19:19			19:51	20:22	20:42	20:36	20:01	19:11	18:23	35	09:32 (M03)	16:47			16:42
21	07:28		06:55		08:27 (M03)	07:11			06:21	05:46	05:37	05:54	06:23	06:54	07:25		08:58 (M03)	07:01			07:29
	17:10		17:48	35	09:02 (M03)	19:20			19:52	20:23	20:43	20:35	20:00	19:10	18:21	34	09:32 (M03)	16:47			16:43
22	07:27		06:53		08:26 (M03)	07:09			06:20	05:45	05:37	05:55	06:24	06:55	07:26		08:58 (M03)	07:03			07:29
	17:12		17:49	36	09:02 (M03)	19:21			19:53	20:24	20:43	20:35	19:58	19:08	18:20	33	09:31 (M03)	16:46			16:43
23	07:26		06:52		08:26 (M03)	07:08			06:18	05:45	05:37	05:56	06:25	06:56	07:28		08:59 (M03)	07:04			07:30
	17:13		17:51	36	09:02 (M03)	19:22			19:54	20:25	20:43	20:34	19:57	19:06	18:18	31	09:30 (M03)	16:45			16:44
24	07:26		06:51		08:25 (M03)	07:06			06:17	05:44	05:37	05:56	06:26	06:57	07:29		08:59 (M03)	07:05			07:30
	17:14		17:52	37	09:02 (M03)	19:23			19:55	20:26	20:43	20:33	19:55	19:05	18:17	30	09:29 (M03)	16:45			16:44
25	07:25	08:46 (M04)	06:49		08:26 (M03)	07:04			06:15	05:43	05:38	05:57	06:27	06:58	07:30		09:00 (M03)	07:06			07:31
	17:15	9 08:55 (M04)	17:53	36	09:02 (M03)	19:24			19:56	20:26	20:43	20:32	19:54	19:03	18:15	28	09:28 (M03)	16:44			16:45
26	07:24	08:44 (M04)	06:48		08:25 (M03)	07:03			06:14	05:42	05:38	05:58	06:28	06:59	07:31		09:02 (M03)	07:07			07:31
	17:16	14 08:58 (M04)	17:54	36	09:01 (M03)	19:25			19:58	20:27	20:44	20:31	19:52	19:01	18:14	25	09:27 (M03)	16:44			16:45
27	07:23	08:42 (M04)	06:46		08:26 (M03)	07:01			06:13	05:42	05:38	05:59	06:29	07:00	07:32		09:04 (M03)	07:08			07:31
	17:18	17 08:59 (M04)	17:55	35	09:01 (M03)	19:26			19:59	20:28	20:44	20:30	19:51	19:00	18:13	21	09:25 (M03)	16:43			16:46
28	07:23	08:41 (M04)	06:45		08:25 (M03)	06:59			06:11	05:41	05:39	06:00	06:30	07:01	07:33		09:06 (M03)	07:09			07:32
	17:19	19 09:00 (M04)	17:56	35	09:00 (M03)	19:27			20:00	20:29	20:44	20:29	19:49	18:58	18:11	17	09:23 (M03)	16:43			16:47
29	07:22	08:40 (M04)				06:58			06:10	05:41	05:39	06:01	06:31	07:02	07:34		09:09 (M03)	07:10			07:32
	17:20	21 09:01 (M04)				19:28			20:01	20:30	20:44	20:28	19:48	18:56	18:10	18	09:27 (M04)	16:42			16:47
30	07:21	08:40 (M04)				06:56			06:09	05:40	05:40	06:02	06:32	07:03	07:36		09:13 (M04)	07:11			07:32
	17:21	22 09:02 (M04)				19:29			20:02	20:31	20:44	20:27	19:46	18:55	18:09	16	09:29 (M04)	16:42			16:48
31	07:20	08:39 (M04)				06:54				05:40		06:03	06:33		07:37		09:13 (M04)				07:32
	17:22	24 09:03 (M04)				19:30				20:31		20:26	19:45		18:08	18	09:31 (M04)				16:49
Potential sun hours	298		297		369		398	448	451	458	428	375	346		299			288		
Total, worst case		126		764		195								729		366				
Sun reduction		0.45		0.62		0.73								0.84		0.61				
Oper. time red.		1.00		1.00		1.00								1.00		1.00				
Wind dir. red.		0.39		0.40		0.41								0.41		0.39				
Total reduction		0.17		0.25		0.30								0.34		0.23				
Total, real		22		190		58								250		86				

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 64 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (136)

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		08:50 (M04)	06:43	08:47 (M03)	06:53	06:07	05:39	05:40	06:04	06:34	07:04		06:38	08:15 (M03)	07:12
	16:50		17:24	26	09:16 (M04)	17:58	23 09:10 (M03)	19:31	20:03	20:32	20:44	20:25	19:43	18:53		18:06	32 08:47 (M03)	16:42
2	07:33		07:18		08:51 (M04)	06:42	08:49 (M03)	06:51	06:06	05:39	05:40	06:05	06:35	07:05		06:39	08:16 (M03)	07:13
	16:51		17:25	25	09:16 (M04)	17:59	18 09:07 (M03)	19:32	20:04	20:33	20:43	20:24	19:41	18:51		17:05	30 08:46 (M03)	16:41
3	07:33		07:17		08:51 (M04)	06:40	08:52 (M03)	06:49	06:05	05:38	05:41	06:06	06:36	07:06		06:40	08:18 (M03)	07:14
	16:52		17:26	24	09:15 (M04)	18:00	10 09:02 (M03)	19:33	20:05	20:34	20:43	20:23	19:40	18:50		17:04	26 08:44 (M03)	16:41
4	07:33		07:16		08:52 (M04)	06:38		06:48	06:04	05:38	05:42	06:07	06:37	07:07		06:41	08:20 (M03)	07:15
	16:52		17:27	22	09:14 (M04)	18:01		19:34	20:06	20:34	20:43	20:22	19:38	18:48		17:03	23 08:43 (M03)	16:41
5	07:33		07:15		08:53 (M04)	06:37		06:46	06:02	05:38	05:42	06:08	06:38	07:08		06:43	08:22 (M03)	07:16
	16:53		17:29	21	09:14 (M04)	18:02		19:35	20:07	20:35	20:43	20:21	19:37	18:46		17:01	20 08:42 (M04)	16:41
6	07:33		07:14		08:52 (M03)	06:35		06:44	06:01	05:37	05:43	06:09	06:39	07:09		06:44	08:23 (M04)	07:17
	16:54		17:30	20	09:12 (M04)	18:03		19:37	20:08	20:36	20:43	20:20	19:35	18:45		17:00	21 08:44 (M04)	16:40
7	07:33		07:13		08:50 (M03)	06:34		06:43	06:00	05:37	05:43	06:10	06:40	07:10		06:45	08:22 (M04)	07:18
	16:55		17:31	24	09:14 (M03)	18:04		19:38	20:09	20:36	20:43	20:19	19:33	18:43		16:59	22 08:44 (M04)	16:40
8	07:32		07:12		08:49 (M03)	07:32		06:41	05:59	05:37	05:44	06:11	06:41	07:11		06:46	08:22 (M04)	07:19
	16:56		17:32	27	09:16 (M03)	19:05		19:39	20:10	20:37	20:42	20:17	19:32	18:41		16:58	24 08:46 (M04)	16:40
9	07:32		07:10		08:46 (M03)	07:31		06:40	05:58	05:36	05:45	06:12	06:42	07:12		06:47	08:21 (M04)	07:20
	16:57		17:34	30	09:16 (M03)	19:07		19:40	20:11	20:38	20:42	20:16	19:30	18:40		16:57	26 08:47 (M04)	16:40
10	07:32		07:09		08:46 (M03)	07:29		06:38	05:57	05:36	05:45	06:13	06:43	07:13		06:49	08:21 (M04)	07:21
	16:58		17:35	31	09:17 (M03)	19:08		19:41	20:12	20:38	20:42	20:15	19:28	18:38		16:56	26 08:47 (M04)	16:40
11	07:32		07:08		08:45 (M03)	07:27		06:36	05:55	05:36	05:46	06:14	06:44	07:14	09:24 (M03)	06:50	08:21 (M04)	07:22
	16:59		17:36	34	09:19 (M03)	19:09		19:42	20:13	20:39	20:41	20:14	19:27	18:36	15 09:39 (M03)	16:55	27 08:48 (M04)	16:40
12	07:32		07:07		08:44 (M03)	07:26		06:35	05:54	05:36	05:47	06:15	06:45	07:15	09:21 (M03)	06:51	08:21 (M04)	07:23
	17:00		17:37	36	09:20 (M03)	19:10		19:43	20:14	20:39	20:41	20:12	19:25	18:35	21 09:42 (M03)	16:54	27 08:48 (M04)	16:40
13	07:31		07:06		08:43 (M03)	07:24		06:33	05:53	05:36	05:47	06:16	06:46	07:17	09:19 (M03)	06:52	08:21 (M04)	07:23
	17:01		17:39	37	09:20 (M03)	19:11		19:44	20:15	20:40	20:40	20:11	19:23	18:33	25 09:44 (M03)	16:53	27 08:48 (M04)	16:41
14	07:31		07:04		08:43 (M03)	07:22		06:32	05:52	05:36	05:48	06:17	06:47	07:18	09:17 (M03)	06:53	08:21 (M04)	07:24
	17:02		17:40	37	09:20 (M03)	19:12		19:45	20:16	20:40	20:40	20:10	19:22	18:32	28 09:45 (M03)	16:52	27 08:48 (M04)	16:41
15	07:31	08:56 (M04)	07:03		08:42 (M03)	07:21		06:30	05:51	05:36	05:49	06:18	06:48	07:19	09:17 (M03)	06:54	08:22 (M04)	07:25
	17:03	7 09:03 (M04)	17:41	39	09:21 (M03)	19:13		19:46	20:17	20:41	20:39	20:08	19:20	18:30	30 09:47 (M03)	16:51	27 08:49 (M04)	16:41
16	07:30	08:53 (M04)	07:02		08:41 (M03)	07:19		06:29	05:50	05:36	05:50	06:19	06:49	07:20	09:15 (M03)	06:56	08:22 (M04)	07:26
	17:05	12 09:05 (M04)	17:42	39	09:20 (M03)	19:14		19:47	20:18	20:41	20:39	20:07	19:18	18:29	33 09:48 (M03)	16:50	27 08:49 (M04)	16:41
17	07:30	08:53 (M04)	07:00		08:41 (M03)	07:18		06:27	05:49	05:36	05:50	06:20	06:50	07:21	09:14 (M03)	06:57	08:22 (M04)	07:26
	17:06	14 09:07 (M04)	17:43	40	09:21 (M03)	19:15		19:48	20:19	20:41	20:38	20:06	19:16	18:27	35 09:49 (M03)	16:50	26 08:48 (M04)	16:41
18	07:29	08:51 (M04)	06:59		08:42 (M03)	07:16		06:26	05:49	05:36	05:51	06:20	06:51	07:22	09:13 (M03)	06:58	08:23 (M04)	07:27
	17:07	17 09:08 (M04)	17:45	39	09:21 (M03)	19:16		19:49	20:20	20:42	20:37	20:04	19:15	18:26	36 09:49 (M03)	16:49	25 08:48 (M04)	16:42
19	07:29	08:51 (M04)	06:58		08:41 (M03)	07:14		06:24	05:48	05:36	05:52	06:21	06:52	07:23	09:12 (M03)	06:59	08:24 (M04)	07:28
	17:08	19 09:10 (M04)	17:46	39	09:20 (M03)	19:17		19:50	20:21	20:42	20:37	20:03	19:13	18:24	38 09:50 (M03)	16:48	25 08:49 (M04)	16:42
20	07:28	08:50 (M04)	06:56		08:41 (M03)	07:13		06:23	05:47	05:36	05:53	06:22	06:53	07:24	09:12 (M03)	07:00	08:25 (M04)	07:28
	17:09	21 09:11 (M04)	17:47	40	09:21 (M03)	19:19		19:51	20:22	20:42	20:36	20:01	19:11	18:23	38 09:50 (M03)	16:47	23 08:48 (M04)	16:42
21	07:28	08:50 (M04)	06:55		08:42 (M03)	07:11		06:21	05:46	05:37	05:54	06:23	06:54	07:25	09:12 (M03)	07:01	08:25 (M04)	07:29
	17:10	23 09:13 (M04)	17:48	39	09:21 (M03)	19:20		19:52	20:23	20:43	20:35	20:00	19:10	18:21	39 09:51 (M03)	16:47	23 08:48 (M04)	16:43
22	07:27	08:50 (M04)	06:53		08:41 (M03)	07:09		06:20	05:45	05:37	05:55	06:24	06:55	07:26	09:12 (M03)	07:03	08:26 (M04)	07:29
	17:12	23 09:13 (M04)	17:49	38	09:19 (M03)	19:21		19:53	20:24	20:43	20:35	19:58	19:08	18:20	39 09:51 (M03)	16:46	21 08:47 (M04)	16:43
23	07:26	08:49 (M04)	06:52		08:42 (M03)	07:08		06:18	05:45	05:37	05:56	06:25	06:56	07:28	09:11 (M03)	07:04	08:27 (M04)	07:30
	17:13	25 09:14 (M04)	17:51	37	09:19 (M03)	19:22		19:54	20:25	20:43	20:34	19:57	19:06	18:18	40 09:51 (M03)	16:45	19 08:46 (M04)	16:44
24	07:26	08:49 (M04)	06:51		08:42 (M03)	07:06		06:17	05:44	05:37	05:56	06:26	06:57	07:29	09:11 (M03)	07:05	08:29 (M04)	07:30
	17:14	25 09:14 (M04)	17:52	36	09:18 (M03)	19:23		19:55	20:26	20:43	20:33	19:55	19:05	18:17	40 09:51 (M03)	16:45	17 08:46 (M04)	16:44
25	07:25	08:49 (M04)	06:49		08:43 (M03)	07:04		06:15	05:43	05:38	05:57	06:27	06:58	07:30	09:11 (M03)	07:06	08:31 (M04)	07:31
	17:15	27 09:16 (M04)	17:53	34	09:17 (M03)	19:24		19:56	20:26	20:43	20:32	19:54	19:03	18:15	40 09:51 (M03)	16:44	14 08:45 (M04)	16:45
26	07:24	08:49 (M04)	06:48		08:43 (M03)	07:03		06:14	05:42	05:38	05:58	06:28	06:59	07:31	09:11 (M03)	07:07	08:32 (M04)	07:31
	17:16	27 09:16 (M04)	17:54	32	09:15 (M03)	19:25		19:58	20:27	20:44	20:31	19:52	19:01	18:14	39 09:50 (M03)	16:44	12 08:44 (M04)	16:45
27	07:23	08:49 (M04)	06:46		08:45 (M03)	07:01		06:13	05:42	05:38	05:59	06:29	07:00	07:32	09:12 (M03)	07:08	08:35 (M04)	07:31
	17:18	27 09:16 (M04)	17:55	29	09:14 (M03)	19:26		19:59	20:28	20:44	20:30	19:51	19:00	18:13	39 09:51 (M03)	16:43	7 08:42 (M04)	16:46
28	07:23	08:49 (M04)	06:45		08:45 (M03)	06:59		06:11	05:41	05:39	06:00	06:30	07:01	07:33	09:12 (M03)	07:09		07:32
	17:19	27 09:16 (M04)	17:56	27	09:12 (M03)	19:27		20:00	20:29	20:44	20:29	19:49	18:58	18:11	38 09:50 (M03)	16:43		16:47
29	07:22	08:49 (M04)				06:58		06:10	05:41	05:39	06:01	06:31	07:02	07:34	09:13 (M03)	07:10		07:32
	17:20	27 09:16 (M04)				19:28		20:01	20:30	20:44	20:28	19:48	18:56	18:10	36 09:49 (M03)	16:42		16:47
30	07:21	08:49 (M04)				06:56		06:09	05:40	05:39	06:02	06:32	07:03	07:36	09:13 (M03)	07:11		07:32
	17:21	27 09:16 (M04)				19:29		20:02	20:31	20:44	20:27	19:46	18:54	18:09	35 09:48 (M03)	16:42		16:48
31	07:20	08:50 (M04)				06:54			05:40		06:03	06:33		07:37	09:15 (M03)			07:32
	17:22	26 09:16 (M04)				19:30			20:31		20:26	19:45		18:08	33 09:48 (M03)			16:49
Potential sun hours	298		297		369		398	448	451	458	428	375	346			299		288
Total, worst case		374		902		51								717			624	
Sun reduction		0.45		0.62		0.73								0.84			0.61	
Oper. time red.		1.00		1.00		1.00								1.00			1.00	
Wind dir. red.		0.38		0.39		0.39								0.39			0.38	
Total reduction		0.17		0.24		0.28								0.33			0.23	
Total, real		64		216		14								233			146	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 65 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (137)

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		08:47 (M04)	06:43	06:53	06:07	05:39	05:40	06:04	06:34	07:04	06:38	08:09 (M03)	07:12
	16:50		17:24	23	09:10 (M04)	17:58	19:31	20:03	20:32	20:44	20:25	19:43	18:53	18:06	32	08:41 (M03)	16:42
2	07:33		07:18		08:48 (M04)	06:42	06:51	06:06	05:39	05:40	06:05	06:35	07:05	06:39		08:09 (M03)	07:13
	16:51		17:25	21	09:09 (M04)	17:59	19:32	20:04	20:33	20:44	20:24	19:41	18:51	17:05	31	08:40 (M03)	16:41
3	07:33		07:17		08:47 (M03)	06:40	06:49	06:05	05:38	05:41	06:06	06:36	07:06	06:40		08:10 (M03)	07:14
	16:52		17:26	22	09:09 (M04)	18:00	19:33	20:05	20:34	20:43	20:23	19:40	18:50	17:04	29	08:39 (M03)	16:41
4	07:33		07:16		08:45 (M03)	06:38	06:48	06:04	05:38	05:42	06:07	06:37	07:07	06:41		08:12 (M03)	07:15
	16:52		17:27	23	09:08 (M04)	18:01	19:34	20:06	20:34	20:43	20:22	19:38	18:48	17:03	27	08:39 (M03)	16:41
5	07:33		07:15		08:44 (M03)	06:37	06:46	06:02	05:38	05:42	06:08	06:38	07:08	06:43		08:13 (M03)	07:16
	16:53		17:29	23	09:07 (M03)	18:02	19:35	20:07	20:35	20:43	20:21	19:37	18:46	17:01	25	08:38 (M03)	16:41
6	07:33		07:14		08:43 (M03)	06:35	06:44	06:01	05:37	05:43	06:09	06:39	07:09	06:44		08:14 (M03)	07:17
	16:54		17:30	25	09:08 (M03)	18:03	19:37	20:08	20:36	20:43	20:20	19:35	18:45	17:00	22	08:36 (M03)	16:40
7	07:33		07:13		08:42 (M03)	06:34	06:43	06:00	05:37	05:43	06:10	06:40	07:10	06:45		08:16 (M03)	07:18
	16:55		17:31	28	09:10 (M03)	18:04	19:38	20:09	20:36	20:43	20:19	19:33	18:43	16:59	22	08:38 (M04)	16:40
8	07:32		07:12		08:41 (M03)	07:32	06:41	05:59	05:37	05:44	06:11	06:41	07:11	06:46		08:19 (M03)	07:19
	16:56		17:32	30	09:11 (M03)	19:05	19:39	20:10	20:37	20:42	20:17	19:32	18:41	16:58	21	08:40 (M04)	16:40
9	07:32		07:10		08:39 (M03)	07:31	06:40	05:58	05:36	05:45	06:12	06:42	07:12	06:47		08:19 (M04)	07:20
	16:57		17:34	32	09:11 (M03)	19:07	19:40	20:11	20:38	20:42	20:16	19:30	18:40	16:57	21	08:40 (M04)	16:40
10	07:32		07:09		08:39 (M03)	07:29	06:38	05:57	05:36	05:45	06:13	06:43	07:13	06:49		08:18 (M04)	07:21
	16:58		17:35	33	09:12 (M03)	19:08	19:41	20:12	20:38	20:42	20:15	19:28	18:38	16:56	23	08:41 (M04)	16:40
11	07:32		07:08		08:39 (M03)	07:27	06:36	05:55	05:36	05:46	06:14	06:44	07:14	06:50		08:19 (M04)	07:22
	16:59		17:36	33	09:12 (M03)	19:09	19:42	20:13	20:39	20:41	20:14	19:27	18:36	16:55	23	08:42 (M04)	16:40
12	07:32		07:07		08:39 (M03)	07:26	06:35	05:54	05:36	05:47	06:15	06:45	07:15	06:51		08:18 (M04)	07:23
	17:00		17:37	34	09:13 (M03)	19:10	19:43	20:14	20:39	20:41	20:12	19:25	18:35	16:54	24	08:42 (M04)	16:40
13	07:31		07:06		08:38 (M03)	07:24	06:33	05:53	05:36	05:47	06:16	06:46	07:17	06:52		08:18 (M04)	07:23
	17:01		17:39	35	09:13 (M03)	19:11	19:44	20:15	20:40	20:40	20:11	19:23	18:33	16:53	25	08:43 (M04)	16:41
14	07:31		07:04		08:38 (M03)	07:22	06:32	05:52	05:36	05:48	06:17	06:47	07:18	06:53		08:18 (M04)	07:24
	17:02		17:40	35	09:13 (M03)	19:12	19:45	20:16	20:40	20:40	20:10	19:22	18:32	16:52	25	08:43 (M04)	16:41
15	07:31	08:51 (M04)	07:03		08:38 (M03)	07:21	06:30	05:51	05:36	05:49	06:18	06:48	07:19	09:21 (M03)	06:54	08:19 (M04)	07:25
	17:04	8 08:59 (M04)	17:41	35	09:13 (M03)	19:13	19:46	20:17	20:41	20:39	20:08	19:20	18:30	9 09:30 (M03)	16:51	25 08:44 (M04)	16:41
16	07:30	08:49 (M04)	07:02		08:38 (M03)	07:19	06:29	05:50	05:36	05:50	06:19	06:49	07:20	09:17 (M03)	06:56	08:19 (M04)	07:26
	17:05	12 09:01 (M04)	17:42	35	09:13 (M03)	19:14	19:47	20:18	20:41	20:39	20:07	19:18	18:29	17 09:34 (M03)	16:50	25 08:44 (M04)	16:41
17	07:30	08:48 (M04)	07:00		08:38 (M03)	07:18	06:27	05:49	05:36	05:50	06:20	06:50	07:21	09:15 (M03)	06:57	08:19 (M04)	07:26
	17:06	15 09:03 (M04)	17:43	34	09:12 (M03)	19:15	19:48	20:19	20:41	20:38	20:06	19:16	18:27	21 09:36 (M03)	16:50	24 08:43 (M04)	16:41
18	07:29	08:47 (M04)	06:59		08:38 (M03)	07:16	06:26	05:49	05:36	05:51	06:20	06:51	07:22	09:13 (M03)	06:58	08:19 (M04)	07:27
	17:07	17 09:04 (M04)	17:45	34	09:12 (M03)	19:16	19:49	20:20	20:42	20:37	20:04	19:15	18:26	24 09:37 (M03)	16:49	24 08:43 (M04)	16:42
19	07:29	08:47 (M04)	06:58		08:38 (M03)	07:14	06:24	05:48	05:36	05:52	06:21	06:52	07:23	09:11 (M03)	06:59	08:20 (M04)	07:28
	17:08	18 09:05 (M04)	17:46	33	09:11 (M03)	19:17	19:50	20:21	20:42	20:37	20:03	19:13	18:24	28 09:39 (M03)	16:48	24 08:44 (M04)	16:42
20	07:28	08:46 (M04)	06:56		08:39 (M03)	07:13	06:23	05:47	05:36	05:53	06:22	06:53	07:24	09:10 (M03)	07:00	08:21 (M04)	07:28
	17:09	20 09:06 (M04)	17:47	32	09:11 (M03)	19:19	19:51	20:22	20:42	20:36	20:01	19:11	18:23	29 09:39 (M03)	16:47	22 08:43 (M04)	16:42
21	07:28	08:46 (M04)	06:55		08:40 (M03)	07:11	06:21	05:46	05:37	05:54	06:23	06:54	07:25	09:10 (M03)	07:01	08:21 (M04)	07:29
	17:10	22 09:08 (M04)	17:48	30	09:10 (M03)	19:20	19:52	20:23	20:43	20:35	20:00	19:10	18:21	31 09:41 (M03)	16:47	22 08:43 (M04)	16:43
22	07:27	08:46 (M04)	06:53		08:40 (M03)	07:09	06:20	05:45	05:37	05:55	06:24	06:55	07:26	09:09 (M03)	07:03	08:22 (M04)	07:29
	17:12	22 09:08 (M04)	17:49	29	09:09 (M03)	19:21	19:53	20:24	20:43	20:35	19:58	19:08	18:20	33 09:42 (M03)	16:46	20 08:42 (M04)	16:43
23	07:26	08:45 (M04)	06:52		08:41 (M03)	07:08	06:18	05:45	05:37	05:56	06:25	06:56	07:28	09:08 (M03)	07:04	08:23 (M04)	07:30
	17:13	24 09:09 (M04)	17:51	27	09:08 (M03)	19:22	19:54	20:25	20:43	20:34	19:57	19:06	18:18	34 09:42 (M03)	16:45	19 08:42 (M04)	16:44
24	07:26	08:45 (M04)	06:51		08:42 (M03)	07:06	06:17	05:44	05:37	05:56	06:26	06:57	07:29	09:08 (M03)	07:05	08:25 (M04)	07:30
	17:14	24 09:09 (M04)	17:52	23	09:05 (M03)	19:23	19:55	20:26	20:43	20:33	19:55	19:05	18:17	34 09:42 (M03)	16:45	17 08:42 (M04)	16:44
25	07:25	08:46 (M04)	06:49		08:44 (M03)	07:04	06:15	05:43	05:38	05:57	06:27	06:58	07:30	09:07 (M03)	07:06	08:26 (M04)	07:31
	17:15	24 09:10 (M04)	17:53	20	09:04 (M03)	19:24	19:56	20:26	20:43	20:32	19:54	19:03	18:15	35 09:42 (M03)	16:44	15 08:41 (M04)	16:45
26	07:24	08:46 (M04)	06:48		08:46 (M03)	07:03	06:14	05:42	05:38	05:58	06:28	06:59	07:31	09:08 (M03)	07:07	08:28 (M04)	07:31
	17:16	25 09:11 (M04)	17:54	14	09:00 (M03)	19:25	19:58	20:27	20:44	20:31	19:52	19:01	18:14	35 09:43 (M03)	16:44	12 08:40 (M04)	16:45
27	07:23	08:46 (M04)	06:46			07:01	06:13	05:42	05:38	05:59	06:29	07:00	07:32	09:08 (M03)	07:08	08:30 (M04)	07:31
	17:18	25 09:11 (M04)	17:55			19:26	19:59	20:28	20:44	20:30	19:51	19:00	18:13	35 09:43 (M03)	16:43	8 08:38 (M04)	16:46
28	07:23	08:46 (M04)	06:45			06:59	06:11	05:41	05:39	06:00	06:30	07:01	07:33	09:07 (M03)	07:09		07:32
	17:19	25 09:11 (M04)	17:56			19:27	20:00	20:29	20:44	20:29	19:49	18:58	18:11	36 09:43 (M03)	16:43		16:47
29	07:22	08:46 (M04)				06:58	06:10	05:41	05:39	06:01	06:31	07:02	07:34	09:07 (M03)	07:10		07:32
	17:20	25 09:11 (M04)				19:28	20:01	20:30	20:44	20:28	19:48	18:56	18:10	35 09:42 (M03)	16:42		16:47
30	07:21	08:46 (M04)				06:56	06:09	05:40	05:39	06:02	06:32	07:03	07:36	09:07 (M03)	07:11		07:32
	17:21	25 09:11 (M04)				19:29	20:02	20:31	20:44	20:27	19:46	18:55	18:09	35 09:42 (M03)	16:42		16:48
31	07:20	08:47 (M04)				06:54		05:40		06:03	06:33		07:37	09:09 (M03)			07:32
	17:22	23 09:10 (M04)				19:30		20:31		20:26	19:45		18:08	33 09:42 (M03)			16:49
Potential sun hours	298		297			369	398	448	451	458	428	375	346		299		288
Total, worst case		354		743										504		607	
Sun reduction		0.45		0.62										0.84		0.61	
Oper. time red.		1.00		1.00										1.00		1.00	
Wind dir. red.		0.38		0.39										0.39		0.38	
Total reduction		0.17		0.24										0.33		0.23	
Total, real		61		178										164		142	

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 66 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (138)

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	07:33	07:19	06:43		06:53	06:07	05:39	05:40	06:04	06:34		07:04		08:17 (M03)	06:38	07:12
	16:50	17:24	17:58		19:31	20:03	20:32	20:44	20:25	19:43		18:53	24	08:41 (M03)	18:06	16:42
2	07:33	07:18	06:42		06:51	06:06	05:39	05:40	06:05	06:35		07:05		08:17 (M03)	06:39	07:13
	16:51	17:25	17:59		19:32	20:04	20:33	20:44	20:24	19:41		18:51	24	08:41 (M03)	17:05	16:41
3	07:33	07:17	06:40		06:49	06:05	05:38	05:41	06:06	06:36		07:06		08:16 (M03)	06:40	07:14
	16:52	17:26	18:00		19:33	20:05	20:34	20:43	20:23	19:40		18:50	25	08:41 (M03)	17:04	16:41
4	07:33	07:16	06:39		07:48 (M03)	06:48	06:04	05:38	05:42	06:07	06:37		07:07		08:16 (M03)	06:41	07:15
	16:53	17:27	18:01	8	07:56 (M03)	19:34	20:06	20:34	20:43	20:22	19:38		18:48	24	08:40 (M03)	17:03	16:41
5	07:33	07:15	06:37		07:44 (M03)	06:46	06:02	05:38	05:42	06:08	06:38		07:08		08:16 (M03)	06:43	07:16
	16:53	17:29	18:02	14	07:58 (M03)	19:35	20:07	20:35	20:43	20:21	19:37		18:46	23	08:39 (M03)	17:01	16:41
6	07:33	07:14	06:35		07:43 (M03)	06:45	06:01	05:37	05:43	06:09	06:39		07:09		08:17 (M03)	06:44	07:17
	16:54	17:30	18:03	17	08:00 (M03)	19:37	20:08	20:36	20:43	20:20	19:35		18:45	21	08:38 (M03)	17:00	16:40
7	07:33	07:13	06:34		07:41 (M03)	06:43	06:00	05:37	05:43	06:10	06:40		07:10		08:18 (M03)	06:45	07:18
	16:55	17:31	18:04	20	08:01 (M03)	19:38	20:09	20:36	20:43	20:19	19:33		18:43	19	08:37 (M03)	16:59	16:40
8	07:33	07:12	07:32		08:40 (M03)	06:41	05:59	05:37	05:44	06:11	06:41		07:11		08:19 (M03)	06:46	07:19
	16:56	17:32	19:05	22	09:02 (M03)	19:39	20:10	20:37	20:42	20:18	19:32		18:41	16	08:35 (M03)	16:58	16:40
9	07:32	07:10	07:31		08:39 (M03)	06:40	05:58	05:37	05:45	06:12	06:42		07:12		08:21 (M03)	06:47	07:20
	16:57	17:34	19:07	23	09:02 (M03)	19:40	20:11	20:38	20:42	20:16	19:30		18:40	11	08:32 (M03)	16:57	16:40
10	07:32	07:09	07:29		08:38 (M03)	06:38	05:57	05:36	05:45	06:13	06:43		07:13		08:25 (M03)	06:49	07:21
	16:58	17:35	19:08	24	09:02 (M03)	19:41	20:12	20:38	20:42	20:15	19:28		18:38	2	08:27 (M03)	16:56	16:40
11	07:32	07:08	07:27		08:38 (M03)	06:37	05:56	05:36	05:46	06:14	06:44		07:14			06:50	07:22
	16:59	17:36	19:09	24	09:02 (M03)	19:42	20:13	20:39	20:41	20:14	19:27		18:37			16:55	16:40
12	07:32	07:07	07:26		08:37 (M03)	06:35	05:54	05:36	05:47	06:15	06:45		07:15			06:51	07:23
	17:00	17:37	19:10	25	09:02 (M03)	19:43	20:14	20:39	20:41	20:12	19:25		18:35			16:54	16:40
13	07:31	07:06	07:24		08:37 (M03)	06:33	05:53	05:36	05:47	06:16	06:46		07:17			06:52	07:23
	17:01	17:39	19:11	24	09:01 (M03)	19:44	20:15	20:40	20:40	20:11	19:23		18:33			16:53	16:41
14	07:31	07:04	07:23		08:38 (M03)	06:32	05:52	05:36	05:48	06:17	06:47		07:18			06:53	07:24
	17:02	17:40	19:12	22	09:00 (M03)	19:45	20:16	20:40	20:40	20:10	19:22		18:32			16:52	16:41
15	07:31	07:03	07:21		08:38 (M03)	06:30	05:51	05:36	05:49	06:18	06:48		07:19			06:54	07:25
	17:04	17:41	19:13	21	08:59 (M03)	19:46	20:17	20:41	20:39	20:08	19:20		18:30			16:51	16:41
16	07:30	07:02	07:19		08:38 (M03)	06:29	05:50	05:36	05:50	06:19	06:49		07:20			06:56	07:26
	17:05	17:42	19:14	19	08:57 (M03)	19:47	20:18	20:41	20:39	20:07	19:18		18:29			16:50	16:41
17	07:30	07:00	07:18		08:40 (M03)	06:27	05:50	05:36	05:51	06:20	06:50		07:21			06:57	07:26
	17:06	17:43	19:15	16	08:56 (M03)	19:48	20:19	20:41	20:38	20:06	19:17		18:27			16:50	16:41
18	07:29	06:59	07:16		08:41 (M03)	06:26	05:49	05:36	05:51	06:21	06:51		07:22			06:58	07:27
	17:07	17:45	19:16	12	08:53 (M03)	19:49	20:20	20:42	20:37	20:04	19:15		18:26			16:49	16:42
19	07:29	06:58	07:14		08:46 (M03)	06:24	05:48	05:36	05:52	06:22	06:52		07:23			06:59	07:28
	17:08	17:46	19:18	1	08:47 (M03)	19:50	20:21	20:42	20:37	20:03	19:13		18:24			16:48	16:42
20	07:28	06:56	07:13			06:23	05:47	05:36	05:53	06:23	06:53		07:24			07:00	07:28
	17:09	17:47	19:19			19:51	20:22	20:42	20:36	20:01	19:11		18:23			16:47	16:42
21	07:28	06:55	07:11			06:21	05:46	05:37	05:54	06:23	06:54		07:25			07:01	07:29
	17:10	17:48	19:20			19:52	20:23	20:43	20:35	20:00	19:10		18:21			16:47	16:43
22	07:27	06:53	07:09			06:20	05:45	05:37	05:55	06:24	06:55		07:26			07:03	07:29
	17:12	17:49	19:21			19:53	20:24	20:43	20:35	19:58	19:08		18:20			16:46	16:43
23	07:26	06:52	07:08			06:18	05:45	05:37	05:56	06:25	06:56		07:28			07:04	07:30
	17:13	17:51	19:22			19:54	20:25	20:43	20:34	19:57	19:06		18:18			16:45	16:44
24	07:26	06:51	07:06			06:17	05:44	05:37	05:56	06:26	06:57		07:29			07:05	07:30
	17:14	17:52	19:23			19:55	20:26	20:43	20:33	19:55	19:05		18:17			16:45	16:44
25	07:25	06:49	07:04			06:15	05:43	05:38	05:57	06:27	06:58	08:26 (M03)	07:30			07:06	07:31
	17:15	17:53	19:24			19:57	20:26	20:43	20:32	19:54	19:03	10 08:36 (M03)	18:16			16:44	16:45
26	07:24	06:48	07:03			06:14	05:42	05:38	05:58	06:28	06:59	08:23 (M03)	07:31			07:07	07:31
	17:16	17:54	19:25			19:58	20:27	20:44	20:31	19:52	19:01	15 08:38 (M03)	18:14			16:44	16:46
27	07:23	06:46	07:01			06:13	05:42	05:38	05:59	06:29	07:00	08:21 (M03)	07:32			07:08	07:31
	17:18	17:55	19:26			19:59	20:28	20:44	20:30	19:51	19:00	18 08:39 (M03)	18:13			16:43	16:46
28	07:23	06:45	06:59			06:11	05:41	05:39	06:00	06:30	07:01	08:20 (M03)	07:33			07:09	07:32
	17:19	17:56	19:27			20:00	20:29	20:44	20:29	19:49	18:58	20 08:40 (M03)	18:11			16:43	16:47
29	07:22		06:58			06:10	05:41	05:39	06:01	06:31	07:02	08:19 (M03)	07:34			07:10	07:32
	17:20		19:28			20:01	20:30	20:44	20:28	19:48	18:56	22 08:41 (M03)	18:10			16:42	16:47
30	07:21		06:56			06:09	05:40	05:40	06:02	06:32	07:03	08:18 (M03)	07:36			07:11	07:32
	17:21		19:29			20:02	20:31	20:44	20:28	19:46	18:55	23 08:41 (M03)	18:09			16:42	16:48
31	07:20		06:54				05:40		06:03	06:33			07:37				07:32
	17:22		19:30				20:31		20:26	19:45			18:08				16:49
Potential sun hours	298	297	369		398	448	451	458	428	375		346			299	288
Total, worst case				292							108		189			
Sun reduction				0.73							0.93		0.84			
Oper. time red.				1.00							1.00		1.00			
Wind dir. red.				0.51							0.51		0.51			
Total reduction				0.37							0.48		0.43			
Total, real				109							51		81			

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 67 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (139)

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	07:33	07:19	06:43		06:53	06:07	05:39	05:40	06:04	06:34		07:04	08:14 (M03)	06:38	07:12
	16:50	17:24	17:58		19:31	20:03	20:32	20:44	20:25	19:43		18:53	12 08:26 (M03)	18:06	16:42
2	07:33	07:18	06:42		06:51	06:06	05:39	05:40	06:05	06:35		07:05	08:19 (M03)	06:39	07:13
	16:51	17:25	17:59		19:32	20:04	20:33	20:44	20:24	19:41		18:51	2 08:21 (M03)	17:05	16:41
3	07:33	07:17	06:40		06:49	06:05	05:38	05:41	06:06	06:36		07:06		06:40	07:14
	16:52	17:26	18:00		19:33	20:05	20:34	20:43	20:23	19:40		18:50		17:04	16:41
4	07:33	07:16	06:39		06:48	06:04	05:38	05:42	06:07	06:37		07:07		06:41	07:15
	16:53	17:27	18:01		19:34	20:06	20:34	20:43	20:22	19:38		18:48		17:03	16:41
5	07:33	07:15	06:37		06:46	06:02	05:38	05:42	06:08	06:38		07:08		06:43	07:16
	16:53	17:29	18:02		19:35	20:07	20:35	20:43	20:21	19:37		18:46		17:01	16:41
6	07:33	07:14	06:35		06:45	06:01	05:37	05:43	06:09	06:39		07:09		06:44	07:17
	16:54	17:30	18:03		19:37	20:08	20:36	20:43	20:20	19:35		18:45		17:00	16:40
7	07:33	07:13	06:34		06:43	06:00	05:37	05:43	06:10	06:40		07:10		06:45	07:18
	16:55	17:31	18:04		19:38	20:09	20:36	20:43	20:19	19:33		18:43		16:59	16:40
8	07:33	07:12	07:32		06:41	05:59	05:37	05:44	06:11	06:41		07:11		06:46	07:19
	16:56	17:32	19:05		19:39	20:10	20:37	20:42	20:18	19:32		18:41		16:58	16:40
9	07:32	07:10	07:31		06:40	05:58	05:37	05:45	06:12	06:42		07:12		06:47	07:20
	16:57	17:34	19:07		19:40	20:11	20:38	20:42	20:16	19:30		18:40		16:57	16:40
10	07:32	07:09	07:29		06:38	05:57	05:36	05:45	06:13	06:43		07:13		06:49	07:21
	16:58	17:35	19:08		19:41	20:12	20:38	20:42	20:15	19:28		18:38		16:56	16:40
11	07:32	07:08	07:27		06:37	05:56	05:36	05:46	06:14	06:44		07:14		06:50	07:22
	16:59	17:36	19:09		19:42	20:13	20:39	20:41	20:14	19:27		18:37		16:55	16:40
12	07:32	07:07	07:26	08:36 (M03)	06:35	05:54	05:36	05:47	06:15	06:45		07:15		06:51	07:23
	17:00	17:37	19:10	9 08:45 (M03)	19:43	20:14	20:39	20:41	20:12	19:25		18:35		16:54	16:40
13	07:31	07:06	07:24	08:32 (M03)	06:33	05:53	05:36	05:47	06:16	06:46		07:17		06:52	07:23
	17:01	17:39	19:11	16 08:48 (M03)	19:44	20:15	20:40	20:40	20:11	19:23		18:33		16:53	16:41
14	07:31	07:04	07:23	08:31 (M03)	06:32	05:52	05:36	05:48	06:17	06:47		07:18		06:53	07:24
	17:02	17:40	19:12	19 08:50 (M03)	19:45	20:16	20:40	20:40	20:10	19:22		18:32		16:52	16:41
15	07:31	07:03	07:21	08:29 (M03)	06:30	05:51	05:36	05:49	06:18	06:48		07:19		06:54	07:25
	17:04	17:41	19:13	21 08:50 (M03)	19:46	20:17	20:41	20:39	20:08	19:20		18:30		16:51	16:41
16	07:30	07:02	07:19	08:28 (M03)	06:29	05:50	05:36	05:50	06:19	06:49	08:23 (M03)	07:20		06:56	07:26
	17:05	17:42	19:14	22 08:50 (M03)	19:47	20:18	20:41	20:39	20:07	19:18	4 08:27 (M03)	18:29		16:50	16:41
17	07:30	07:00	07:18	08:27 (M03)	06:27	05:50	05:36	05:51	06:20	06:50	08:18 (M03)	07:21		06:57	07:26
	17:06	17:43	19:15	24 08:51 (M03)	19:48	20:19	20:41	20:38	20:06	19:17	12 08:30 (M03)	18:27		16:50	16:41
18	07:29	06:59	07:16	08:26 (M03)	06:26	05:49	05:36	05:51	06:21	06:51	08:16 (M03)	07:22		06:58	07:27
	17:07	17:45	19:16	25 08:51 (M03)	19:49	20:20	20:42	20:37	20:04	19:15	16 08:32 (M03)	18:26		16:49	16:42
19	07:29	06:58	07:14	08:25 (M03)	06:24	05:48	05:36	05:52	06:22	06:52	08:14 (M03)	07:23		06:59	07:28
	17:08	17:46	19:18	25 08:50 (M03)	19:50	20:21	20:42	20:37	20:03	19:13	19 08:33 (M03)	18:24		16:48	16:42
20	07:28	06:56	07:13	08:26 (M03)	06:23	05:47	05:36	05:53	06:23	06:53	08:13 (M03)	07:24		07:00	07:28
	17:09	17:47	19:19	25 08:51 (M03)	19:51	20:22	20:42	20:36	20:01	19:11	21 08:34 (M03)	18:23		16:47	16:42
21	07:28	06:55	07:11	08:25 (M03)	06:21	05:46	05:37	05:54	06:23	06:54	08:12 (M03)	07:25		07:01	07:29
	17:10	17:48	19:20	25 08:50 (M03)	19:52	20:23	20:43	20:35	20:00	19:10	23 08:35 (M03)	18:21		16:47	16:43
22	07:27	06:53	07:09	08:25 (M03)	06:20	05:45	05:37	05:55	06:24	06:55	08:11 (M03)	07:26		07:03	07:29
	17:12	17:49	19:21	24 08:49 (M03)	19:53	20:24	20:43	20:35	19:58	19:08	24 08:35 (M03)	18:20		16:46	16:43
23	07:26	06:52	07:08	08:26 (M03)	06:18	05:45	05:37	05:56	06:25	06:56	08:10 (M03)	07:28		07:04	07:30
	17:13	17:51	19:22	22 08:48 (M03)	19:54	20:25	20:43	20:34	19:57	19:06	25 08:35 (M03)	18:18		16:45	16:44
24	07:26	06:51	07:06	08:26 (M03)	06:17	05:44	05:37	05:56	06:26	06:57	08:10 (M03)	07:29		07:05	07:30
	17:14	17:52	19:23	20 08:46 (M03)	19:55	20:26	20:43	20:33	19:55	19:05	25 08:35 (M03)	18:17		16:45	16:44
25	07:25	06:49	07:04	08:27 (M03)	06:15	05:43	05:38	05:57	06:27	06:58	08:10 (M03)	07:30		07:06	07:31
	17:15	17:53	19:24	17 08:44 (M03)	19:56	20:26	20:43	20:32	19:54	19:03	25 08:35 (M03)	18:16		16:44	16:45
26	07:24	06:48	07:03	08:29 (M03)	06:14	05:42	05:38	05:58	06:28	06:59	08:10 (M03)	07:31		07:07	07:31
	17:16	17:54	19:25	14 08:43 (M03)	19:58	20:27	20:44	20:31	19:52	19:01	24 08:34 (M03)	18:14		16:44	16:46
27	07:23	06:46	07:01	08:32 (M03)	06:13	05:42	05:38	05:59	06:29	07:00	08:10 (M03)	07:32		07:08	07:31
	17:18	17:55	19:26	7 08:39 (M03)	19:59	20:28	20:44	20:30	19:51	19:00	23 08:33 (M03)	18:13		16:43	16:46
28	07:23	06:45	06:59		06:11	05:41	05:39	06:00	06:30	07:01	08:10 (M03)	07:33		07:09	07:32
	17:19	17:56	19:27		20:00	20:29	20:44	20:29	19:49	18:58	22 08:32 (M03)	18:11		16:43	16:47
29	07:22		06:58		06:10	05:41	05:39	06:01	06:31	07:02	08:11 (M03)	07:34		07:10	07:32
	17:20		19:28		20:01	20:30	20:44	20:28	19:48	18:56	20 08:31 (M03)	18:10		16:42	16:47
30	07:21		06:56		06:09	05:40	05:40	06:02	06:32	07:03	08:12 (M03)	07:36		07:11	07:32
	17:21		19:29		20:02	20:31	20:44	20:28	19:46	18:55	17 08:29 (M03)	18:09		16:42	16:48
31	07:20		06:54			05:40		06:03	06:33			07:37			07:32
	17:22		19:30			20:31		20:26	19:45			18:08			16:49
Potential sun hours	298	297	369		398	448	451	458	428	375		346		299	288
Total, worst case				315							300		14		
Sun reduction				0.73							0.93		0.84		
Oper. time red.				1.00							1.00		1.00		
Wind dir. red.				0.54							0.54		0.54		
Total reduction				0.39							0.50		0.45		
Total, real				123							150		6		

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)

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217 Montgomery St., Suite 1000
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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 68 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (140)

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		18:32 (D03)	06:07	05:39	05:40	06:04	06:34		07:04	06:38	07:12
	16:50	17:23	17:57		19:31	29	19:01 (D03)	20:03	20:32	20:44	20:25	19:43		18:53	18:06	16:41
2	07:33	07:18	06:41		06:51		18:32 (D03)	06:06	05:38	05:40	06:05	06:35	18:37 (D03)	07:05	06:39	07:13
	16:50	17:25	17:58		19:32	29	19:01 (D03)	20:04	20:33	20:43	20:24	19:41	11 18:48 (D03)	18:51	17:05	16:41
3	07:33	07:17	06:40		06:49		18:32 (D03)	06:05	05:38	05:41	06:05	06:36	18:34 (D03)	07:06	06:40	07:14
	16:51	17:26	18:00		19:33	28	19:00 (D03)	20:05	20:34	20:43	20:23	19:40	16 18:50 (D03)	18:49	17:04	16:41
4	07:33	07:16	06:38		06:48		18:32 (D03)	06:03	05:38	05:41	06:06	06:37	18:32 (D03)	07:07	06:41	07:15
	16:52	17:27	18:01		19:34	28	19:00 (D03)	20:06	20:34	20:43	20:22	19:38	20 18:52 (D03)	18:48	17:02	16:40
5	07:33	07:15	06:37		06:46		18:32 (D03)	06:02	05:37	05:42	06:07	06:38	18:30 (D03)	07:08	06:43	07:16
	16:53	17:28	18:02		19:35	27	18:59 (D03)	20:07	20:35	20:43	20:21	19:36	23 18:53 (D03)	18:46	17:01	16:40
6	07:33	07:14	06:35		06:44		18:32 (D03)	06:01	05:37	05:42	06:08	06:39	18:29 (D03)	07:09	06:44	07:17
	16:54	17:30	18:03		19:36	25	18:57 (D03)	20:08	20:36	20:43	20:20	19:35	24 18:53 (D03)	18:44	17:00	16:40
7	07:33	07:13	06:34		06:43		18:34 (D03)	06:00	05:37	05:43	06:09	06:40	18:27 (D03)	07:10	06:45	07:18
	16:55	17:31	18:04		19:37	23	18:57 (D03)	20:09	20:36	20:43	20:19	19:33	27 18:54 (D03)	18:43	16:59	16:40
8	07:32	07:12	07:32		06:41		18:35 (D03)	05:59	05:36	05:44	06:10	06:41	18:26 (D03)	07:11	06:46	07:19
	16:56	17:32	19:05		19:38	20	18:55 (D03)	20:10	20:37	20:42	20:17	19:31	28 18:54 (D03)	18:41	16:58	16:40
9	07:32	07:10	07:30		06:39		18:36 (D03)	05:57	05:36	05:44	06:11	06:42	18:26 (D03)	07:12	06:47	07:20
	16:57	17:33	19:06		19:40	16	18:52 (D03)	20:11	20:38	20:42	20:16	19:30	28 18:54 (D03)	18:39	16:57	16:40
10	07:32	07:09	07:29		06:38		18:39 (D03)	05:56	05:36	05:45	06:12	06:43	18:25 (D03)	07:13	06:48	07:21
	16:58	17:35	19:07		19:41	11	18:50 (D03)	20:12	20:38	20:42	20:15	19:28	29 18:54 (D03)	18:38	16:56	16:40
11	07:32	07:08	07:27		06:36			05:55	05:36	05:46	06:13	06:44	18:25 (D03)	07:14	06:50	07:22
	16:59	17:36	19:09		19:42			20:13	20:39	20:41	20:14	19:26	29 18:54 (D03)	18:36	16:55	16:40
12	07:32	07:07	07:26		06:35			05:54	05:36	05:46	06:14	06:45	18:24 (D03)	07:15	06:51	07:23
	17:00	17:37	19:10		19:43			20:14	20:39	20:41	20:12	19:25	30 18:54 (D03)	18:35	16:54	16:40
13	07:31	07:05	07:24		06:33			05:53	05:36	05:47	06:15	06:46	18:24 (D03)	07:16	06:52	07:23
	17:01	17:38	19:11		19:44			20:15	20:40	20:40	20:11	19:23	29 18:53 (D03)	18:33	16:53	16:40
14	07:31	07:04	07:22		06:32			05:52	05:36	05:48	06:16	06:47	18:24 (D03)	07:17	06:53	07:24
	17:02	17:39	19:12		19:45			20:16	20:40	20:40	20:10	19:21	28 18:52 (D03)	18:32	16:52	16:40
15	07:31	07:03	07:21		06:30			05:51	05:36	05:49	06:17	06:48	18:25 (D03)	07:19	06:54	07:25
	17:03	17:41	19:13		19:46			20:17	20:41	20:39	20:08	19:20	26 18:51 (D03)	18:30	16:51	16:41
16	07:30	07:02	07:19		06:28			05:50	05:36	05:49	06:18	06:49	18:25 (D03)	07:20	06:56	07:26
	17:04	17:42	19:14		19:47			20:18	20:41	20:39	20:07	19:18	25 18:50 (D03)	18:28	16:50	16:41
17	07:30	07:00	07:17		06:27			05:49	05:36	05:50	06:19	06:50	18:26 (D03)	07:21	06:57	07:26
	17:05	17:43	19:15		19:48			20:19	20:41	20:38	20:06	19:16	23 18:49 (D03)	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	18:27 (D03)	07:22	06:58	07:27
	17:07	17:44	19:16		19:49			20:20	20:42	20:37	20:04	19:15	20 18:47 (D03)	18:25	16:48	16:41
19	07:29	06:58	07:14		06:24			05:47	05:36	05:52	06:21	06:52	18:28 (D03)	07:23	06:59	07:27
	17:08	17:46	19:17		19:50			20:21	20:42	20:37	20:03	19:13	16 18:44 (D03)	18:24	16:48	16:42
20	07:28	06:56	07:12		06:22			05:47	05:36	05:53	06:22	06:53	18:30 (D03)	07:24	07:00	07:28
	17:09	17:47	19:18		19:51			20:22	20:42	20:36	20:01	19:11	10 18:40 (D03)	18:22	16:47	16:42
21	07:28	06:55	07:11		06:21			05:46	05:36	05:53	06:23	06:54		07:25	07:01	07:29
	17:10	17:48	19:19		19:52			20:23	20:43	20:35	20:00	19:10		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	07:03	07:29
	17:11	17:49	19:21		19:53			20:24	20:43	20:35	19:58	19:08		18:19	16:46	16:43
23	07:26	06:52	07:07		18:46 (D03)		06:18	05:44	05:37	05:55	06:25	06:56		07:27	07:04	07:30
	17:12	17:50	19:22	8	18:54 (D03)		19:54	20:25	20:43	20:34	19:57	19:06		18:18	16:45	16:43
24	07:26	06:50	07:06		18:42 (D03)		06:17	05:43	05:37	05:56	06:26	06:57		07:29	07:05	07:30
	17:14	17:51	19:23	15	18:57 (D03)		19:55	20:26	20:43	20:33	19:55	19:04		18:17	16:44	16:44
25	07:25	06:49	07:04		18:39 (D03)		06:15	05:43	05:37	05:57	06:27	06:58		07:30	07:06	07:30
	17:15	17:53	19:24	19	18:58 (D03)		19:56	20:26	20:43	20:32	19:54	19:03		18:15	16:44	16:45
26	07:24	06:48	07:02		18:37 (D03)		06:14	05:42	05:38	05:58	06:28	06:59		07:31	07:07	07:31
	17:16	17:54	19:25	22	18:59 (D03)		19:57	20:27	20:44	20:31	19:52	19:01		18:14	16:43	16:45
27	07:23	06:46	07:01		18:36 (D03)		06:12	05:41	05:38	05:59	06:29	07:00		07:32	07:08	07:31
	17:17	17:55	19:26	25	19:01 (D03)		19:58	20:28	20:44	20:30	19:51	18:59		18:12	16:43	16:46
28	07:22	06:45	06:59		18:35 (D03)		06:11	05:41	05:38	06:00	06:30	07:01		07:33	07:09	07:32
	17:18	17:56	19:27	26	19:01 (D03)		20:00	20:29	20:44	20:29	19:49	18:58		18:11	16:42	16:46
29	07:22		06:57		18:33 (D03)		06:10	05:40	05:39	06:01	06:31	07:02		07:34	07:10	07:32
	17:20		19:28	28	19:01 (D03)		20:01	20:30	20:44	20:28	19:48	18:56		18:10	16:42	16:47
30	07:21		06:56		18:33 (D03)		06:08	05:40	05:39	06:02	06:32	07:03		07:35	07:11	07:32
	17:21		19:29	29	19:02 (D03)		20:02	20:31	20:44	20:27	19:46	18:54		18:09	16:42	16:48
31	07:20		06:54		18:32 (D03)			05:39		06:03	06:33			07:37		07:32
	17:22		19:30	29	19:01 (D03)			20:31		20:26	19:44			18:07		16:49
Potential sun hours	298	297	369		398			448	452	458	428	375		346	298	288
Total, worst case				201		236							442			
Sun reduction				0.73		0.82							0.93			
Oper. time red.				1.00		1.00							1.00			
Wind dir. red.				0.68		0.68							0.68			
Total reduction				0.49		0.55							0.63			
Total, real				99		131							278			

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
Jacob Runner / jrunner@edrdpc.com

Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 69 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (141)

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	18:21 (D03)	06:07	05:39	05:40	06:04	06:34	07:04	06:38	07:12
	16:50	17:23	17:57	19:31 29	18:50 (D03)	20:03	20:32	20:44	20:25	19:43	18:53	18:06	16:41
2	07:33	07:18	06:41	06:51	18:22 (D03)	06:06	05:38	05:40	06:05	06:35	07:05	06:39	07:13
	16:50	17:25	17:58	19:32 28	18:50 (D03)	20:04	20:33	20:44	20:24	19:41	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49	18:22 (D03)	06:05	05:38	05:41	06:05	06:36	07:06	06:40	07:14
	16:51	17:26	18:00	19:33 26	18:48 (D03)	20:05	20:34	20:43	20:23	19:40	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48	18:24 (D03)	06:03	05:38	05:41	06:06	06:37	07:07	06:41	07:15
	16:52	17:27	18:01	19:34 24	18:48 (D03)	20:06	20:34	20:43	20:22	19:38	18:48	17:02	16:40
5	07:33	07:15	06:37	06:46	18:25 (D03)	06:02	05:37	05:42	06:07	06:38 18:25 (D03)	07:08	06:43	07:16
	16:53	17:28	18:02	19:35 20	18:45 (D03)	20:07	20:35	20:43	20:21	19:36 11	18:36 (D03)	18:46	17:01	16:40
6	07:33	07:14	06:35	06:44	18:26 (D03)	06:01	05:37	05:42	06:08	06:39 18:22 (D03)	07:09	06:44	07:17
	16:54	17:30	18:03	19:36 17	18:43 (D03)	20:08	20:36	20:43	20:20	19:35 17	18:39 (D03)	18:44	17:00	16:40
7	07:33	07:13	06:34	06:43	18:29 (D03)	06:00	05:37	05:43	06:09	06:40 18:20 (D03)	07:10	06:45	07:18
	16:55	17:31	18:04	19:37 11	18:40 (D03)	20:09	20:36	20:43	20:19	19:33 20	18:40 (D03)	18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	05:59	05:36	05:44	06:10	06:41 18:18 (D03)	07:11	06:46	07:19
	16:56	17:32	19:05	19:38	20:10	20:37	20:42	20:17	19:31 24	18:42 (D03)	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 18:16 (D03)	07:12	06:47	07:20
	16:57	17:33	19:06	19:40	20:11	20:38	20:42	20:16	19:30 26	18:42 (D03)	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 18:15 (D03)	07:13	06:48	07:21
	16:58	17:35	19:07	19:41	20:12	20:38	20:42	20:15	19:28 28	18:43 (D03)	18:38	16:56	16:40
11	07:32	07:08	07:27	06:36	05:55	05:36	05:46	06:13	06:44 18:14 (D03)	07:14	06:50	07:22
	16:59	17:36	19:09	19:42	20:13	20:39	20:41	20:14	19:26 29	18:43 (D03)	18:36	16:55	16:40
12	07:32	07:07	07:26	06:35 19:10 (D02)	05:54	05:36	05:46	06:14	06:45 18:13 (D03)	07:15	06:51	07:23
	17:00	17:37	19:10	19:43 9 19:19 (D02)	20:14	20:39	20:41	20:12	19:25 30	18:43 (D03)	18:35	16:54	16:40
13	07:31	07:05	07:24	06:33 19:06 (D02)	05:53	05:36	05:47	06:15	06:46 18:13 (D03)	07:16	06:52	07:23
	17:01	17:38	19:11	19:44 15 19:21 (D02)	20:15	20:40	20:40	20:11	19:23 30	18:43 (D03)	18:33	16:53	16:40
14	07:31	07:04	07:22	06:32 19:05 (D02)	05:52	05:36	05:48	06:16	06:47 18:12 (D03)	07:17	06:53	07:24
	17:02	17:39	19:12	19:45 18 19:23 (D02)	20:16	20:40	20:40	20:10	19:21 31	18:43 (D03)	18:32	16:52	16:40
15	07:31	07:03	07:21	06:30 19:03 (D02)	05:51	05:36	05:49	06:17 19:15 (D02)	06:48 18:12 (D03)	07:19	06:54	07:25
	17:03	17:41	19:13	19:46 20 19:23 (D02)	20:17	20:41	20:39	20:08 6 19:21 (D02)	19:20 31	18:43 (D03)	18:30	16:51	16:41
16	07:30	07:02	07:19	06:28 19:03 (D02)	05:50	05:36	05:49	06:18 19:11 (D02)	06:49 18:12 (D03)	07:20	06:56	07:26
	17:04	17:42	19:14	19:47 21 19:24 (D02)	20:18	20:41	20:39	20:07 13 19:24 (D02)	19:18 30	18:42 (D03)	18:28	16:50	16:41
17	07:30	07:00	07:17	06:27 19:01 (D02)	05:49	05:36	05:50	06:19 19:10 (D02)	06:50 18:11 (D03)	07:21	06:57	07:26
	17:05	17:43	19:15	19:48 23 19:24 (D02)	20:19	20:41	20:38	20:06 15 19:25 (D02)	19:16 31	18:42 (D03)	18:27	16:49	16:41
18	07:29	06:59	07:16	06:25 19:01 (D02)	05:48	05:36	05:51	06:20 19:08 (D02)	06:51 18:12 (D03)	07:22	06:58	07:27
	17:07	17:44	19:16	19:49 23 19:24 (D02)	20:20	20:42	20:37	20:04 18 19:26 (D02)	19:15 29	18:41 (D03)	18:25	16:48	16:41
19	07:29	06:58	07:14 18:36 (D03)	06:24 19:00 (D02)	05:47	05:36	05:52	06:21 19:07 (D02)	06:52 18:11 (D03)	07:23	06:59	07:28
	17:08	17:46	19:17 8 18:44 (D03)	19:50 24 19:24 (D02)	20:21	20:42	20:37	20:03 20 19:27 (D02)	19:13 28	18:39 (D03)	18:24	16:48	16:42
20	07:28	06:56	07:12 18:32 (D03)	06:22 19:01 (D02)	05:47	05:36	05:53	06:22 19:06 (D02)	06:53 18:11 (D03)	07:24	07:00	07:28
	17:09	17:47	19:18 16 18:48 (D03)	19:51 23 19:24 (D02)	20:22	20:42	20:36	20:01 22 19:28 (D02)	19:11 27	18:38 (D03)	18:22	16:47	16:42
21	07:28	06:55	07:11 18:29 (D03)	06:21 19:00 (D02)	05:46	05:36	05:53	06:23 19:05 (D02)	06:54 18:12 (D03)	07:25	07:01	07:29
	17:10	17:48	19:19 21 18:50 (D03)	19:52 23 19:23 (D02)	20:23	20:43	20:35	20:00 23 19:28 (D02)	19:10 24	18:36 (D03)	18:21	16:46	16:42
22	07:27	06:53	07:09 18:27 (D03)	06:19 19:01 (D02)	05:45	05:36	05:54	06:24 19:05 (D02)	06:55 18:13 (D03)	07:26	07:03	07:29
	17:11	17:49	19:21 24 18:51 (D03)	19:53 22 19:23 (D02)	20:24	20:43	20:35	19:58 23 19:28 (D02)	19:08 21	18:34 (D03)	18:20	16:46	16:43
23	07:26	06:52	07:07 18:26 (D03)	06:18 19:00 (D02)	05:44	05:37	05:55	06:25 19:05 (D02)	06:56 18:15 (D03)	07:27	07:04	07:30
	17:12	17:50	19:22 26 18:52 (D03)	19:54 22 19:22 (D02)	20:25	20:43	20:34	19:57 23 19:28 (D02)	19:06 17	18:32 (D03)	18:18	16:45	16:43
24	07:26	06:50	07:06 18:25 (D03)	06:17 19:01 (D02)	05:43	05:37	05:56	06:26 19:04 (D02)	06:57 18:18 (D03)	07:29	07:05	07:30
	17:14	17:51	19:23 27 18:52 (D03)	19:55 20 19:21 (D02)	20:26	20:43	20:33	19:55 24 19:28 (D02)	19:04 11 18:29 (D03)	18:17	16:44	16:44
25	07:25	06:49	07:04 18:23 (D03)	06:15 19:03 (D02)	05:43	05:37	05:57	06:27 19:04 (D02)	06:58	07:30	07:06	07:31
	17:15	17:53	19:24 30 18:53 (D03)	19:56 17 19:20 (D02)	20:26	20:43	20:32	19:54 23 19:27 (D02)	19:03	18:15	16:44	16:45
26	07:24	06:48	07:02 18:22 (D03)	06:14 19:03 (D02)	05:42	05:38	05:58	06:28 19:04 (D02)	06:59	07:31	07:07	07:31
	17:16	17:54	19:25 30 18:52 (D03)	19:57 15 19:18 (D02)	20:27	20:44	20:31	19:52 23 19:27 (D02)	19:01	18:14	16:43	16:45
27	07:23	06:46	07:01 18:22 (D03)	06:12 19:05 (D02)	05:41	05:38	05:59	06:29 19:05 (D02)	07:00	07:32	07:08	07:31
	17:17	17:55	19:26 31 18:53 (D03)	19:58 11 19:16 (D02)	20:28	20:44	20:30	19:51 21 19:26 (D02)	18:59	18:12	16:43	16:46
28	07:22	06:45	06:59 18:22 (D03)	06:11 19:09 (D02)	05:41	05:38	06:00	06:30 19:05 (D02)	07:01	07:33	07:09	07:32
	17:18	17:56	19:27 31 18:53 (D03)	20:00 4 19:13 (D02)	20:29	20:44	20:29	19:49 20 19:25 (D02)	18:58	18:11	16:42	16:46
29	07:22		06:57 18:21 (D03)	06:10	05:40	05:39	06:01	06:31 19:06 (D02)	07:02	07:34	07:10	07:32
	17:20		19:28 31 18:52 (D03)	20:01	20:30	20:44	20:28	19:48 17 19:23 (D02)	18:56	18:10	16:42	16:47
30	07:21		06:56 18:21 (D03)	06:08	05:40	05:39	06:02	06:32 19:08 (D02)	07:03	07:35	07:11	07:32
	17:21		19:29 31 18:52 (D03)	20:02	20:31	20:44	20:27	19:46 14 19:22 (D02)	18:54	18:09	16:42	16:48
31	07:20		06:54 18:21 (D03)		05:39		06:03	06:33 19:09 (D02)		07:37		07:32
	17:22		19:30 30 18:51 (D03)		20:31		20:26	19:44 9 19:18 (D02)		18:07		16:49
Potential sun hours	298	297	369	398	448	452	458	428	375	346	298	288
Total, worst case			336	465				314	495			
Sun reduction			0.73	0.82				0.96	0.93			
Oper. time red.			1.00	1.00				1.00	1.00			
Wind dir. red.			0.70	0.62				0.58	0.70			
Total reduction			0.51	0.51				0.55	0.65			
Total, real			172	236				174	324			

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)

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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 70 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (142)

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		18:29 (D03)	06:07	05:39	05:40	06:04	06:34			07:04	06:38	07:12
	16:50	17:23	17:57			19:31	28	18:57 (D03)	20:03	20:32	20:44	20:25	19:43			18:53	18:06	16:41
2	07:33	07:18	06:41			06:51		18:30 (D03)	06:06	05:38	05:40	06:05	06:35			07:05	06:39	07:13
	16:50	17:25	17:58			19:32	27	18:57 (D03)	20:04	20:33	20:43	20:24	19:41			18:51	17:05	16:41
3	07:33	07:17	06:40			06:49		18:30 (D03)	06:05	05:38	05:41	06:05	06:36			07:06	06:40	07:14
	16:51	17:26	18:00			19:33	25	18:55 (D03)	20:05	20:34	20:43	20:23	19:40			18:49	17:04	16:41
4	07:33	07:16	06:38			06:48		18:31 (D03)	06:03	05:38	05:41	06:06	06:37			07:07	06:41	07:15
	16:52	17:27	18:01			19:34	24	18:55 (D03)	20:06	20:34	20:43	20:22	19:38			18:48	17:02	16:40
5	07:33	07:15	06:37			06:46		18:32 (D03)	06:02	05:37	05:42	06:07	06:38		18:32 (D03)	07:08	06:43	07:16
	16:53	17:28	18:02			19:35	21	18:53 (D03)	20:07	20:35	20:43	20:21	19:36	12	18:44 (D03)	18:46	17:01	16:40
6	07:33	07:14	06:35			06:44		18:33 (D03)	06:01	05:37	05:42	06:08	06:39		18:29 (D03)	07:09	06:44	07:17
	16:54	17:30	18:03			19:36	17	18:50 (D03)	20:08	20:36	20:43	20:20	19:35	17	18:46 (D03)	18:44	17:00	16:40
7	07:33	07:13	06:34			06:43		18:36 (D03)	06:00	05:37	05:43	06:09	06:40		18:27 (D03)	07:10	06:45	07:18
	16:55	17:31	18:04			19:37	12	18:48 (D03)	20:09	20:36	20:43	20:19	19:33	21	18:48 (D03)	18:43	16:59	16:40
8	07:32	07:12	07:32			06:41			05:59	05:36	05:44	06:10	06:41		18:26 (D03)	07:11	06:46	07:19
	16:56	17:32	19:05			19:38			20:10	20:37	20:42	20:17	19:31	23	18:49 (D03)	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		18:24 (D03)	07:12	06:47	07:20
	16:57	17:33	19:06			19:40			20:11	20:38	20:42	20:16	19:30	25	18:49 (D03)	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		18:23 (D03)	07:13	06:48	07:21
	16:58	17:35	19:07			19:41			20:12	20:38	20:42	20:15	19:28	27	18:50 (D03)	18:38	16:56	16:40
11	07:32	07:08	07:27			06:36			05:55	05:36	05:46	06:13	06:44		18:22 (D03)	07:14	06:50	07:22
	16:59	17:36	19:09			19:42			20:13	20:39	20:41	20:14	19:26	28	18:50 (D03)	18:36	16:55	16:40
12	07:32	07:07	07:26			06:35			05:54	05:36	05:46	06:14	06:45		18:22 (D03)	07:15	06:51	07:23
	17:00	17:37	19:10			19:43			20:14	20:39	20:41	20:12	19:25	28	18:50 (D03)	18:35	16:54	16:40
13	07:31	07:05	07:24			06:33			05:53	05:36	05:47	06:15	06:46		18:21 (D03)	07:16	06:52	07:23
	17:01	17:38	19:11			19:44			20:15	20:40	20:40	20:11	19:23	29	18:50 (D03)	18:33	16:53	16:40
14	07:31	07:04	07:22			06:32			05:52	05:36	05:48	06:16	06:47		18:21 (D03)	07:17	06:53	07:24
	17:02	17:39	19:12			19:45			20:16	20:40	20:40	20:10	19:21	29	18:50 (D03)	18:32	16:52	16:40
15	07:31	07:03	07:21			06:30			05:51	05:36	05:49	06:17	06:48		18:20 (D03)	07:19	06:54	07:25
	17:03	17:41	19:13			19:46			20:17	20:41	20:39	20:08	19:20	29	18:49 (D03)	18:30	16:51	16:41
16	07:30	07:02	07:19			06:28			05:50	05:36	05:49	06:18	06:49		18:20 (D03)	07:20	06:56	07:26
	17:04	17:42	19:14			19:47			20:18	20:41	20:39	20:07	19:18	29	18:49 (D03)	18:28	16:50	16:41
17	07:30	07:00	07:17			06:27			05:49	05:36	05:50	06:19	06:50		18:20 (D03)	07:21	06:57	07:26
	17:05	17:43	19:15			19:48			20:19	20:41	20:38	20:06	19:16	28	18:48 (D03)	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		18:21 (D03)	07:22	06:58	07:27
	17:07	17:44	19:16			19:49			20:20	20:42	20:37	20:04	19:15	26	18:47 (D03)	18:25	16:48	16:41
19	07:29	06:58	07:14			06:24			05:47	05:36	05:52	06:21	06:52		18:20 (D03)	07:23	06:59	07:28
	17:08	17:46	19:17			19:50			20:21	20:42	20:37	20:03	19:13	25	18:45 (D03)	18:24	16:48	16:42
20	07:28	06:56	07:12			06:22			05:47	05:36	05:53	06:22	06:53		18:21 (D03)	07:24	07:00	07:28
	17:09	17:47	19:18			19:51			20:22	20:42	20:36	20:01	19:11	22	18:43 (D03)	18:22	16:47	16:42
21	07:28	06:55	07:11		18:41 (D03)	06:21			05:46	05:36	05:53	06:23	06:54		18:22 (D03)	07:25	07:01	07:29
	17:10	17:48	19:19	12	18:53 (D03)	19:52			20:23	20:43	20:35	20:00	19:10	19	18:41 (D03)	18:21	16:46	16:42
22	07:27	06:53	07:09		18:37 (D03)	06:19			05:45	05:36	05:54	06:24	06:55		18:24 (D03)	07:26	07:03	07:29
	17:11	17:49	19:21	18	18:55 (D03)	19:53			20:24	20:43	20:35	19:58	19:08	15	18:39 (D03)	18:19	16:46	16:43
23	07:26	06:52	07:07		18:36 (D03)	06:18			05:44	05:37	05:55	06:25	06:56		18:28 (D03)	07:27	07:04	07:30
	17:12	17:50	19:22	21	18:57 (D03)	19:54			20:25	20:43	20:34	19:57	19:06	6	18:34 (D03)	18:18	16:45	16:43
24	07:26	06:50	07:06		18:34 (D03)	06:17			05:43	05:37	05:56	06:26	06:57			07:29	07:05	07:30
	17:14	17:51	19:23	24	18:58 (D03)	19:55			20:26	20:43	20:33	19:55	19:04			18:17	16:44	16:44
25	07:25	06:49	07:04		18:33 (D03)	06:15			05:43	05:37	05:57	06:27	06:58			07:30	07:06	07:30
	17:15	17:53	19:24	25	18:58 (D03)	19:56			20:26	20:43	20:32	19:54	19:03			18:15	16:44	16:45
26	07:24	06:48	07:02		18:31 (D03)	06:14			05:42	05:38	05:58	06:28	06:59			07:31	07:07	07:31
	17:16	17:54	19:25	28	18:59 (D03)	19:57			20:27	20:44	20:31	19:52	19:01			18:14	16:43	16:45
27	07:23	06:46	07:01		18:31 (D03)	06:12			05:41	05:38	05:59	06:29	07:00			07:32	07:08	07:31
	17:17	17:55	19:26	28	18:59 (D03)	19:58			20:28	20:44	20:30	19:51	18:59			18:12	16:43	16:46
28	07:22	06:45	06:59		18:30 (D03)	06:11			05:41	05:38	06:00	06:30	07:01			07:33	07:09	07:32
	17:18	17:56	19:27	29	18:59 (D03)	20:00			20:29	20:44	20:29	19:49	18:58			18:11	16:42	16:46
29	07:22		06:57		18:29 (D03)	06:10			05:40	05:39	06:01	06:31	07:02			07:34	07:10	07:32
	17:20		19:28	30	18:59 (D03)	20:01			20:30	20:44	20:28	19:48	18:56			18:10	16:42	16:47
30	07:21		06:56		18:30 (D03)	06:08			05:40	05:39	06:02	06:32	07:03			07:35	07:11	07:32
	17:21		19:29	29	18:59 (D03)	20:02			20:31	20:44	20:27	19:46	18:54			18:09	16:42	16:48
31	07:20		06:54		18:29 (D03)				05:39		06:03	06:33				07:37		07:32
	17:22		19:30	29	18:58 (D03)				20:31		20:26	19:44				18:07		16:49
Potential sun hours	298	297	369			398			448	452	458	428	375			346	298	288
Total, worst case				273			154							438				
Sun reduction				0.73			0.82							0.93				
Oper. time red.				1.00			1.00							1.00				
Wind dir. red.				0.69			0.69							0.69				
Total reduction				0.50			0.56							0.64				
Total, real				137			87							281				

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
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(315) 471 0688
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 71 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (143)

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	18:19 (D03)	06:07	05:39	05:40	06:04	06:34	18:57 (D02)	07:04	06:38	07:12
	16:50	17:23	17:57	19:31 16	18:35 (D03)	20:03	20:32	20:44	20:25	19:43 20	19:17 (D02)	18:53	18:06	16:41
2	07:33	07:18	06:41	06:51	18:23 (D03)	06:06	05:38	05:40	06:05	06:35	18:58 (D02)	07:05	06:39	07:13
	16:50	17:25	17:58	19:32 8	18:31 (D03)	20:04	20:33	20:44	20:24	19:41 17	19:15 (D02)	18:51	17:05	16:41
3	07:33	07:17	06:40	06:49		06:05	05:38	05:41	06:05	06:36	18:59 (D02)	07:06	06:40	07:14
	16:51	17:26	18:00	19:33		20:05	20:34	20:43	20:23	19:40 14	19:13 (D02)	18:49	17:04	16:41
4	07:33	07:16	06:38	06:48		06:03	05:38	05:41	06:06	06:37	19:02 (D02)	07:07	06:41	07:15
	16:52	17:27	18:01	19:34		20:06	20:34	20:43	20:22	19:38 8	19:10 (D02)	18:48	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	06:43	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	07:33	07:14	06:35	06:44		06:01	05:37	05:42	06:08	06:39		07:09	06:44	07:17
	16:54	17:30	18:03	19:36		20:08	20:36	20:43	20:20	19:35		18:44	17:00	16:40
7	07:33	07:13	06:34	06:43		06:00	05:37	05:43	06:09	06:40		07:10	06:45	07:18
	16:55	17:31	18:04	19:37		20:09	20:36	20:43	20:19	19:33		18:43	16:59	16:40
8	07:32	07:12	07:32	06:41	19:05 (D02)	05:59	05:36	05:44	06:10	06:41		07:11	06:46	07:19
	16:56	17:32	19:05	19:38 8	19:13 (D02)	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	19:02 (D02)	05:57	05:36	05:44	06:11	06:42		07:12	06:47	07:20
	16:57	17:33	19:06	19:40 13	19:15 (D02)	20:11	20:38	20:42	20:16	19:30		18:39	16:57	16:40
10	07:32	07:09	07:29	06:38	19:00 (D02)	05:56	05:36	05:45	06:12	06:43	18:17 (D03)	07:13	06:48	07:21
	16:58	17:35	19:07	19:41 17	19:17 (D02)	20:12	20:38	20:42	20:15	19:28 7	18:24 (D03)	18:38	16:56	16:40
11	07:32	07:08	07:27	06:36	18:58 (D02)	05:55	05:36	05:46	06:13	06:44	18:13 (D03)	07:14	06:50	07:22
	16:59	17:36	19:09	19:42 20	19:18 (D02)	20:13	20:39	20:41	20:14	19:26 14	18:27 (D03)	18:36	16:55	16:40
12	07:32	07:07	07:26	06:35	18:58 (D02)	05:54	05:36	05:46	06:14	06:45	18:10 (D03)	07:15	06:51	07:23
	17:00	17:37	19:10	19:43 21	19:19 (D02)	20:14	20:39	20:41	20:12	19:25 19	18:29 (D03)	18:35	16:54	16:40
13	07:31	07:05	07:24	06:33	18:56 (D02)	05:53	05:36	05:47	06:15	06:46	18:08 (D03)	07:16	06:52	07:23
	17:01	17:38	19:11	19:44 23	19:19 (D02)	20:15	20:40	20:40	20:11	19:23 23	18:31 (D03)	18:33	16:53	16:40
14	07:31	07:04	07:22 18:27 (D03)	06:32	18:56 (D02)	05:52	05:36	05:48	06:16	06:47	18:06 (D03)	07:17	06:53	07:24
	17:02	17:39	19:12 12 18:39 (D03)	19:45 24	19:20 (D02)	20:16	20:40	20:40	20:10	19:21 26	18:32 (D03)	18:32	16:52	16:40
15	07:31	07:03	07:21 18:23 (D03)	06:30	18:55 (D02)	05:51	05:36	05:49	06:17	06:48	18:05 (D03)	07:19	06:54	07:25
	17:03	17:41	19:13 18 18:41 (D03)	19:46 24	19:19 (D02)	20:17	20:41	20:39	20:08	19:20 27	18:32 (D03)	18:30	16:51	16:41
16	07:30	07:02	07:19 18:21 (D03)	06:28	18:56 (D02)	05:50	05:36	05:49	06:18	06:49	18:04 (D03)	07:20	06:56	07:26
	17:04	17:42	19:14 22 18:43 (D03)	19:47 23	19:19 (D02)	20:18	20:41	20:39	20:07	19:18 29	18:33 (D03)	18:28	16:50	16:41
17	07:30	07:00	07:17 18:20 (D03)	06:27	18:55 (D02)	05:49	05:36	05:50	06:19	06:50	18:03 (D03)	07:21	06:57	07:26
	17:05	17:43	19:15 25 18:45 (D03)	19:48 23	19:18 (D02)	20:19	20:41	20:38	20:06	19:16 30	18:33 (D03)	18:27	16:49	16:41
18	07:29	06:59	07:16 18:18 (D03)	06:25	18:56 (D02)	05:48	05:36	05:51	06:20	06:51	18:02 (D03)	07:22	06:58	07:27
	17:07	17:44	19:16 27 18:45 (D03)	19:49 22	19:18 (D02)	20:20	20:42	20:37	20:04	19:15 31	18:33 (D03)	18:25	16:48	16:41
19	07:29	06:58	07:14 18:16 (D03)	06:24	18:55 (D02)	05:47	05:36	05:52	06:21 19:08 (D02)	06:52	18:00 (D03)	07:23	06:59	07:28
	17:08	17:46	19:17 29 18:45 (D03)	19:50 22	19:17 (D02)	20:21	20:42	20:37	20:03 6 19:14 (D02)	19:13 32	18:32 (D03)	18:24	16:48	16:42
20	07:28	06:56	07:12 18:16 (D03)	06:22	18:56 (D02)	05:47	05:36	05:53	06:22 19:05 (D02)	06:53	18:00 (D03)	07:24	07:00	07:28
	17:09	17:47	19:18 30 18:46 (D03)	19:51 20	19:16 (D02)	20:22	20:42	20:36	20:01 12 19:17 (D02)	19:11 32	18:32 (D03)	18:22	16:47	16:42
21	07:28	06:55	07:11 18:15 (D03)	06:21	18:57 (D02)	05:46	05:36	05:53	06:23 19:03 (D02)	06:54	18:00 (D03)	07:25	07:01	07:29
	17:10	17:48	19:19 31 18:46 (D03)	19:52 18	19:15 (D02)	20:23	20:43	20:35	20:00 16 19:19 (D02)	19:10 31	18:31 (D03)	18:21	16:46	16:42
22	07:27	06:53	07:09 18:14 (D03)	06:19	18:58 (D02)	05:45	05:36	05:54	06:24 19:01 (D02)	06:55	17:59 (D03)	07:26	07:03	07:29
	17:11	17:49	19:21 32 18:46 (D03)	19:53 15	19:13 (D02)	20:24	20:43	20:35	19:58 19 19:20 (D02)	19:08 32	18:31 (D03)	18:20	16:46	16:43
23	07:26	06:52	07:07 18:15 (D03)	06:18	19:00 (D02)	05:44	05:37	05:55	06:25 19:00 (D02)	06:56	17:59 (D03)	07:27	07:04	07:30
	17:12	17:50	19:22 31 18:46 (D03)	19:54 11	19:11 (D02)	20:25	20:43	20:34	19:57 20 19:20 (D02)	19:06 31	18:30 (D03)	18:18	16:45	16:43
24	07:26	06:50	07:06 18:14 (D03)	06:17	19:04 (D02)	05:43	05:37	05:56	06:26 18:59 (D02)	06:57	18:00 (D03)	07:29	07:05	07:30
	17:14	17:51	19:23 32 18:46 (D03)	19:55 3	19:07 (D02)	20:26	20:43	20:33	19:55 22 19:21 (D02)	19:04 29	18:29 (D03)	18:17	16:44	16:44
25	07:25	06:49	07:04 18:14 (D03)	06:15		05:43	05:37	05:57	06:27 18:58 (D02)	06:58	18:00 (D03)	07:30	07:06	07:31
	17:15	17:53	19:24 31 18:45 (D03)	19:56		20:26	20:43	20:32	19:54 23 19:21 (D02)	19:03 28	18:28 (D03)	18:15	16:44	16:45
26	07:24	06:48	07:02 18:13 (D03)	06:14		05:42	05:38	05:58	06:28 18:58 (D02)	06:59	18:01 (D03)	07:31	07:07	07:31
	17:16	17:54	19:25 31 18:44 (D03)	19:57		20:27	20:44	20:31	19:52 23 19:21 (D02)	19:01 25	18:26 (D03)	18:14	16:43	16:45
27	07:23	06:46	07:01 18:14 (D03)	06:12		05:41	05:38	05:59	06:29 18:57 (D02)	07:00	18:02 (D03)	07:32	07:08	07:31
	17:17	17:55	19:26 30 18:44 (D03)	19:58		20:28	20:44	20:30	19:51 24 19:21 (D02)	18:59 23	18:25 (D03)	18:12	16:43	16:46
28	07:22	06:45	06:59 18:15 (D03)	06:11		05:41	05:38	06:00	06:30 18:57 (D02)	07:01	18:03 (D03)	07:33	07:09	07:32
	17:18	17:56	19:27 27 18:42 (D03)	20:00		20:29	20:44	20:29	19:49 24 19:21 (D02)	18:58 20	18:23 (D03)	18:11	16:42	16:46
29	07:22		06:57 18:15 (D03)	06:10		05:40	05:39	06:01	06:31 18:57 (D02)	07:02	18:05 (D03)	07:34	07:10	07:32
	17:20		19:28 26 18:41 (D03)	20:01		20:30	20:44	20:28	19:48 23 19:20 (D02)	18:56 15	18:20 (D03)	18:10	16:42	16:47
30	07:21		06:56 18:17 (D03)	06:08		05:40	05:39	06:02	06:32 18:57 (D02)	07:03	18:09 (D03)	07:35	07:11	07:32
	17:21		19:29 23 18:40 (D03)	20:02		20:31	20:44	20:27	19:46 23 19:20 (D02)	18:54 7	18:16 (D03)	18:09	16:42	16:48
31	07:20		06:54 18:17 (D03)			05:39		06:03	06:33 18:57 (D02)			07:37		07:32
	17:22		19:30 20 18:37 (D03)			20:31		20:26	19:44 21 19:18 (D02)			18:07		16:49
Potential sun hours	298	297	369	398		448	452	458	428	375		346	298	288
Total, worst case			477	331					256	570				
Sun reduction			0.73	0.82					0.96	0.93				
Oper. time red.			1.00	1.00					1.00	1.00				
Wind dir. red.			0.73	0.61					0.60	0.71				
Total reduction			0.53	0.50					0.57	0.66				
Total, real			254	165					147	379				

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
Jacob Runner / jrunner@edrdpc.com
Calculated:
4/27/2020 10:38 PM/3.3.274

SHADOW - Calendar

Shadow receptor: 72 - Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (144)

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	18:15 (D03)	06:07	05:39	05:40	06:04	06:34	18:56 (D02)	07:04	17:57 (D03)	06:38	07:12
	16:50	17:23	17:57	19:31	14 18:29 (D03)	20:03	20:32	20:44	20:25	19:43	20 19:16 (D02)	18:53	18 18:15 (D03)	18:06	16:41
2	07:33	07:18	06:41	06:51	18:21 (D03)	06:06	05:38	05:40	06:05	06:35	18:57 (D02)	07:05	17:59 (D03)	06:39	07:13
	16:50	17:25	17:58	19:32	1 18:22 (D03)	20:04	20:33	20:44	20:24	19:41	18 19:15 (D02)	18:51	13 18:12 (D03)	17:05	16:41
3	07:33	07:17	06:40	06:49		06:05	05:38	05:41	06:05	06:36	18:59 (D02)	07:06		06:40	07:14
	16:51	17:26	18:00	19:33		20:05	20:34	20:43	20:23	19:40	14 19:13 (D02)	18:49		17:04	16:41
4	07:33	07:16	06:38	06:48		06:03	05:38	05:41	06:06	06:37	19:02 (D02)	07:07		06:41	07:15
	16:52	17:27	18:01	19:34		20:06	20:34	20:43	20:22	19:38	7 19:09 (D02)	18:48		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		06:43	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	07:33	07:14	06:35	06:44		06:01	05:37	05:42	06:08	06:39		07:09		06:44	07:17
	16:54	17:30	18:03	19:36		20:08	20:36	20:43	20:20	19:35		18:44		17:00	16:40
7	07:33	07:13	06:34	06:43		06:00	05:37	05:43	06:09	06:40		07:10		06:45	07:18
	16:55	17:31	18:04	19:37		20:09	20:36	20:43	20:19	19:33		18:43		16:59	16:40
8	07:32	07:12	07:32	06:41	19:05 (D02)	05:59	05:36	05:44	06:10	06:41		07:11		06:46	07:19
	16:56	17:32	19:05	19:38	7 19:12 (D02)	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	19:01 (D02)	05:57	05:36	05:44	06:11	06:42		07:12		06:47	07:20
	16:57	17:33	19:06	19:40	14 19:15 (D02)	20:11	20:38	20:42	20:16	19:30		18:39		16:57	16:40
10	07:32	07:09	07:29	06:38	18:59 (D02)	05:56	05:36	05:45	06:12	06:43		07:13		06:48	07:21
	16:58	17:35	19:07	19:41	18 19:17 (D02)	20:12	20:38	20:42	20:15	19:28		18:38		16:56	16:40
11	07:32	07:08	07:27	18:24 (D03) 06:36	18:57 (D02)	05:55	05:36	05:46	06:13	06:44	18:08 (D03)	07:14		06:50	07:22
	16:59	17:36	19:09	8 18:32 (D03) 19:42	20 19:17 (D02)	20:13	20:39	20:41	20:14	19:26	13 18:21 (D03)	18:36		16:55	16:40
12	07:32	07:07	07:26	18:19 (D03) 06:35	18:57 (D02)	05:54	05:36	05:46	06:14	06:45	18:05 (D03)	07:15		06:51	07:23
	17:00	17:37	19:10	17 18:36 (D03) 19:43	22 19:19 (D02)	20:14	20:39	20:41	20:12	19:25	19 18:24 (D03)	18:35		16:54	16:40
13	07:31	07:06	07:24	18:16 (D03) 06:33	18:55 (D02)	05:53	05:36	05:47	06:15	06:46	18:02 (D03)	07:16		06:52	07:23
	17:01	17:38	19:11	22 18:38 (D03) 19:44	24 19:19 (D02)	20:15	20:40	20:40	20:11	19:23	23 18:25 (D03)	18:33		16:53	16:40
14	07:31	07:04	07:22	18:15 (D03) 06:32	18:55 (D02)	05:52	05:36	05:48	06:16	06:47	18:00 (D03)	07:17		06:53	07:24
	17:02	17:39	19:12	25 18:40 (D03) 19:45	25 19:20 (D02)	20:16	20:40	20:40	20:10	19:21	26 18:26 (D03)	18:32		16:52	16:40
15	07:31	07:03	07:21	18:13 (D03) 06:30	18:54 (D02)	05:51	05:36	05:49	06:17	06:48	17:59 (D03)	07:19		06:54	07:25
	17:03	17:41	19:13	28 18:41 (D03) 19:46	25 19:19 (D02)	20:17	20:41	20:39	20:08	19:20	28 18:27 (D03)	18:30		16:51	16:41
16	07:30	07:02	07:19	18:11 (D03) 06:28	18:54 (D02)	05:50	05:36	05:49	06:18	06:49	17:57 (D03)	07:20		06:56	07:26
	17:04	17:42	19:14	30 18:41 (D03) 19:47	26 19:20 (D02)	20:18	20:41	20:39	20:07	19:18	31 18:28 (D03)	18:28		16:50	16:41
17	07:30	07:00	07:17	18:11 (D03) 06:27	18:53 (D02)	05:49	05:36	05:50	06:19	06:50	17:56 (D03)	07:21		06:57	07:26
	17:05	17:43	19:15	31 18:42 (D03) 19:48	26 19:19 (D02)	20:19	20:41	20:38	20:06	19:16	32 18:28 (D03)	18:27		16:49	16:41
18	07:29	06:59	07:16	18:09 (D03) 06:25	18:54 (D02)	05:48	05:36	05:51	06:20	19:05 (D02) 06:51	17:55 (D03)	07:22		06:58	07:27
	17:07	17:44	19:16	33 18:42 (D03) 19:49	25 19:19 (D02)	20:20	20:42	20:37	20:04	11 19:16 (D02) 19:15	33 18:28 (D03)	18:25		16:48	16:41
19	07:29	06:58	07:14	18:08 (D03) 06:24	18:53 (D02)	05:47	05:36	05:52	06:21	19:03 (D02) 06:52	17:53 (D03)	07:23		06:59	07:28
	17:08	17:46	19:17	34 18:42 (D03) 19:50	25 19:18 (D02)	20:21	20:42	20:37	20:03	15 19:18 (D02) 19:13	35 18:28 (D03)	18:24		16:48	16:42
20	07:28	06:56	07:12	18:08 (D03) 06:22	18:54 (D02)	05:47	05:36	05:53	06:22	19:01 (D02) 06:53	17:53 (D03)	07:24		07:00	07:28
	17:09	17:47	19:18	35 18:43 (D03) 19:51	24 19:18 (D02)	20:22	20:42	20:36	20:01	18 19:19 (D02) 19:11	34 18:27 (D03)	18:22		16:47	16:42
21	07:28	06:55	07:11	18:08 (D03) 06:21	18:54 (D02)	05:46	05:36	05:54	06:23	19:00 (D02) 06:54	17:52 (D03)	07:25		07:01	07:29
	17:10	17:48	19:19	34 18:42 (D03) 19:52	22 19:16 (D02)	20:23	20:43	20:35	20:00	20 19:20 (D02) 19:10	35 18:27 (D03)	18:21		16:46	16:43
22	07:27	06:53	07:09	18:07 (D03) 06:19	18:55 (D02)	05:45	05:36	05:54	06:24	18:59 (D02) 06:55	17:52 (D03)	07:26		07:03	07:29
	17:11	17:49	19:21	35 18:42 (D03) 19:53	20 19:15 (D02)	20:24	20:43	20:35	19:58	22 19:21 (D02) 19:08	35 18:27 (D03)	18:20		16:46	16:43
23	07:26	06:52	07:07	18:07 (D03) 06:18	18:56 (D02)	05:44	05:37	05:55	06:25	18:58 (D02) 06:56	17:52 (D03)	07:27		07:04	07:30
	17:12	17:50	19:22	35 18:42 (D03) 19:54	17 19:13 (D02)	20:25	20:43	20:34	19:57	23 19:21 (D02) 19:06	34 18:26 (D03)	18:18		16:45	16:43
24	07:26	06:50	07:06	18:07 (D03) 06:17	18:57 (D02)	05:43	05:37	05:56	06:26	18:57 (D02) 06:57	17:52 (D03)	07:29		07:05	07:30
	17:14	17:51	19:23	34 18:41 (D03) 19:55	15 19:12 (D02)	20:26	20:43	20:33	19:55	25 19:22 (D02) 19:04	34 18:26 (D03)	18:17		16:44	16:44
25	07:25	06:49	07:04	18:07 (D03) 06:15	19:00 (D02)	05:43	05:37	05:57	06:27	18:57 (D02) 06:58	17:52 (D03)	07:30		07:06	07:31
	17:15	17:53	19:24	33 18:40 (D03) 19:56	10 19:10 (D02)	20:26	20:43	20:32	19:54	25 19:22 (D02) 19:03	33 18:25 (D03)	18:15		16:44	16:45
26	07:24	06:48	07:02	18:07 (D03) 06:14		05:42	05:38	05:58	06:28	18:56 (D02) 06:59	17:52 (D03)	07:31		07:07	07:31
	17:16	17:54	19:25	32 18:39 (D03) 19:57		20:27	20:44	20:31	19:52	26 19:22 (D02) 19:01	32 18:24 (D03)	18:14		16:43	16:45
27	07:23	06:46	07:01	18:08 (D03) 06:12		05:41	05:38	05:59	06:29	18:56 (D02) 07:00	17:52 (D03)	07:32		07:08	07:31
	17:17	17:55	19:26	31 18:39 (D03) 19:59		20:28	20:44	20:30	19:51	25 19:21 (D02) 18:59	31 18:23 (D03)	18:13		16:43	16:46
28	07:22	06:45	06:59	18:08 (D03) 06:11		05:41	05:38	06:00	06:30	18:56 (D02) 07:01	17:53 (D03)	07:33		07:09	07:32
	17:18	17:56	19:27	29 18:37 (D03) 20:00		20:29	20:44	20:29	19:49	25 19:21 (D02) 18:58	28 18:21 (D03)	18:11		16:42	16:46
29	07:22		06:57	18:09 (D03) 06:10		05:40	05:39	06:01	06:31	18:56 (D02) 07:02	17:54 (D03)	07:34		07:10	07:32
	17:20		19:28	26 18:35 (D03) 20:01		20:30	20:44	20:28	19:48	24 19:20 (D02) 18:56	26 18:20 (D03)	18:10		16:42	16:47
30	07:21		06:56	18:11 (D03) 06:08		05:40	05:39	06:02	06:32	18:56 (D02) 07:03	17:55 (D03)	07:35		07:11	07:32
	17:21		19:29	23 18:34 (D03) 20:02		20:31	20:44	20:27	19:46	24 19:20 (D02) 18:54	23 18:18 (D03)	18:09		16:42	16:48
31	07:20		06:54	18:12 (D03)		05:39		06:03	06:33	18:57 (D02)		07:37			07:32
	17:22		19:30	20 18:32 (D03)		20:31		20:26	19:45	22 19:19 (D02)		18:07			16:49
Potential sun hours	298	297	369	398		448	452	458	428	375		346		298	288
Total, worst case			595	380					305	644		31			
Sun reduction			0.73	0.82					0.96	0.93		0.84			
Oper. time red.			1.00	1.00					1.00	1.00		1.00			
Wind dir. red.			0.74	0.60					0.60	0.72		0.74			
Total reduction			0.54	0.49					0.57	0.68		0.62			
Total, real			321	188					175	435		19			

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)

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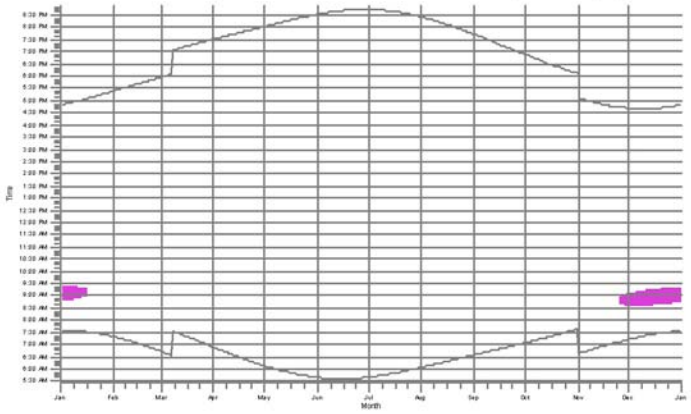
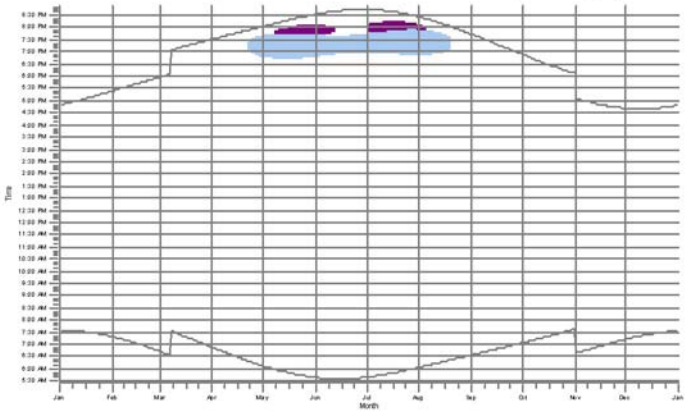
SHADOW - Calendar, graphical

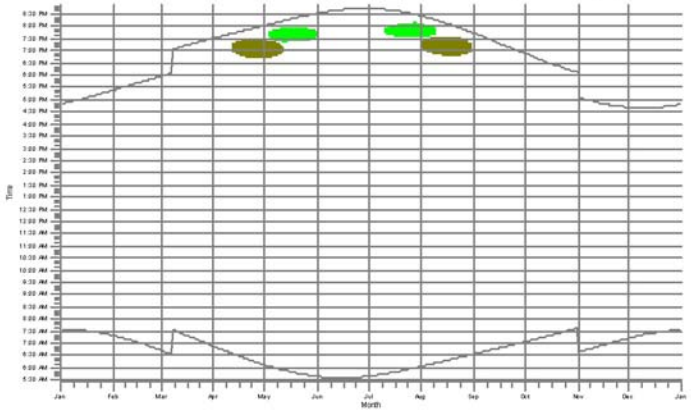
1: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (76)



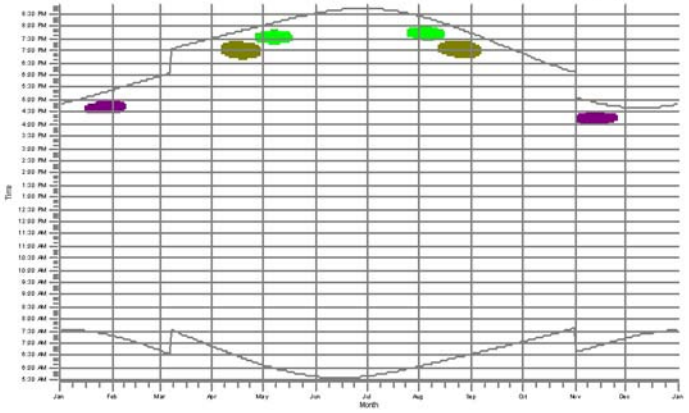
2: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (77)



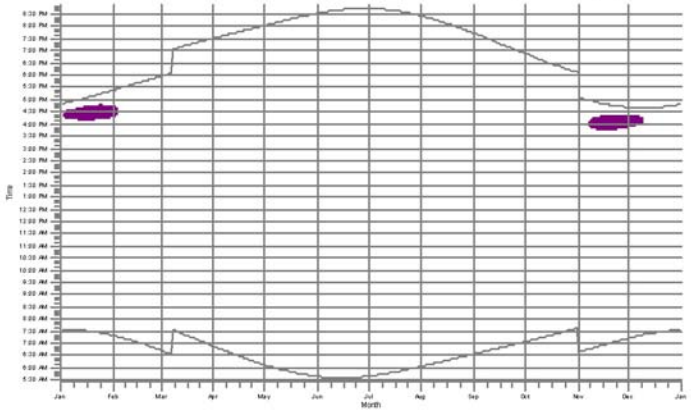
3: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (78)



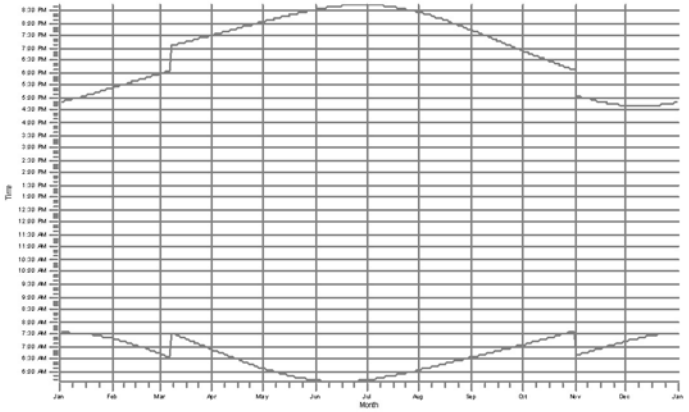
4: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (79)



5: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (80)



6: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (81)



WTGs

D02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (76)
D03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (77)
D04: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (78)
D05: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (82)
L04: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (102)

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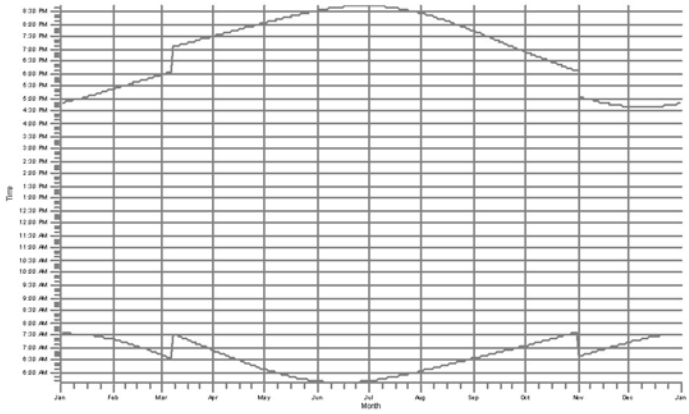
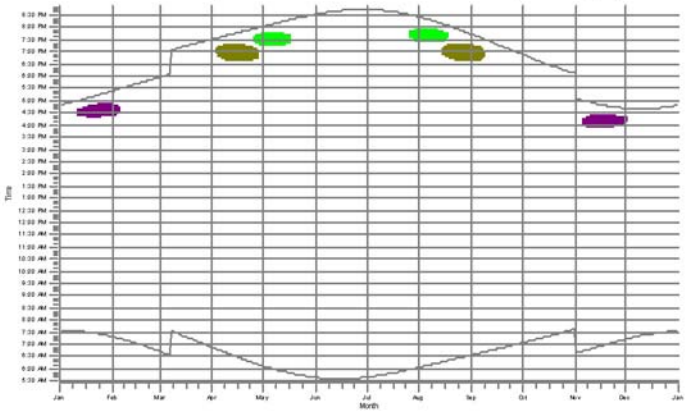
SHADOW - Calendar, graphical

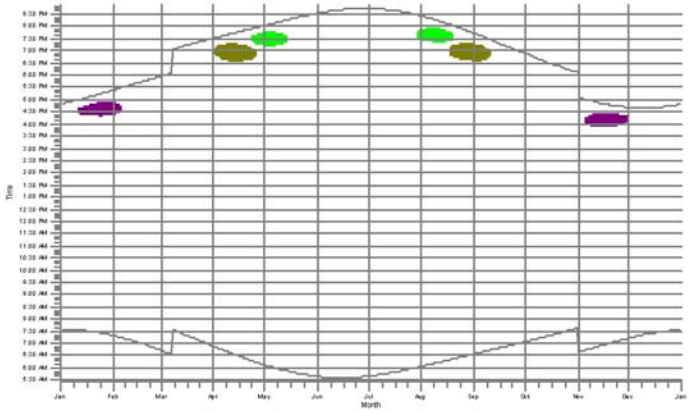
7: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (82)



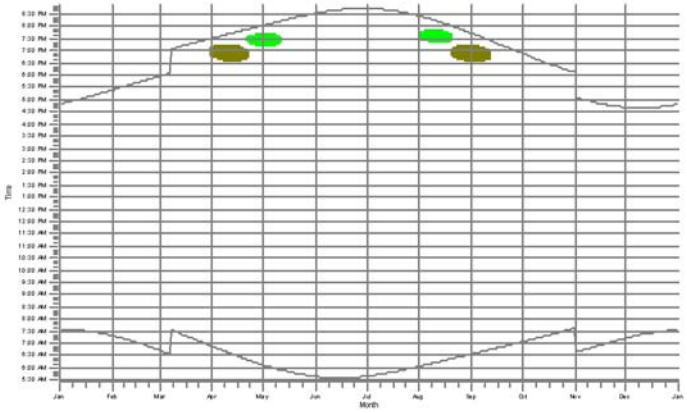
8: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (83)



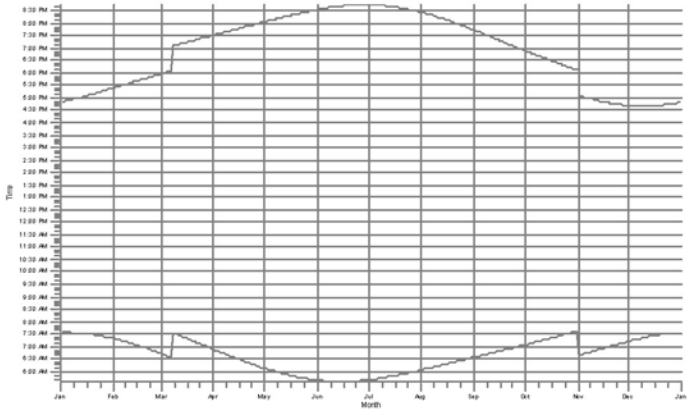
9: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (84)



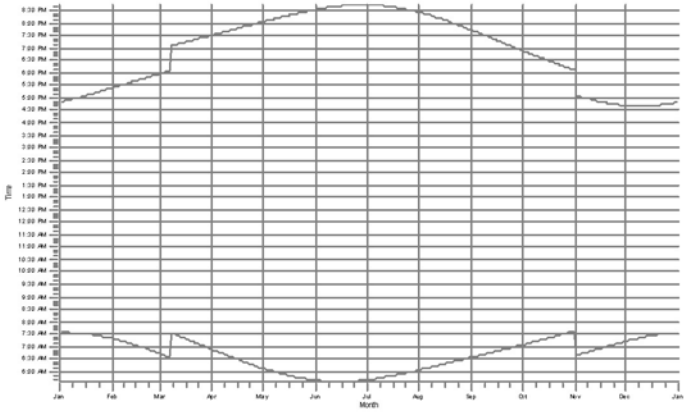
10: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (85)



11: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (86)



12: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (87)



WTGs

D02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (76)

D03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (77)

D04: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (78)

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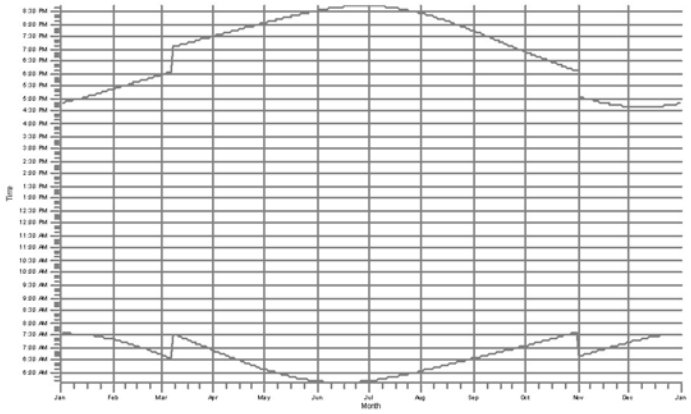
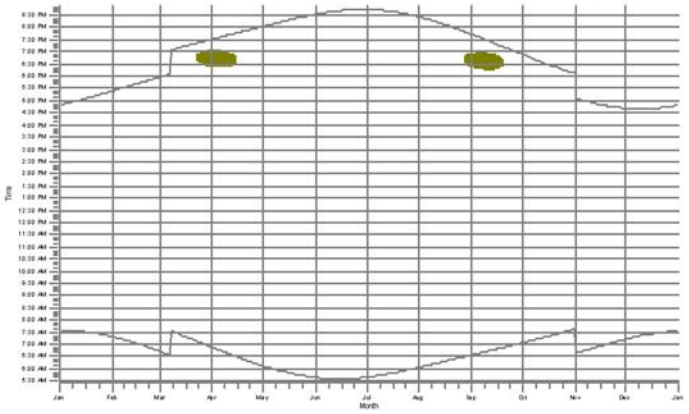
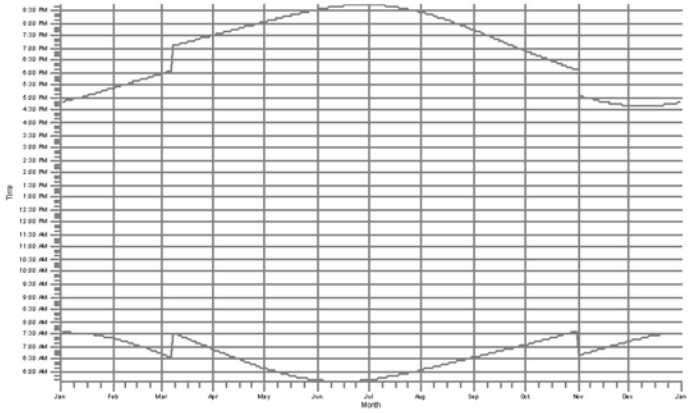
13: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (88)



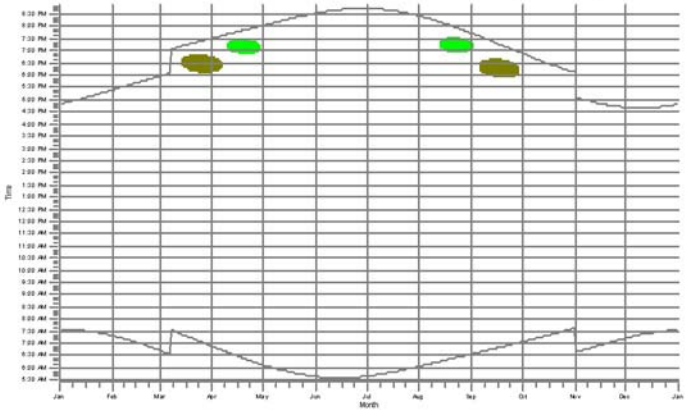
14: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (89)



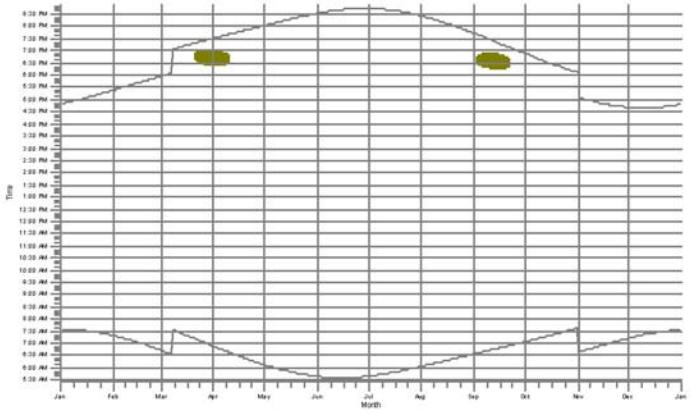
15: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (90)



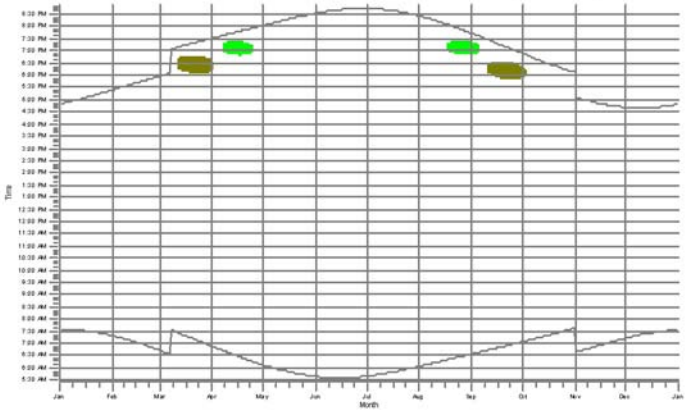
16: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (91)



17: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (92)



18: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (93)



WTGs

D02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (76)

D03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (77)

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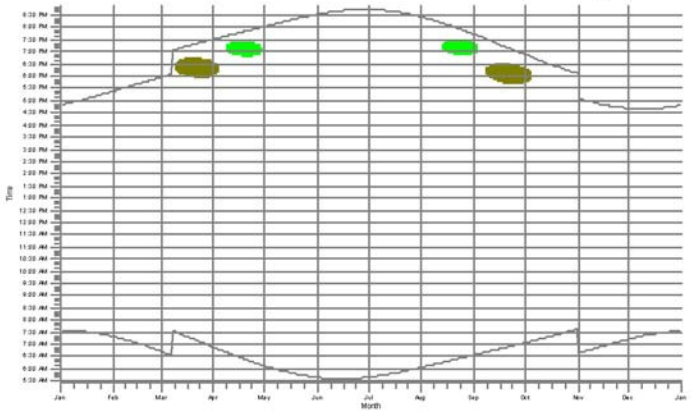
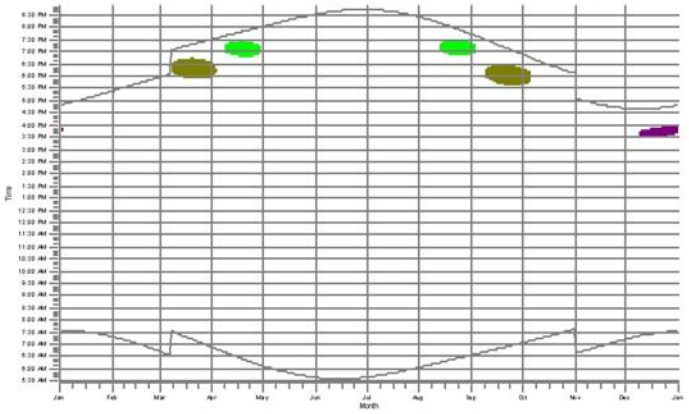
SHADOW - Calendar, graphical

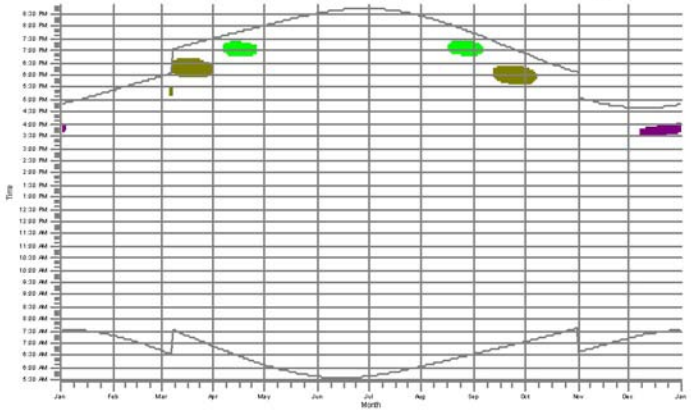
19: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (94)



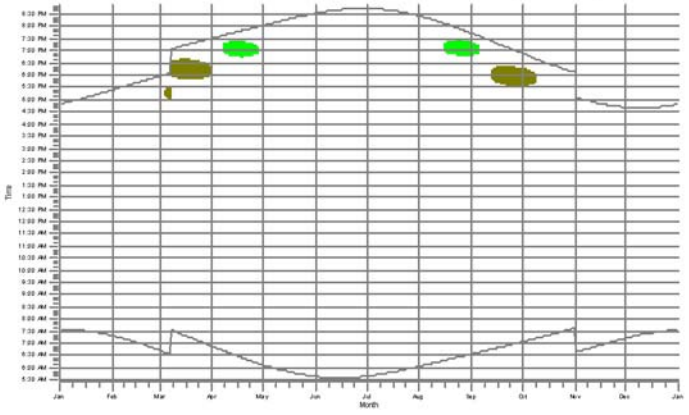
20: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (95)



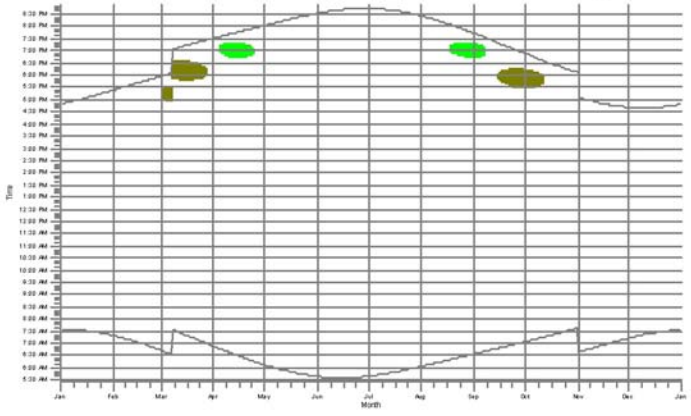
21: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (96)



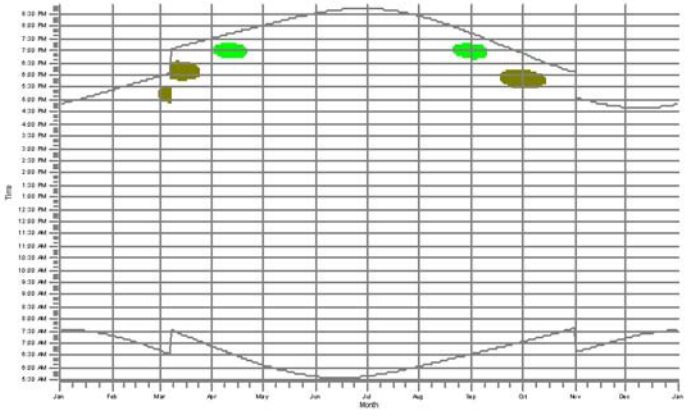
22: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (97)



23: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (98)



24: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (99)



WTGs

D02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (76)

D03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (77)

D04: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (78)

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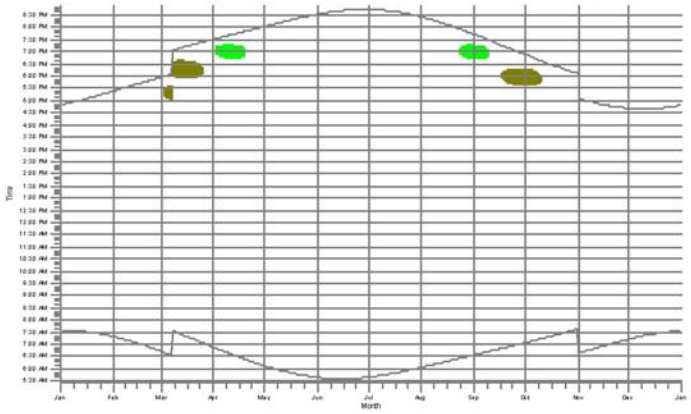
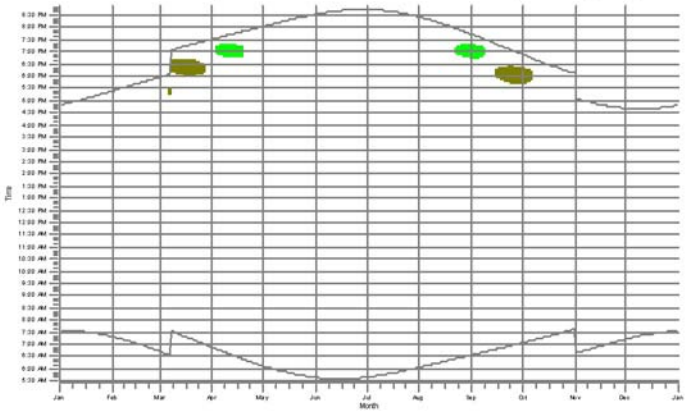
SHADOW - Calendar, graphical

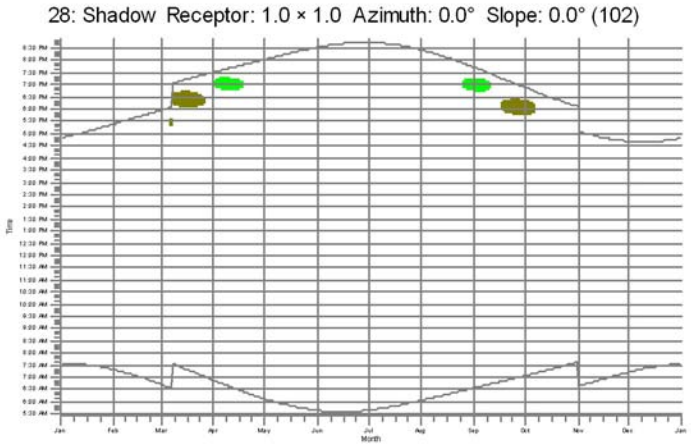
25: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (100)



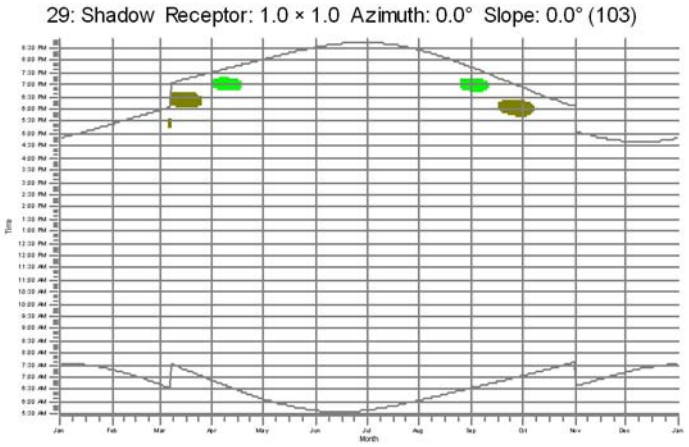
26: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (101)



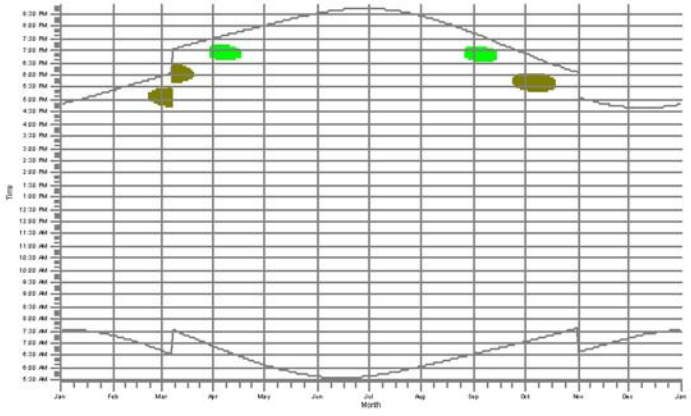
28: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (102)



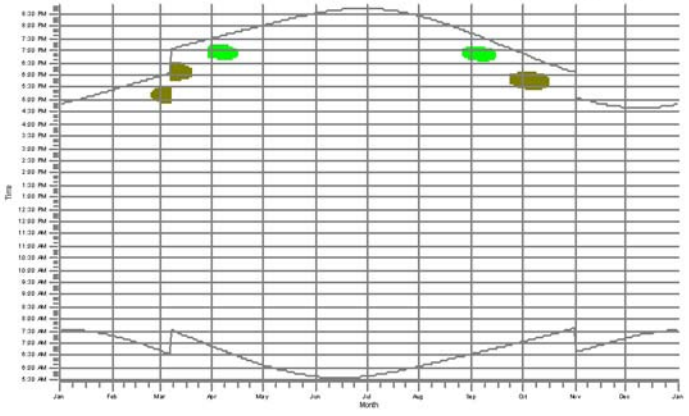
29: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (103)



30: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (104)



31: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (105)



WTGs

D02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (76)

D03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (77)

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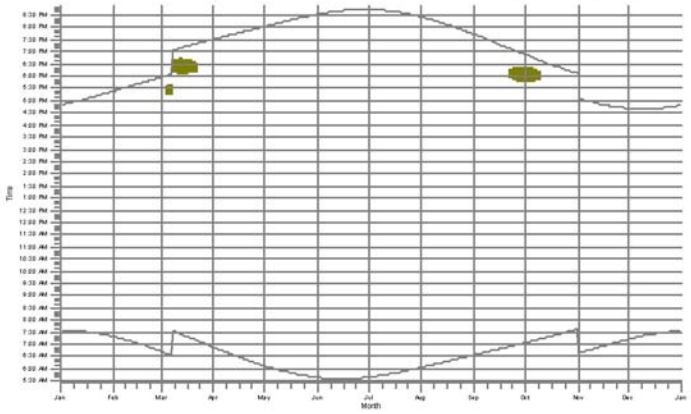
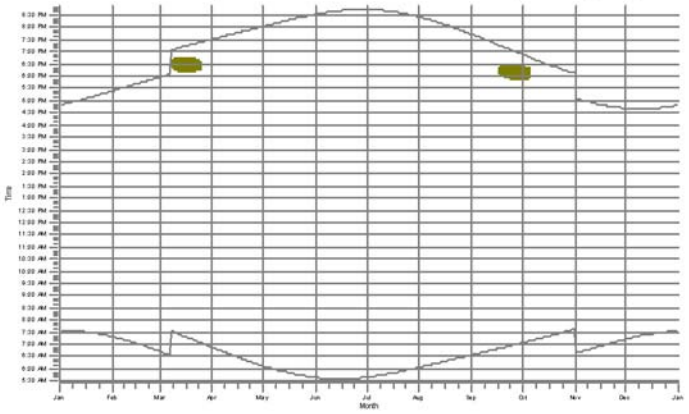
SHADOW - Calendar, graphical

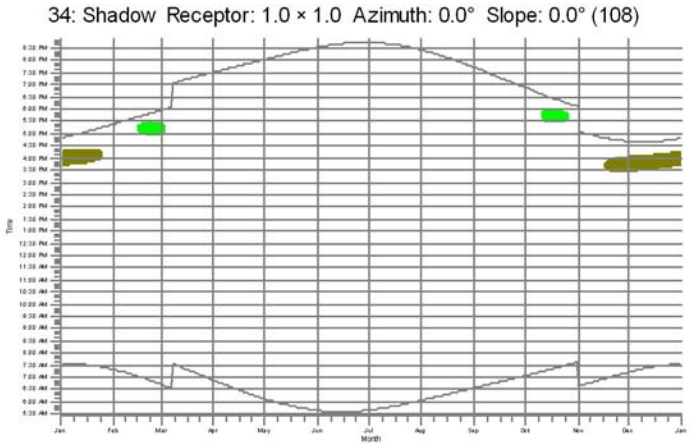
32: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (106)



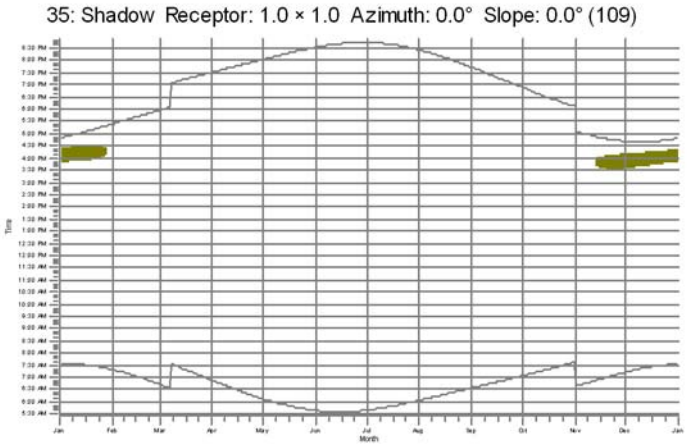
33: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (107)



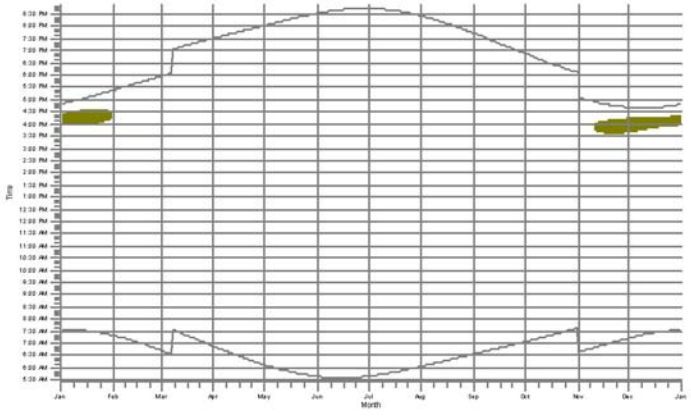
34: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (108)



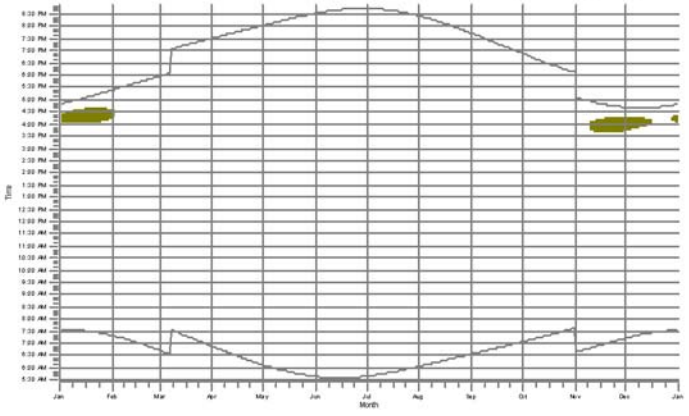
35: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (109)



36: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (110)



37: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (111)



WTGs

D02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (76)

D03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (77)

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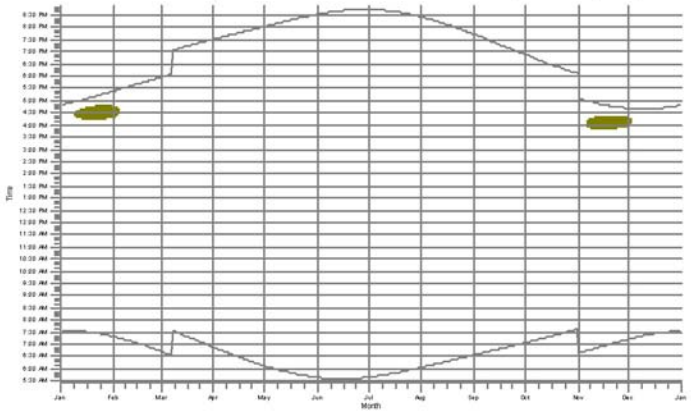
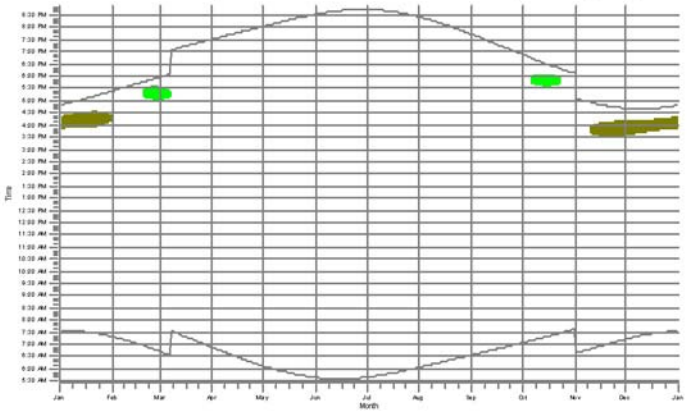
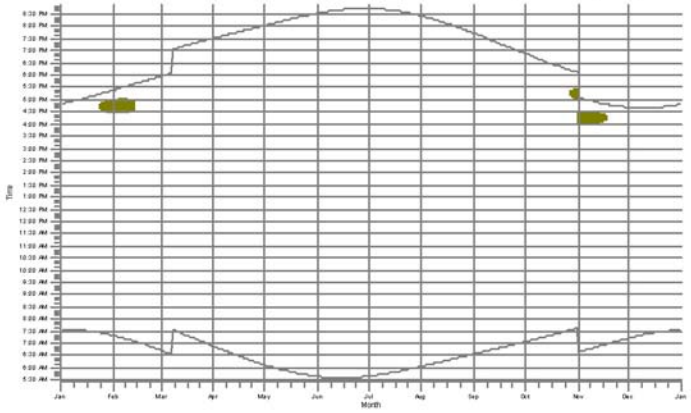
38: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (112)



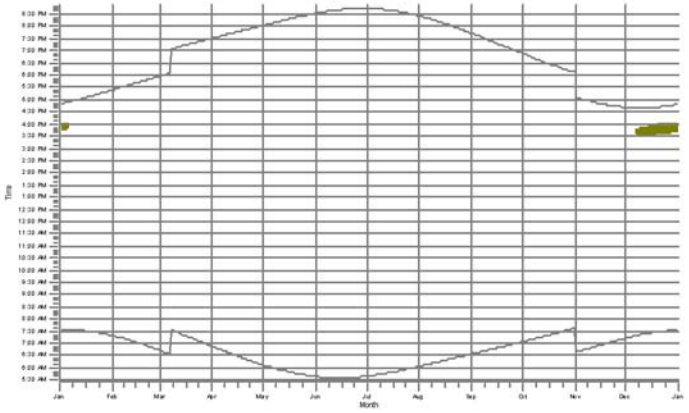
39: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (113)



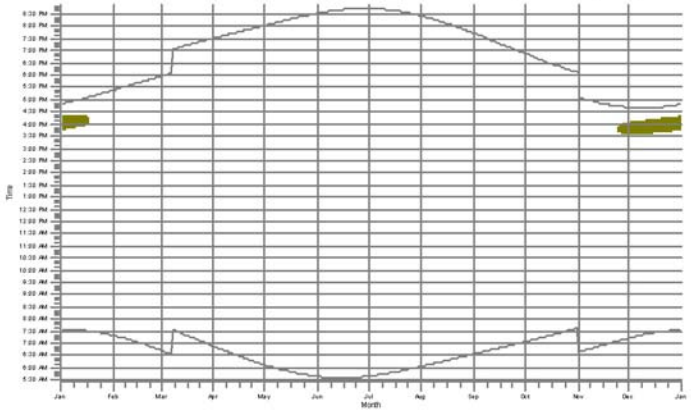
40: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (114)



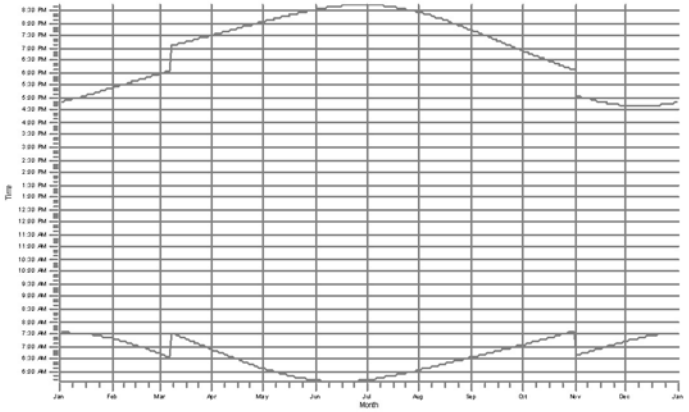
41: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (115)



42: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (116)



43: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (117)



WTGs

D02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (76)

D03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (77)

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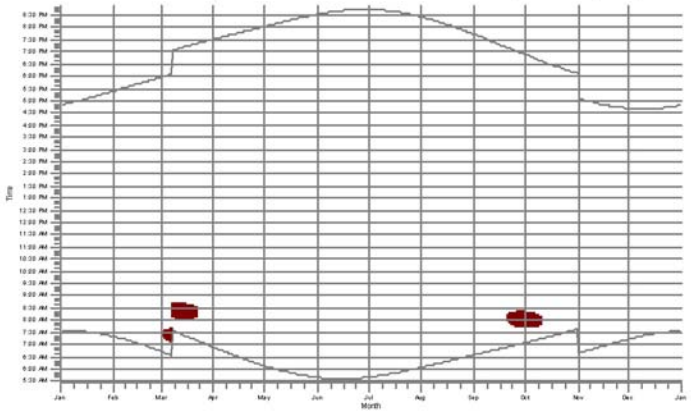
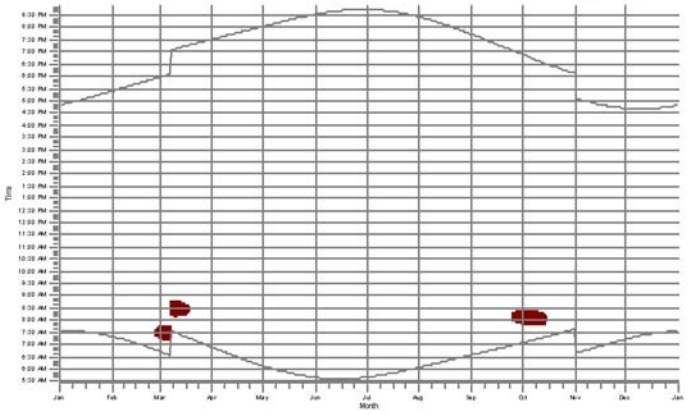
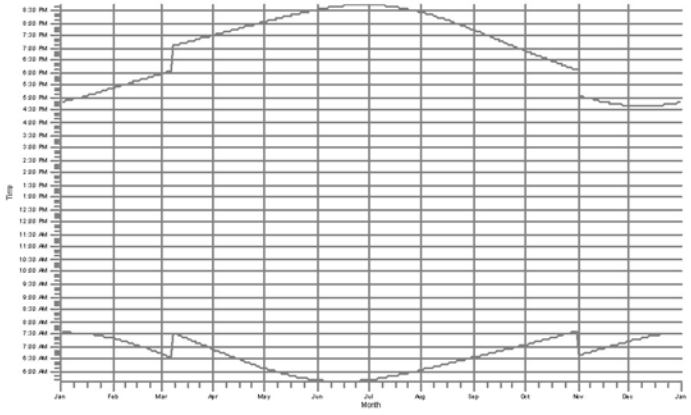
44: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (118)



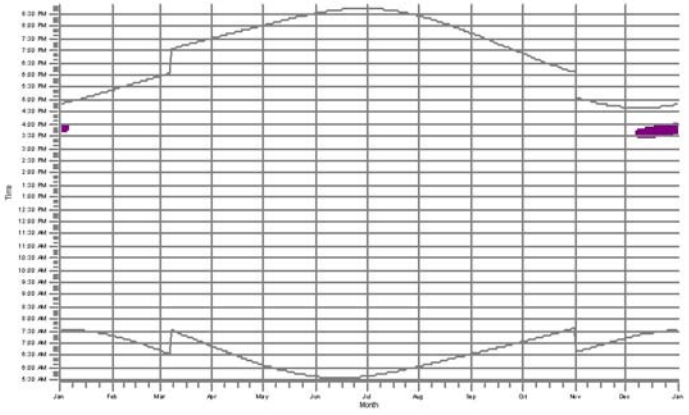
45: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (119)



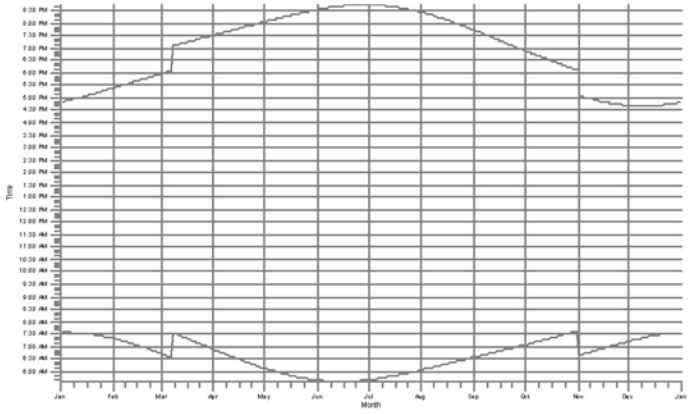
46: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (120)



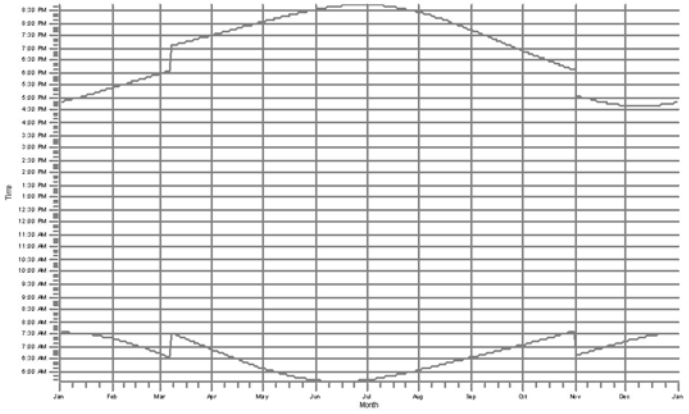
47: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (121)



48: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (122)



49: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (123)



WTGs

D01: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (75)

D04: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (78)

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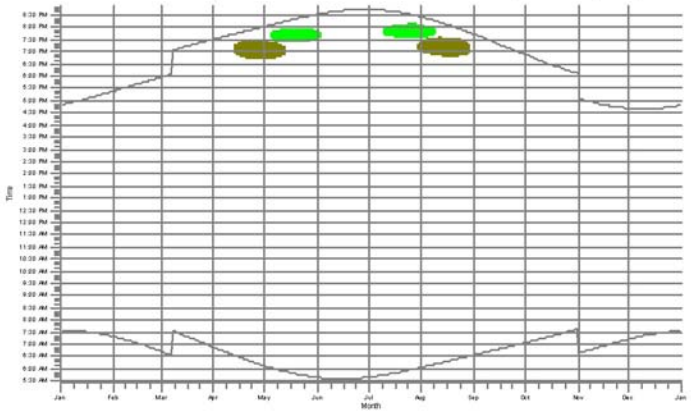
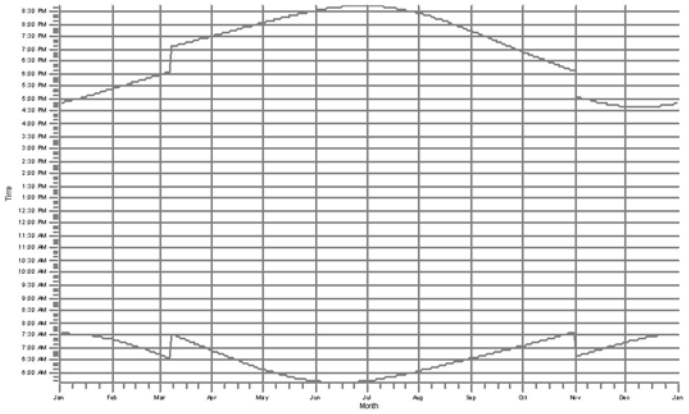
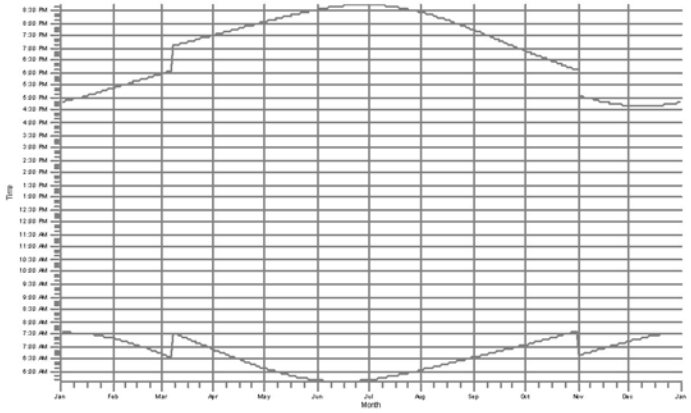
50: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (124)



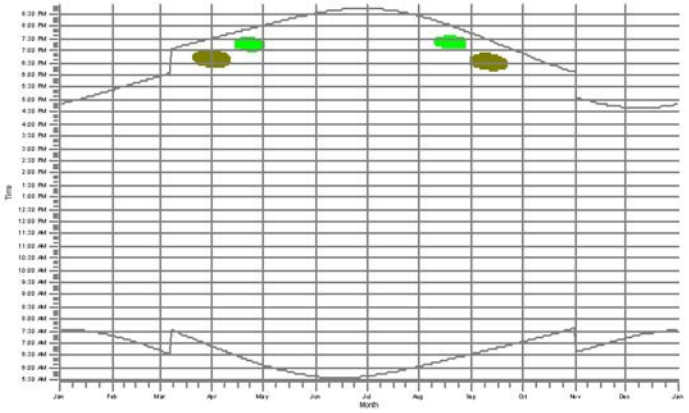
51: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (125)



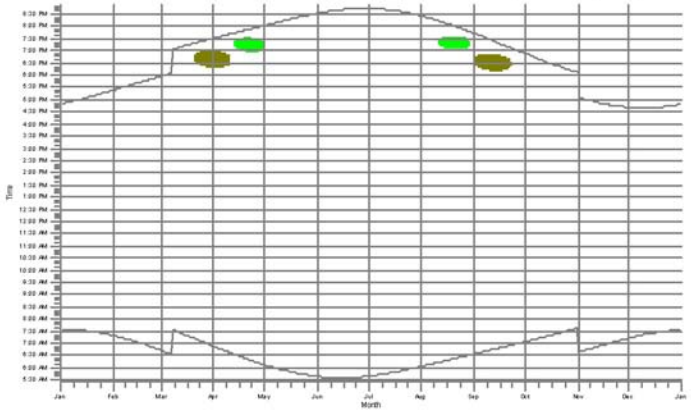
52: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (126)



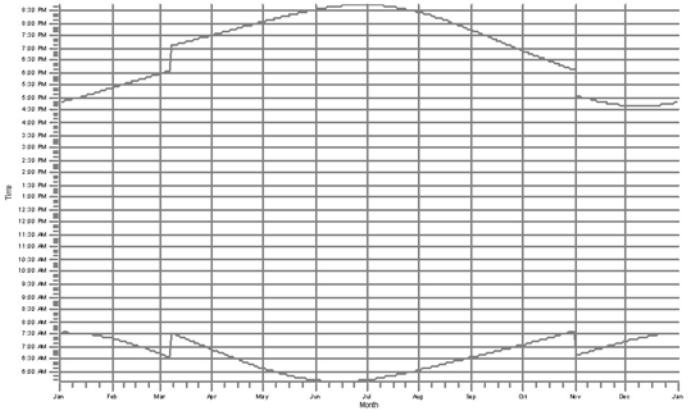
53: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (127)



54: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (128)



57: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (129)



WTGs

D02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (76)

D03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (77)

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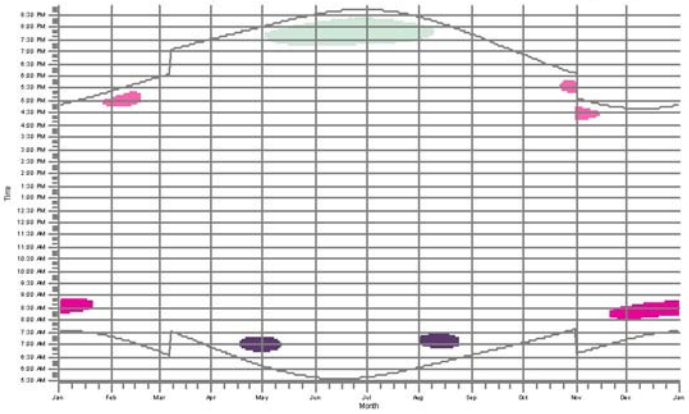
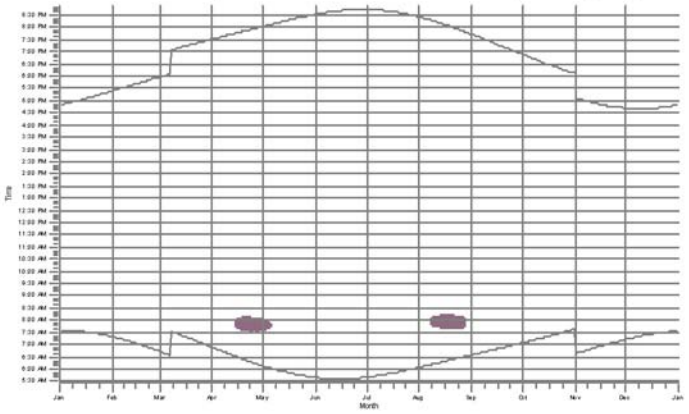
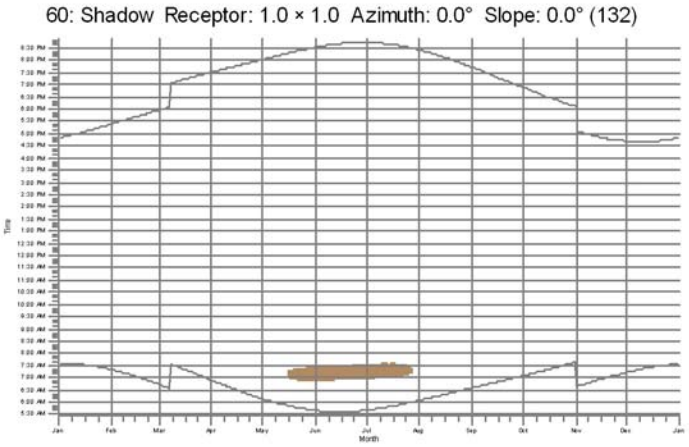
58: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (130)



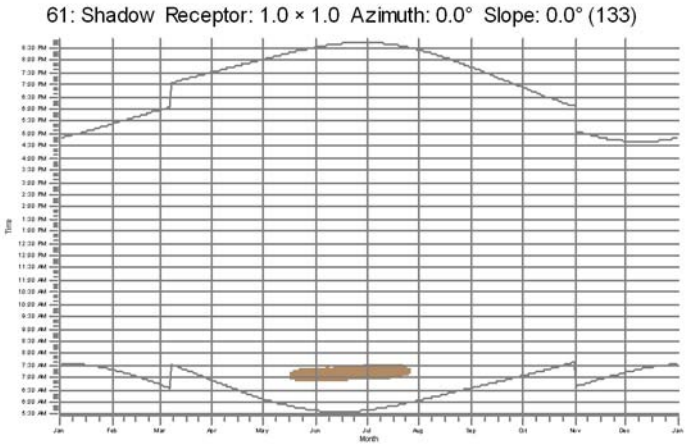
59: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (131)



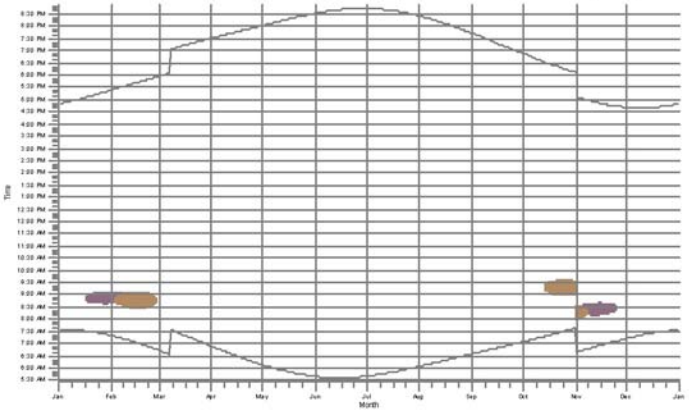
60: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (132)



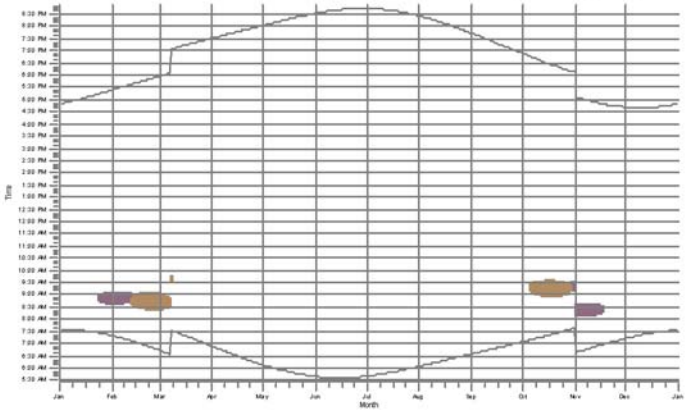
61: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (133)



62: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (134)



63: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (135)



WTGs

N02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (127)
M08: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (128)
M10: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (130)
N05: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (133)
M04: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (137)
M03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (138)

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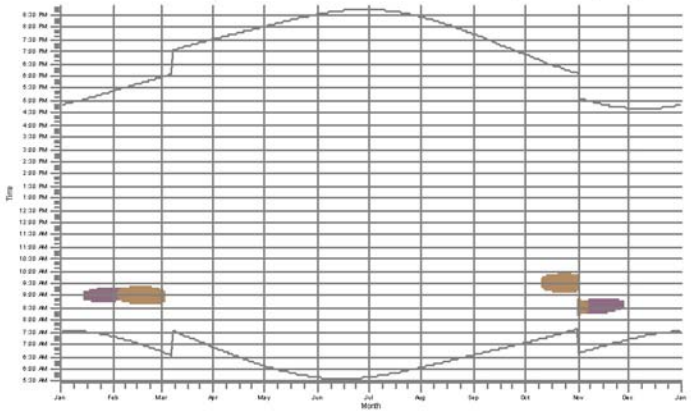
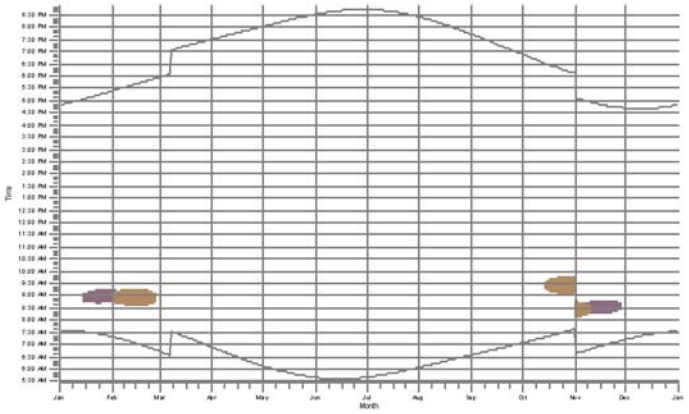
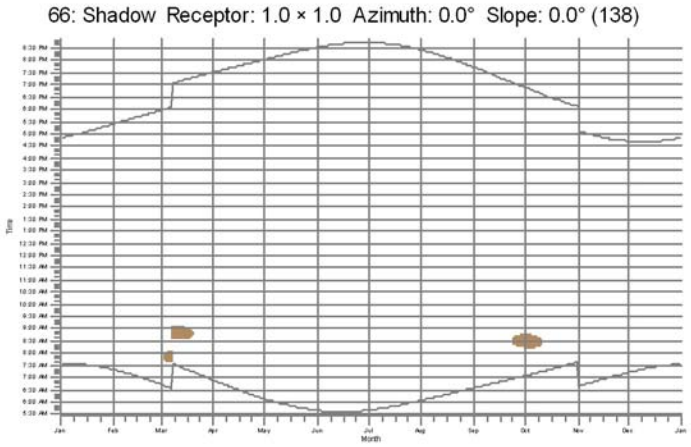
64: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (136)



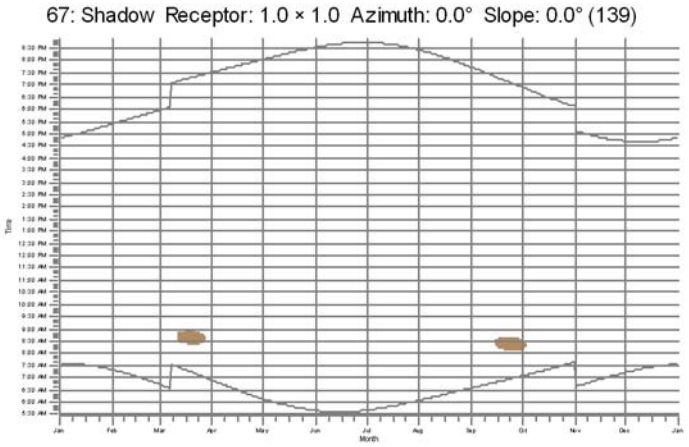
65: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (137)



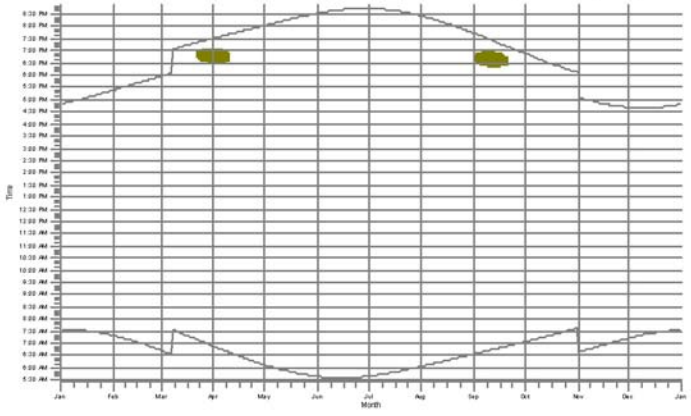
66: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (138)



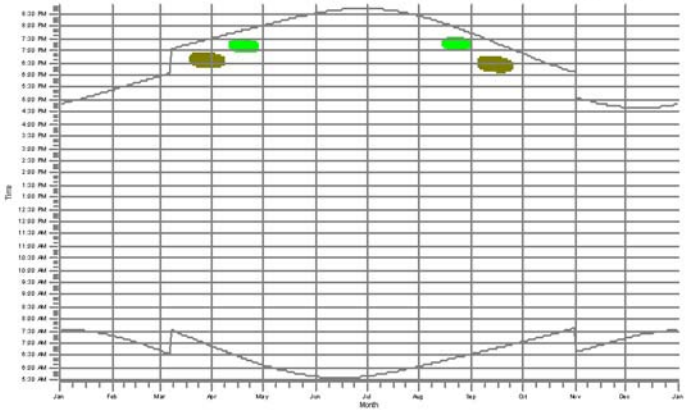
67: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (139)



68: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (140)



69: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (141)



WTGs

D02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (76)

D03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (77)

M04: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (137)

M03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (138)

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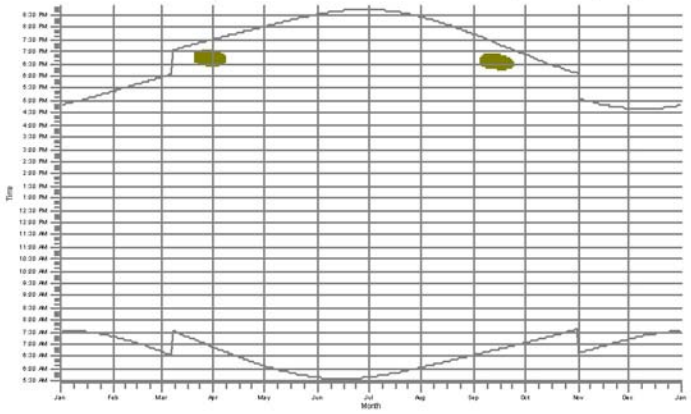
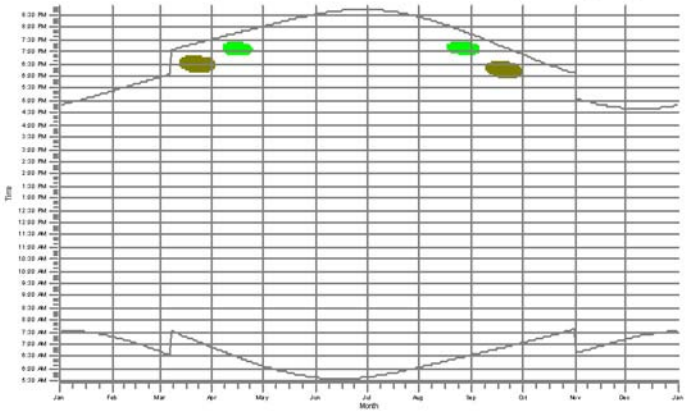
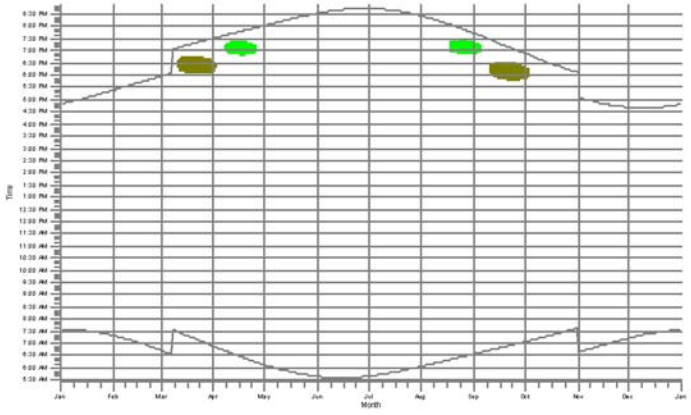
70: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (142)



71: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (143)



72: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (144)



WTGs

D02: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (76)

D03: VESTAS V162 5600 162.0 IOI hub: 125.0 m (TOT: 206.0 m) (77)

Appendix G
Noise and Vibration

FOUNTAIN WIND ENERGY PROJECT NOISE TECHNICAL REPORT

Shasta County, California

December 20, 2019

Prepared for:

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361

Prepared by:

Dana M. Lodico, PE, INCE Bd. Cert.

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
429 E. Cotati Ave.
Cotati, CA 94931
(707) 794-0400

Project: 18-069

EXECUTIVE SUMMARY

This report provides a noise assessment of the Fountain Wind Energy Project (Project) proposed in an unincorporated area in the southern end of the Cascade Range in Shasta County, California. The Project proposes the construction, operation, maintenance, and decommissioning of up to 72 turbines, each having a generating capacity of 3 to 5.7 megawatts (MW), for a total nameplate generating capacity of up to approximately 216 MW. The lands underlying the Project are designated as Timber Production and Unclassified.

The closest residences are located about 2,200 feet from proposed turbines. The existing noise environment in the vicinity of nearby residences is defined primarily by natural sounds, such as wind rustling the leaves of foliage, insects, and birds. In locations adjacent to SR-299, traffic is the dominant noise source. Based on noise monitoring results, existing ambient noise levels range from 42 dBA L_{dn} at more remote locations to 54 dBA L_{dn} in locations adjacent to SR-299.

Noise associated with Project operations is not expected to exceed Shasta County noise standards or the supplementary criteria for low frequency and infrasonic noise at any residential property in the site vicinity. However, use of helicopters during construction and any nighttime construction located within 2,500 feet of residences would have the potential to cause sleep and/or speech interference. Noise reduction measures, including limiting helicopter and heavy construction near residential areas to daytime hours and minimizing helicopter use, are provided to minimize disruption and annoyance during construction.

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INTRODUCTION

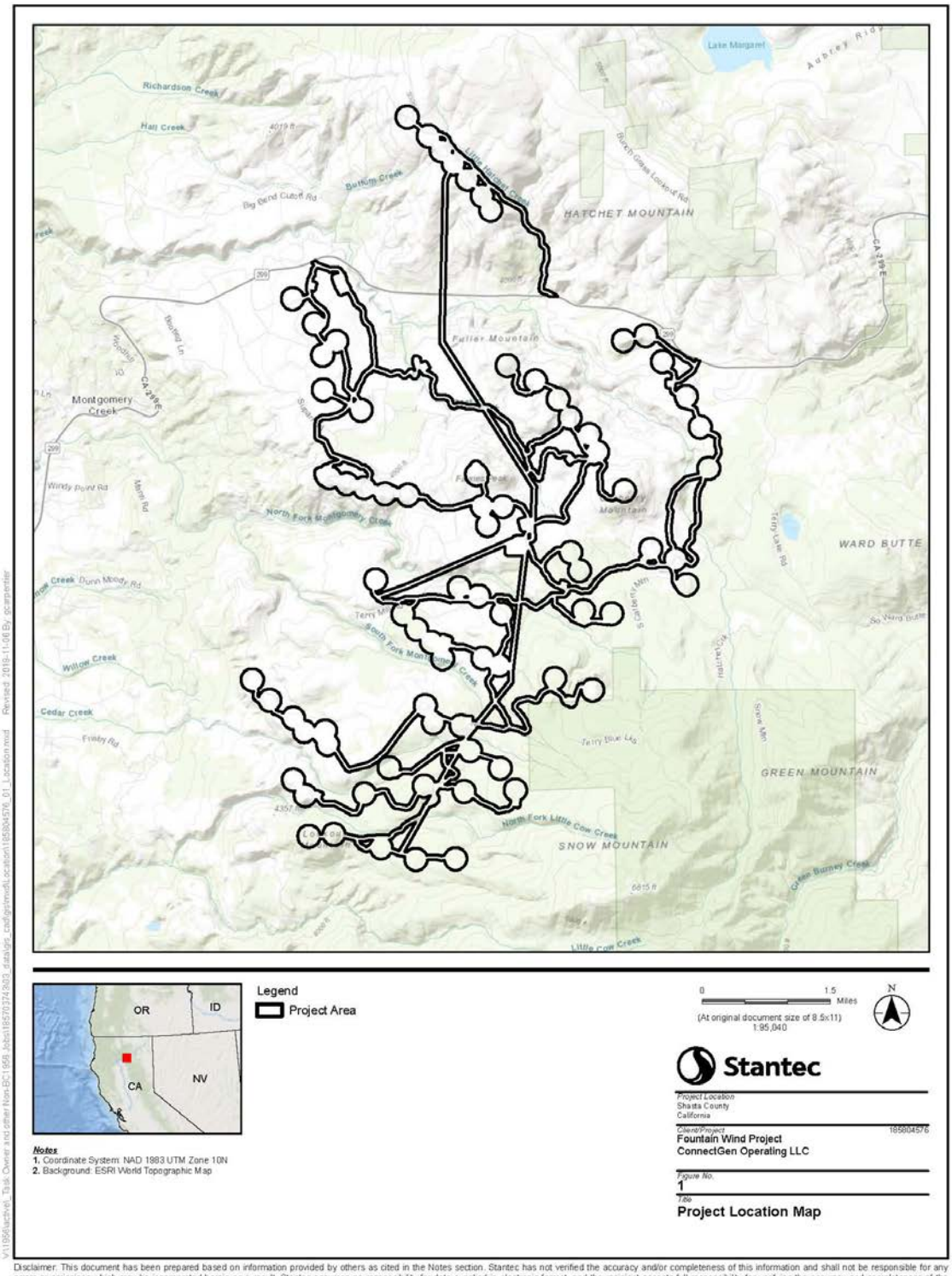
The Fountain Wind Energy Project (Project) proposes the construction, operation, maintenance, and decommissioning of up to 72 wind turbines and related infrastructure in the southern end of the Cascade Range in Shasta County, California (Figure 1). This Project proposes a reduction in turbines from the originally proposed project, for which an environmental noise study was prepared in March 2019.[1]

Each turbine would be no more than 679 feet above ground level at the top of the blade and would have a generating capacity of 3 to 5.7 megawatts (MW). The Project would have a total nameplate generating capacity of up to 216 MW. Associated infrastructure and ancillary facilities would include: a 34.5-kilovolt (kV) overhead and underground electrical collector system to connect turbines together and to an onsite collector substation; overhead and underground fiber-optic communication lines, an onsite switching station to connect the Project to the regional grid operated by the Pacific Gas and Electric Company (PG&E), a temporary construction and equipment laydown area, 14 temporary laydown areas distributed throughout the Project Site to store and stage building materials and equipment, an operation and maintenance (O&M) facility, up to four permanent meteorological (MET) towers and temporary, episodic deployment of mobile Sonic Detection and Ranging (SoDAR) or Light Detection and Ranging (LiDAR) systems, two storage sheds, and three temporary cement batch plants. New access roads would be constructed within the Project Site, and existing roads would be improved. The lands underlying the Project are designated as Timber Production and Unclassified.

This report includes basic information on noise measurement and assessment, applicable noise regulations and guidelines, an evaluation of the existing noise environment, an assessment of noise levels generated by Project construction and operations, and a discussion of potential noise reduction options, as needed.

[1] Illingworth & Rodkin, Inc., Fountain Wind Energy Project, Noise Technical Report, March 19, 2019.

Figure 1: Fountain Wind Project Site with Wind Turbine Layout



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FUNDAMENTALS OF ENVIRONMENTAL NOISE

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity is a measure of the amplitude (height) of the sound wave.

There are several noise measurement scales which are used to describe noise. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10-decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

Environmental noise is typically described in terms of the *sound pressure level*, the quantity that is directly measured by a sound level meter at a specified location. The strength of a wind turbine source, however, is often characterized by its *sound power level*. Sound power level is independent of the distance a receiver is from the source and is a property of the source alone. Knowing the sound power level of an idealized source and its distance from a receiver, the sound pressure level at the receiver point can be calculated based on geometrical spreading. Both sound pressure level and sound power level utilize the decibel scale, although the relative reference used is different between the two concepts. This approach is applied to wind turbine generators in the standard measurement techniques for determining the sound power or source level[1].

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. The *C-weighed sound level (dBC)* also follows the frequency sensitivity of the human ear, but at much higher noise levels. This results in a flatter curve giving more emphasis to low frequency sounds.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as wind turbines, roadways, and airports. The accuracy of the predicted models depends upon the receptor's distance from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

For sound propagation outdoors, the sound level decreases with distance due to the spreading out of sound waves originating from the source. For an ideal "point" source, this geometrical or spherical spreading results in a reduction of sound pressure level of 6 dB per doubling of distance from the source. In addition, other phenomena can create excess

attenuation. These include atmospheric absorption, ground absorption, and shielding. For sound propagation outdoors, there is almost always excess attenuation producing lower levels than what would be predicted by spherical spreading alone. At large distances attenuation by air absorption can be significant: approximately 4 dB per mile in the 500 Hz band at standard atmospheric conditions (68°F and 50% humidity). Ground absorption is lower for a reflective surface such as pavement or water and higher for an absorptive surface such as lawn or soft forest floor. For sound propagating over soft ground at near grazing angles of incidence, excess attenuations of 20 to 30 dB can be measured due to interference effect of the direct and reflected sound. Shielding from intervening terrain, structures, or barriers can provide 5 to 20 dB of sound reduction if the line-of-sight between the source and receiver is broken. Under certain meteorological conditions, some of these excess attenuation mechanisms are reduced or eliminated, leaving spherical spreading as the primary determinate of sound level at a receiver location.

When more than one noise source contributes to the sound pressure level at a receiver point, the overall sound level is determined by combining the contribution of the sources. This is done by logarithmically adding the individual sound pressures together. The logarithmic addition of two sound sources that are independent and equal would result in a 3 dB increase over the level of each alone. In assessing environmental noise, a 3 dB increase in level is typically considered as just perceivable, while an increase of 1 dB is difficult to detect and within the accuracy limitations of the sound level meter and predicted models.

Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration. Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* (*DNL* or L_{dn}) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Sound Power	Sound power is the rate at which sound energy is emitted, reflected, transmitted or received, per unit time. Sound power is a property of a sound source, equal to the total power emitted by that source in all directions and is neither room-dependent nor distance-dependent.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
C-Weighted Sound Level, dBC	The sound pressure level in decibels as measured using the C-weighting filter network. The C-weighting is very close to an unweighted or "flat" response. C-weighting is only used in special cases when low frequency noise is of particular importance.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

FUNDAMENTALS OF NOISE AND VIBRATION FROM BLASTING

When explosive charges are detonated in rock, the blast has been designed so that most of the energy is used in breaking and displacing the rock mass. However, some of the energy can also be released in the form of transient stress waves, which in turn cause temporary ground vibration. Detonating charges also create rock movement and the release of high-pressure gas, which in turn, induces air-overpressure (blast noise).

The average person is quite sensitive to ground motion, and vibration levels as low as 0.01 in/sec can be detected by the human body. Frequency of motion or cycles per second is a measure of how many times a particle of ground moves back and forth (or up and down) in one second of time. Frequency is expressed in units of Hertz (Hz).

Noise from blasting or "blast noise" is primarily composed of sound pressures at frequencies below the threshold-of-hearing for humans (16 to 20 Hz). Hence, the common industry term for blast-induced noise is "air-overpressure". As its name implies, air-overpressure is a measure of the transient pressure changes above and below ambient atmospheric pressure. When calculating maximum overpressure values, the absolute value of the greatest pressure change is used — regardless of whether it is a positive or negative change.

When measurements include low frequency noise (2 Hz and higher) with a flat response, they are called "linear scale" measurements. Air-overpressure measurements are typically expressed in dB units, and when the scale is linear, the unit designation is "dB(L)." Regular acoustical noise measurements taken for the purpose of monitoring compliance with local noise ordinances almost always use weighted scales that discriminate against low frequency noise. Thus, for a similar noise source, A-weighted and C-weighted scales will usually record significantly lower levels of noise.

The regulatory limit defined by the former United States Department of the Interior, Bureau of Mines (US Bureau of Mines) for air-overpressure measured with 2-Hz response seismographs is 133 dB(L) (USBM 1971). Damage to old or poorly glazed windows does not occur until air-overpressure reaches about 150 dB(L). More importantly, since the decibel scale is a logarithmic ratio, the actual overpressure at 150 dB(L) is 0.092 pounds per square inch (psi), versus 0.013 psi at 133 dB(L). Therefore, the actual pressure at the 133 dB(L) limit, is over seven times (0.0915/0.0129) lower than the threshold damage level at 150 dB(L).

When blasting occurs at large distances from sensitive structures, the primary concern is damage to structures. Structural damage can be classified as cosmetic, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from "Historic and some old buildings" to "Modern industrial/commercial buildings". Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is

at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to an elevated human reaction, even though there is very little risk of actual structural damage.

TABLE 3 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

REGULATORY BACKGROUND

Noise from wind turbine generator operations is typically regulated at the County level. Applicable guidance from the Noise Element of the Shasta County General Plan and supplemental criteria for low frequency and infrasonic noise are described below.

Shasta County Noise Element. An objective of the Noise Element of the Shasta County General Plan is to protect County residents from the harmful and annoying effects of exposure to excessive noise. The General Plan considers residential land uses "generally acceptable" in noise environments of 60 dBA L_{dn} or less and "conditionally acceptable" in noise environments between 60 to 70 dBA L_{dn}. See Figure N-1.

In addition, the following Policies would be applicable to the Project:

N-b: Noise likely to be created by a proposed non-transportation land use shall be mitigated so as not to exceed the noise level standards of Table N–IV (shown below) as measured immediately within the property line of adjacent lands designated as noise-sensitive. (From Table N-IV: In rural areas where large lots exist, the exterior noise level standard shall be applied at a point 100' away from the residence.) Noise generated from existing or proposed agricultural operations conducted in accordance with generally accepted agricultural industry standards and practices is not required to be mitigated.

N-c: Where proposed non-residential land uses are likely to produce noise levels exceeding the performance standards of Table N–IV upon existing or planned noise-sensitive uses, an acoustical analysis shall be required as part of the environmental review process so that appropriate noise mitigation may be included in the project design. The requirements for the content of an acoustical analysis are given by Table N-V (not shown).

N-g: Existing noise-sensitive uses may be exposed to increased noise levels due to future roadway improvement projects as a result of increased traffic capacity and volumes and increases in travel speeds. In these instances, it may not be practical to reduce increased traffic noise levels consistent with those contained in Table N-VI (shown below). Therefore, as an alternative, the following criteria may be used as a test of significance for increases in the ambient outdoor activity areas of the noise level of noise-sensitive uses created as a result of a new roadway improvement project:

- Where existing traffic noise levels are less than 60 dB L_{dn}, a +5 dB L_{dn} increase will be considered significant; and
- Where existing traffic noise levels range between 60 and 65 dB L_{dn}, a +3 dB L_{dn} increase will be considered significant; and
- Where existing traffic noise levels are greater than 65 dB L_{dn}, a + 1.5 dB L_{dn} increase will be considered significant.

N-i: Where noise mitigation measures are required to achieve the standards of Tables N-IV and N-VI, the emphasis of such measures shall be placed upon site planning and project design. The use of noise barriers shall be considered a means of achieving compliance with the noise standards only after all other practical design-related noise mitigation measures have been integrated into the project.

Shasta County regulations do not address the operational characteristics of wind turbines. Wind turbines only operate when the wind exceeds a "cut-in" speed which is typically about 4 m/sec (8.9 mph). As a result, they do not produce noise continuously. For Shasta County, the noise limits are interpreted to be not-to-exceed levels, or essentially steady-state levels. Since wind turbines may operate day or night, the nighttime limits (50 dBA as measured immediately within the property line of adjacent lands designated as noise-sensitive) will be considered as the appropriate levels with which to compare the estimated noise levels produced by the proposed Project.

FIGURE N-1: TRANSPORTATION NOISE RELATED LAND USE COMPATIBILITY GUIDELINES FOR DEVELOPMENT

LAND USE CATEGORY		50	55	60	65	70	75	80
		COMMUNITY NOISE EXPOSURE L_{dn} OR CNEL, dB						
Residential, Theaters, Music Halls, Meeting Halls, Churches, & Auditoriums	G.A.	■	■					
	C.A.			▒	▒			
	G.U.					■	■	■
Transient Lodging - Motels, Hotels, & RV Parks	G.A.	■	■					
	C.A			▒	▒	▒		
	G.U.						■	■
Schools, Libraries, Museums, Nursing Homes, & Child Care	G.A.	■	■					
	C.A.			▒	▒	▒		
	G.U.						■	■
Playgrounds, Neighborhood Parks, & Amphitheaters	G.A.	■	■	■	■			
	C.A.					▒		
	G.U.						■	■
Office Buildings, Business, Commercial, & Professional	G.A.	■	■	■				
	C.A.				▒	▒		
	G.U.						■	■
Industrial, Manufacturing, Agriculture, & Utilities	G.A.	■	■	■	■			
	C.A.					▒	▒	▒
	G.U.							
Golf Courses, Outdoor Spectator Sports, & Riding Stables	G.A.	■	■	■	■			
	C.A.					▒	▒	
	G.U.							■

INTERPRETATION:

G.A. = **GENERALLY ACCEPTABLE**

Specified land use is satisfactory. No noise mitigation measures are required.

C.A. = **CONDITIONALLY ACCEPTABLE**

Use should be permitted only after careful study and inclusion of protective measures as needed to satisfy the policies of the Noise Element.

G.U. = **GENERALLY UNACCEPTABLE**

Development is usually not feasible in accordance with the goals of the Noise Element.

Source: Brown-Buntin Associates Inc, 1998

TABLE N-IV:
NOISE LEVEL PERFORMANCE STANDARDS FOR NEW PROJECTS AFFECTED BY OR INCLUDING NON-TRANSPORTATION SOURCES

Noise Level Descriptor	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly L_{eq}, dB	55	50

The noise levels specified above shall be lowered by 5 dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings). The County can impose noise level standards, which are more restrictive than those specified above based upon determination of existing low ambient noise levels. In rural areas where large lots exist, the exterior noise level standard shall be applied at a point 100' away from the residence. Industrial, light industrial, commercial, and public service facilities which have the potential for producing objectionable noise levels at nearby noise-sensitive uses are dispersed throughout the County. Fixed-noise sources which are typically of concern include, but are not limited to, the following:

HVAC Systems	Cooling Towers/Evaporative Condensers
Pump Stations	Lift Stations
Emergency Generators	Boilers
Steam Valves	Steam Turbines
Generators	Fans
Air Compressors	Heavy Equipment
Conveyor Systems	Transformers
Pile Drivers	Grinders
Drill Rigs	Gas or Diesel Motors
Welders	Cutting Equipment
Outdoor Speakers	Blowers

The types of uses which may typically produce the noise sources described above include, but are not limited to: industrial facilities including lumber mills, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, public works projects, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, and athletic fields. Note: For the purposes of the Noise Element, transportation noise sources are defined as traffic on public roadways, railroad line operations, and aircraft in flight. Control of noise from these sources is preempted by Federal and State regulations. Other noise sources are presumed to be subject to local regulations, such as a noise control ordinance. Non-transportation noise sources may include industrial operations, outdoor recreation facilities, HVAC units, loading docks, etc.

Source: Shasta County Noise Element

Supplemental Criteria for Low Frequency and Infrasonic Noise. Neither the State of California nor Shasta County specifically address low frequency noise and infrasonic noise from wind energy or other projects. However, low frequency noise and infrasonic noise from wind energy projects should be explored as part of a complete noise assessment[2]. Other criteria can be considered to determine if the project would exhibit high infrasonic noise generation potential. In general, low frequency noise has been associated with older generation, downwind turbines. For these turbines, the wake of the tower interacts with the passing blades to generate pulses at the rate the blades pass the tower. Low frequency noise is typically minimized with upwind turbines. Objective sound pressure level guidelines can be inferred from several different sources.

One source of low frequency criteria is the Alameda County Standard Conditions of Permit Approval for Windfarms[3]. This document uses 70 dBC L_{dn} as the threshold for considering "reasonable complaints". Another source of low frequency criteria within the State of California is the Kern County Code[4]. Under this criteria, the low frequency noise levels at 50 feet from a residence are given below for 1/3 octave bands centered at 2 to 125 Hz as shown in Table 4. In the infrasonic range (below 20 Hz), the Table 4 criteria are actually lower than the established threshold of hearing by 18 to 37 dB[7]. As a result, achieving the values shown for the Kern County criteria should assure that any infrasonic noise generated by the Project will be sufficiently low in level to avoid any noise impact.

TABLE 4 Low frequency noise criteria used by Kern County

1/3 Octave Band Center Frequency, Hz	Noise Level Limit, dB
2 to 16	70
20	68
25	67
31.5	65
40	62
50	60
63	57
80	55
100	52
125	50

Finally, a simpler criterion based on the difference of overall levels has also been proposed as a predictor of annoyance. This occurs when the C-weighted level exceeds the A-weighted level by 20 dB or more[5].

EXISTING NOISE ENVIRONMENT

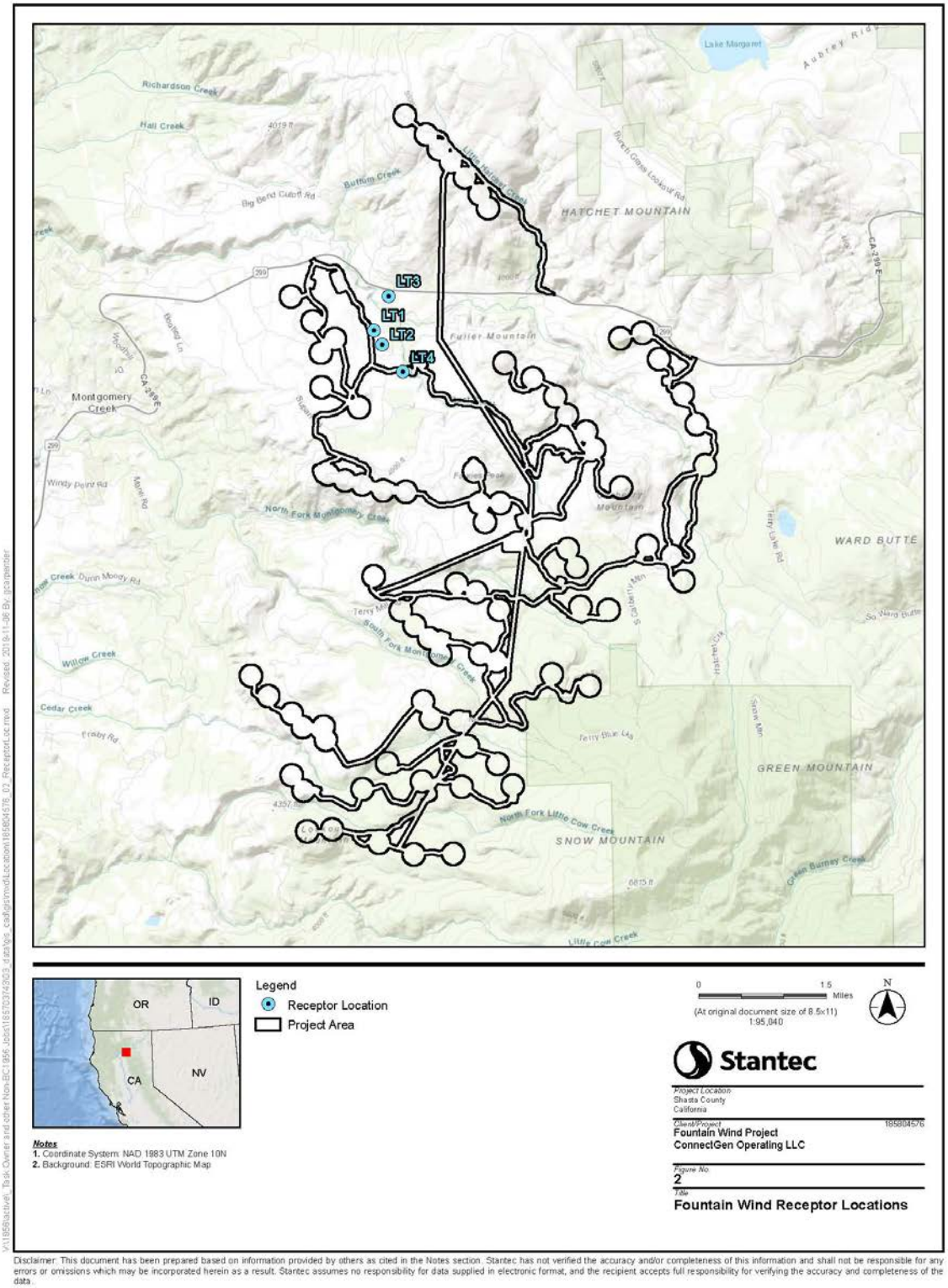
The Project Site is located in an unincorporated area of eastern Shasta County, approximately 1 mile west of the existing Hatchet Ridge Wind Project, 6 miles west of Burney, 35 miles northeast of Redding, immediately north and south of California State Route 299 (SR 299), and near the private recreational facility of Moose Camp. Other communities near the Project Area include Montgomery Creek, Round Mountain, and Wengler (each approximately 3 miles from the Project Site) and Big Bend (approximately 7 miles from the Project Site). The Project Site is located within the southern end of the Cascade Range with topography characterized by buttes and peaks separated by small valleys. The Lassen National Forest lies adjacent to the Project Site to the southeast and the Shasta-Trinity National Forest borders the Project Site to the north. Other surrounding lands are privately owned; many are used for timber harvesting purposes.

There are no residences within the bounds of the project. The closest residences are located about 2,200 feet from proposed turbines. The noise environment in the vicinity of nearby residences is defined primarily by natural sounds, such as wind rustling the leaves of foliage, insects, and birds. In locations adjacent to SR-299, traffic is the dominant noise source. The Project Site is under active timber management and noise associated with related vehicle trips along the roadway network are included in the ambient noise environment.

Noise Measurement Methods

To objectively characterize the noise environment, sound pressure levels were measured in and surrounding the Project Site. Long-term, unattended noise measurements were made at four locations in the vicinity of the Project Site at locations indicated as LT-1, LT-2, LT-3, and LT-4 in Figure 2. Measurements were conducted over an 8-day period from Sunday, August 19th, 2018 to Monday, August 27th, 2018. The sites were selected to represent the closest residences to the Project. Sites LT-1, LT-2, and LT-3 were selected at distances of about 100 feet from the closest residences, in the worst-case location relative to the proposed turbines. Due to the inaccessibility of the residence to the south (represented by LT-4), measurements were not attempted on this property, but rather were taken to be representative of the Project Site. The long-term noise levels were measured with Larson-Davis 820 precision Type 1 sound level meters (SLMs) fitted with a ½-inch pre-polarized condenser microphone and a windscreen. The meters were calibrated before and after the surveys with a 94 dB, 1000 Hz Larson-Davis acoustical calibrator.

Figure 2: Ambient Noise Measurement Locations



The long-term data were monitored in 10-minute intervals that were later combined to give hourly levels. The measured levels included the L_{eq}, L_{max}, L_{min}, L_1, L_2, L_{10}, L_{25}, L_{50}, and L_{90} for each 10-minute interval. The daily trends in noise levels for the long-term measurement site are presented in Appendix A.

Noise Measurement Results

Ambient Noise Levels. For purposes of comparison of ambient noise levels to those predicted for the Project, the primary metric of concern based on the Shasta County criteria is the hourly L_{eq}. These data are shown in Appendix A for each of the test days for each LT measurement. As indicated in the data, there is considerable variation in level between test days and times of day at each site. The average hourly L_{eq} values for the daytime hours (7:00 a.m. to 10:00 p.m.) and the nighttime hours (10:00 p.m. to 7:00 a.m.) are shown in Table 5 along with the day-night average levels for each LT measurement. At all sites, elevated noise levels occurring between approximately 7:00 pm and 11:00 pm are thought to be attributable to insect and other natural sounds. At all sites and on all measurement days, noise levels during these hours increased substantially (15 to 20 dB) around 8:00 pm and then dropped off slowly between 8:00 pm and 11:00 pm.

Table 5: Summary of Ambient Levels at Long-Term Measurement Locations

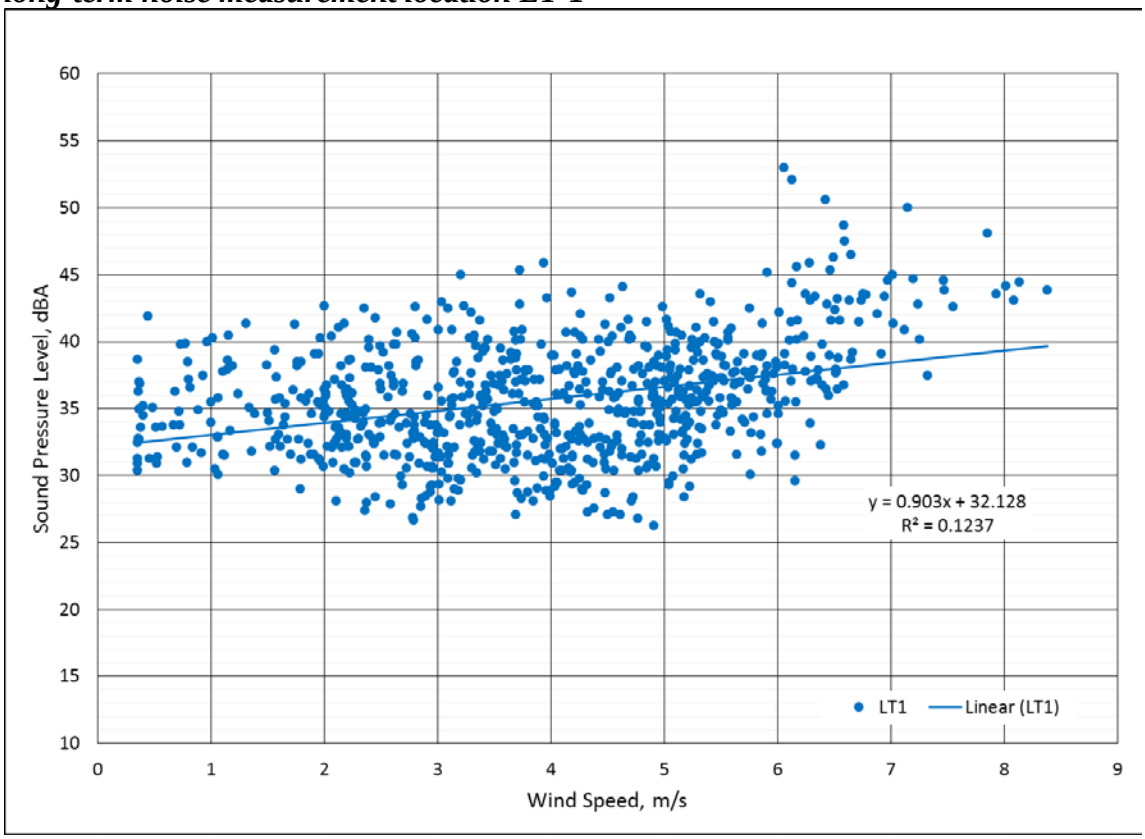
Location	Time Period	Hourly L_{eq}		Standard Dev., dB	L_{dn}, dBA
		Average, dBA	Range, dBA		
LT-1	Daytime	40	28-49	4.4	43-45
	Nighttime	36	32-45	3.5	
LT-2	Daytime	38	28-50	5.2	42-44
	Nighttime	34	28-42	3.5	
LT-3	Daytime	47	39-53	3.5	53-54
	Nighttime	46	40-53	3.6	
LT-4	Daytime	42	38-49	2.8	47-50
	Nighttime	42	38-48	2.9	

Daytime vs. Nighttime Noise Levels. As indicated in Table 5, daytime noise levels were about 4 dBA greater than nighttime noise levels at locations LT-1 and LT-2, but were similar between daytime and nighttime periods at LT-3 and LT-4. The noise environment at LT-1, LT-2, and LT-4 is primarily comprised of natural sounds, such as wind rustling the leaves of foliage, insects, and birds, and vehicular traffic on local logging roads. At LT-3, noise from occasional traffic on SR-299 is the primary noise source, along with evening insect noise; however, insect noise is similar in level to the traffic noise at this site and does not appear to significantly affect the L_{50} and L_{eq} levels. The L_{dn} values calculated for each LT locations are also provided in Table 5 and range from 42 dBA L_{dn} at more remote locations (LT-2) to 54 dBA L_{dn} in locations adjacent to SR-299 (LT-3). The noise floor identified in the data at LT-4 is due to the noise floor of the sound level meter. These trends can be observed in greater detail on the figures given in Appendix A.

Effects of Wind Speed on Noise Levels. To document the effect of wind speed on the ambient noise levels, wind speed data were reviewed from meteorological towers located near the Project site. The 10-minute L_{eq} levels measured at the four long-term noise monitoring locations from August 19th, 2018 to August 27th, 2018 were plotted against average 10-minute wind speed. As an example, the sound pressure level (L_{eq}) versus wind speed at location LT-1 is shown in Figure 4. Similar trends were seen at of the LT sites. Based on review of Figure 3 (and similar charts for the other LT locations), higher noise levels were observed under wind speeds exceeding 6 m/s. However, considerable scatter is apparent in the data; R^2 values of 0.12 or less at all locations indicate very low correlation

between wind speed and noise level. Higher wind speed may result in a stronger correlation; however, based on the data reviewed, the noise environment at these sites is not directly correlated with wind speed.

Figure 3: 10-Minute L_{eq} level versus wind speed from nearby meteorological tower for long-term noise measurement location LT-1



NOISE ASSESSMENT

The noise assessment consisted of a review of the construction and operational details of the Project, calculation of noise levels at nearby noise sensitive areas based on the proposed turbine layout, the assessment of the predicted levels relative to the appropriate regulations and guidelines, and the discussion of noise reduction strategies, as necessary. The following criteria, which generally follow the California Environmental Quality Act (CEQA) Guidelines, Appendix G, were used to evaluate the significance of environmental noise resulting from the Project:

- **Noise Levels in Excess of Standards:** A noise impact would be identified if the Project would exceed 55 dBA during daytime hours (7:00 am to 10:00 pm), 50 dBA during nighttime hours (10:00 pm to 7:00 am), and/or 60 dBA L_{dn} at noise sensitive uses (residences). *Shasta County General Plan Policy N-b and Figure N-1.*

- **Permanent Noise Increases:** A noise impact would be identified if operational noise generated by the Project would substantially increase noise levels at sensitive receivers in the vicinity. Shasta County defines noise level increases of 3 dBA L_{dn} or greater to be considered significant where exterior noise levels would exceed the generally acceptable noise level standard (60 dBA L_{dn} for residential land uses). Where noise levels would remain at or below the normally acceptable noise level standard with the Project, noise level increases of 5 dBA L_{dn} or greater would be considered significant. *Shasta County General Plan Policy N-g*

- **Supplemental Criteria for Low Frequency and Infrasonic Noise:** The threshold for concern for low frequency noise occurs when the C-weighted level exceeds the A-weighted level by 20 dB or more or if the 1/3rd octave band thresholds shown in Table 4 are exceeded.

- **Temporary Noise Increase from Construction:** A temporary noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA L_{eq} at residential land uses, and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses. For temporary noise increases due to construction traffic, Shasta County's 3 and 5 dBA L_{dn} increase criteria would apply, as described above.

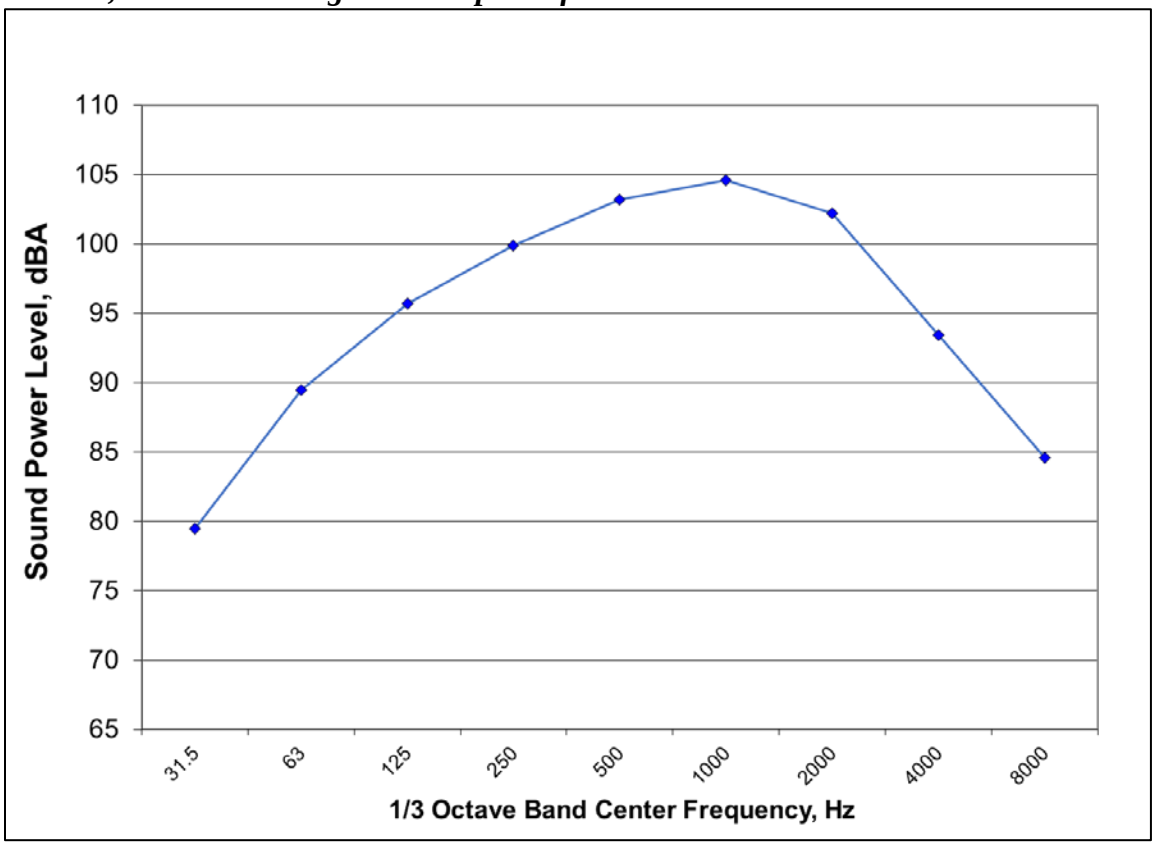
- **Groundborne Vibration from Blasting:** A vibration impact would be identified if the Project blasting for construction would generate groundborne vibration levels exceeding 0.3 in/sec PPV or groundborne noise exceeding 133 dB(L). *See Table 3 and discussion.*

NOISE GENERATED DURING OPERATIONS

Wind Turbine Operation

The Project is located on approximately 4,400 acres of land in the southern end of the Cascade Range in Shasta County, California. The proposed, 72-turbine layout is shown in Figure 1. Based on preliminary design, the Nordex N163/5.X turbine was selected as the worst-case, loudest turbine that is anticipated to be used at the site. This turbine has a maximum sound power level of 109.2 dBA and a hub height of 118 m (387 feet). One-third octave band data for this turbine is shown in Figure 4.

Figure 4: One-third octave band sound power levels for the Nordex N163/5.X Wind Turbine, with a Hub Height Wind Speed of 15 m/s



As sound spreads out from a noise source, physics dictates an attenuation of 6 dB for each doubling of distance from the source. The closest residences are located about 2,200 feet from adjacent turbines. Given the long propagation distances and mountainous terrain between the turbines and the closest receptors, turbine sound would be subject to additional attenuation by shielding from intervening terrain, atmospheric absorption, and ground absorption. Some variation in noise exposure at residences will occur with variations in temperature gradients and/or wind speed gradients, which vary over time.

Noise Levels in Excess of Standards

SoundPLAN Version 8.1 was used to calculate noise levels at adjacent noise sensitive locations, assuming a worst-case condition with operation of all wind turbines

simultaneously. SoundPLAN is a three-dimensional ray-tracing program, which takes into account the topography of the area and the spectral characteristics of the noise sources. These results include the effect of atmospheric attenuation, ground reflection/absorption, and topography. Neutral environmental conditions are assessed for CEQA purposes, i.e., no wind or temperature gradients.

Figure 5 shows the calculated future A-Weighted noise contours generated during a worst-case scenario with all wind turbines operating simultaneously. Contours are shown for the area surrounding the Project, much of which is currently undeveloped. Receptor locations are representative of the worst-case existing residential locations, located 100 feet from the residences themselves in the direction of the closest turbine. For LT-1, LT-2, and LT-3, these locations are the same as the ambient measurement locations. For LT-4, a location representative of the receptor further to the south was selected (R-4).

The calculated levels at each of the nearest existing noise sensitive receptors under this same worst-case scenario are shown in tabular form in Table 6, which gives A-Weighted L_{eq} and L_{dn} results at each location. Measurement and receptor locations are indicated in Figures 2 and 5.

TABLE 6: Project Generated Sound Pressure Levels at Nearby Residences

Receiver	A-Weighted L_{eq}, dBA	L_{dn}[1], dBA
LT-1	40	46
LT-2	40	46
LT-3	38	45
R-4	43	50

[1] Assumes continuous simultaneous operation of all turbines, 24-hr/day.

As shown in Table 6, A-Weighted L_{eq} levels would range from 38 to 43 dBA at the nearest existing residences and L_{dn} levels, assuming a worst-case scenario with turbine operating continuously for 24-hr/day, would range from 45 to 50 dBA. Therefore, wind turbine noise levels would not be anticipated to exceed the County's daytime (55 dBA L_{eq}), nighttime (50 dBA L_{eq}), or L_{dn} (60 dBA L_{dn}) thresholds.

Figure 5a: Fountain Wind Energy Project A-Weighted Contours

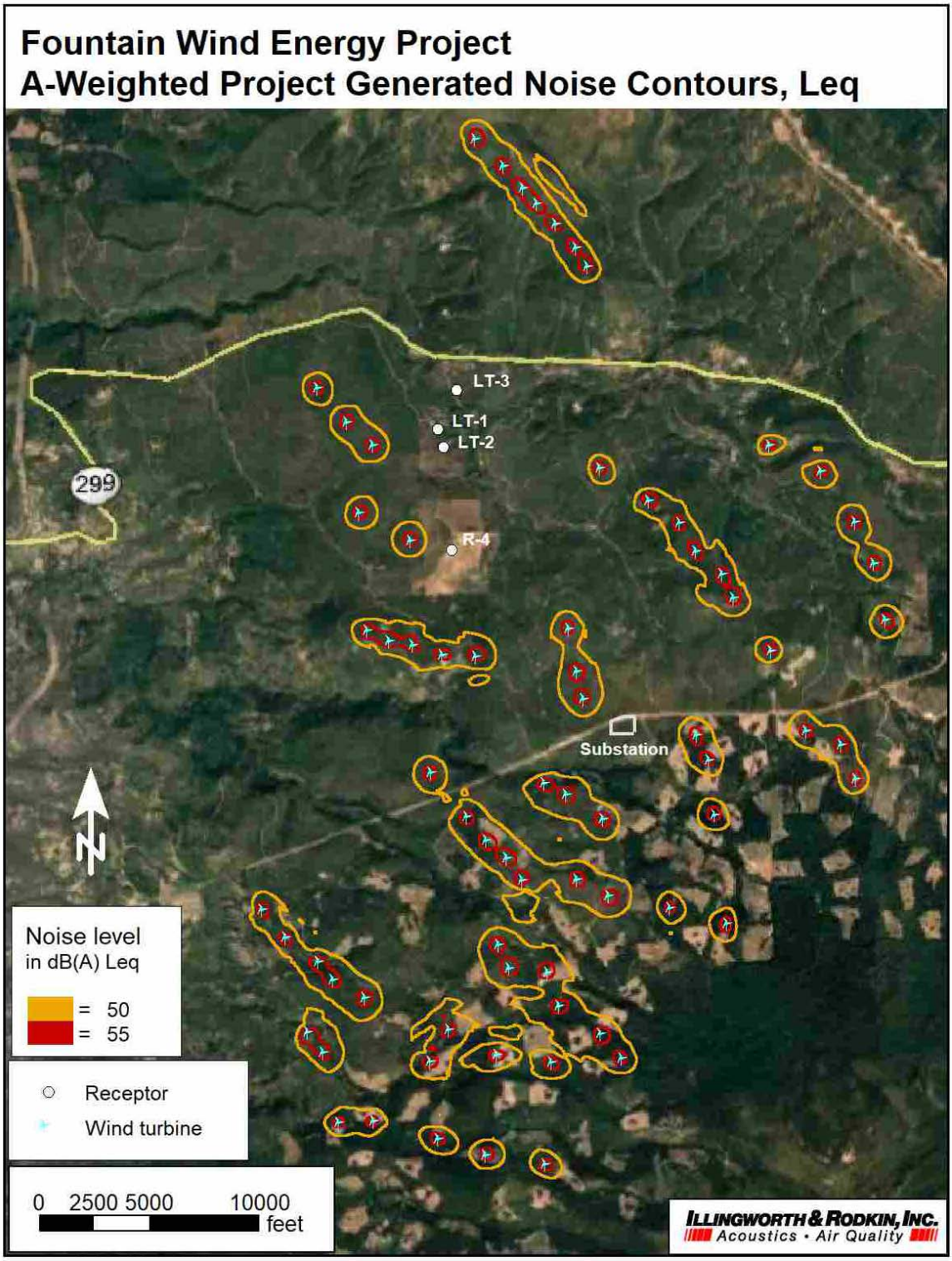
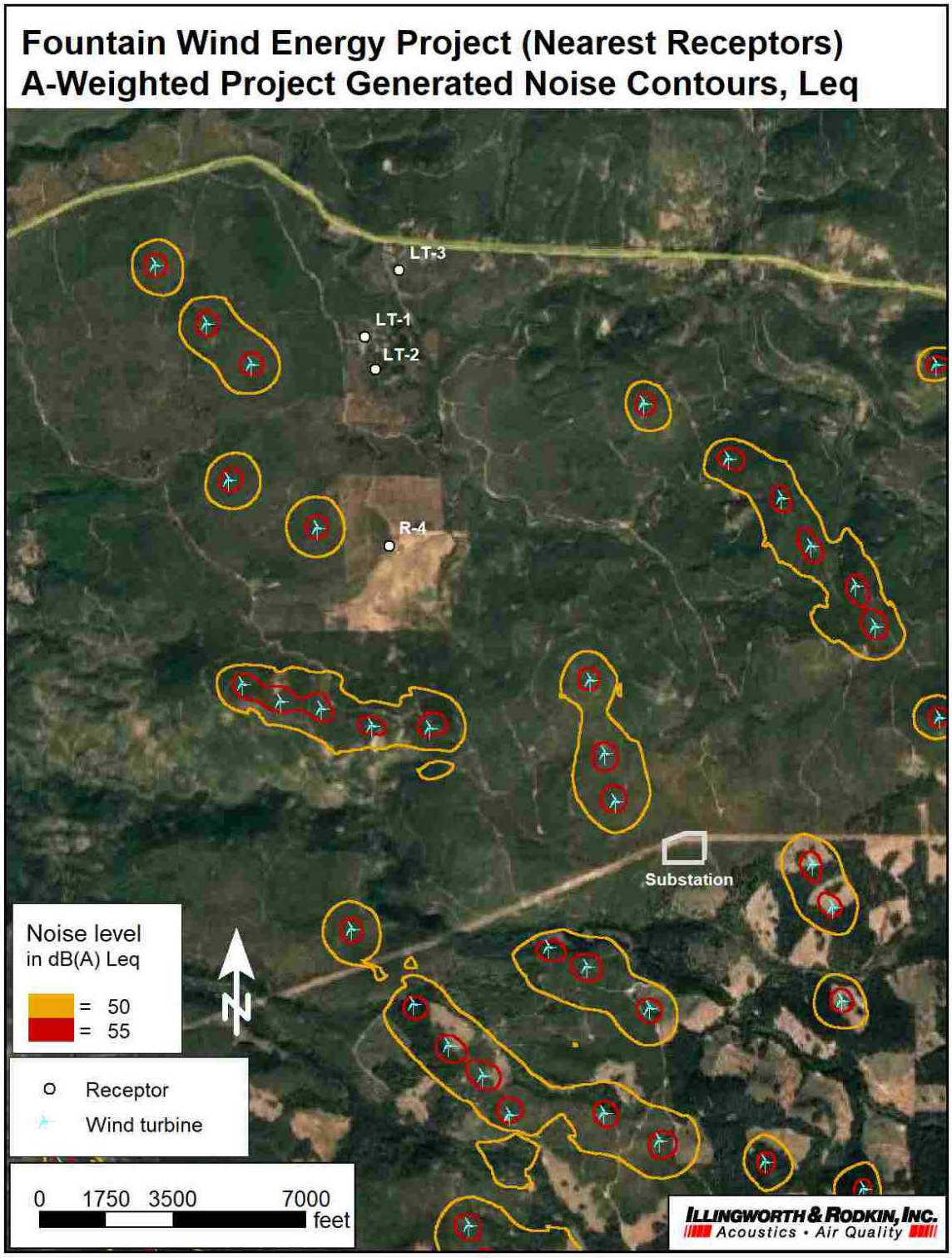


Figure 5b: Fountain Wind Energy Project A-Weighted Contours, Nearest Receptors



Permanent Noise Increases

Table 7 shows existing ambient and calculated L_{dn} noise levels resulting from the worst-case wind turbine scenario discussed above, with all turbines operating simultaneously 24-hr/day. Ambient L_{dn} levels are based on noise measurements and observations made during the noise monitoring survey.

TABLE 7: Increase in L_{dn} Resulting from Project Operations, 100% Operations

Receiver	Average Ambient L_{dn}, dBA	Project Generated L_{dn}[1], dBA	Existing + Project L_{dn}[1], dBA	L_{dn} Increase[2], dBA
LT-1	44	46	48	4.1
LT-2	43	46	48	5.0
LT-3	54	45	54	0.5
R-4	49	50	52	3.3

[1] Assumes continuous simultaneous operation of all turbines, 24-hr/day.
[2] Results were rounded to the nearest decibel. In some cases, this can result in relative changes that may not appear intuitive. For example, the difference between 64.4 (64) and 64.5 (65) is 0.1 (0), not 1.

As indicated in Table 7, worst-case wind turbine operation would result in L_{dn} noise levels increases of 0.5 to 5.0 dBA at the nearest surrounding residences, assuming 100% operations. Ambient noise levels at all receptors are below 60 dBA L_{dn}; therefore, the 5 dBA increase threshold would apply. Noise increases at all receptors would be 5.0 dBA L_{dn} or less. More likely assumptions, assuming 30, 40, 50, and 85% operations, would result in lower Project generated L_{dn} levels and thus lower noise level increases at residences. Likewise, selection of a lower noise turbine would result in lower Project generated L_{dn} levels and thus lower noise level increases at residences.

Low Frequency and Infrasonic Noise

Spectral data for the worst-case wind turbine scenario are shown in Figure 4. Table 8 shows the differences between the A-Weighted and C-Weighted levels, as calculated at each receptor location.

TABLE 8: Difference Between A-Weighted and C-Weighted Results

Receiver	A-Weighted L_{eq}, dBA	C-Weighted L_{eq}, dBC	L_{dn}[1], dBA	L_{dn}[1], dBC	dBC – dBA, dB
LT-1	39.5	58.4	46	65	18.9
LT-2	39.5	58.5	46	65	19.0
LT-3	38.2	57.7	45	64	19.5
R-4	43.3	61.0	50	67	17.7

[1] Assumes continuous simultaneous operation of all turbines, 24-hr/day.

As shown in Table 8, the difference between the A-Weighted and C-Weighted levels are anticipated to be 17.7 to 19.5 dB. These differences are below the 20-dB threshold of concern for low frequency noise relative to A-weighted levels. Levels are also 5 dB or more below the Kern County thresholds shown in Table 4 and the standard condition of approval used in Alameda County (70 dBA dBC). As a result, low frequency noise from the turbines is anticipated to be below any of the typical regulations or guidelines if the A-weighted sound level limits are achieved.

Onsite Collector Substation and Switching Station

An onsite collector substation and switching station (Substation) would increase the voltage of the electricity from the collection system's 34.5 kV to 230 kV to match the voltage of the existing PG&E 230 kV line. The closest existing residential areas are 1.5 miles to the northwest and southwest from the Substation location (see Figure 5). The basic elements of the substation facilities include a control house, a bank of one or two main transformers, outdoor breakers, capacitor banks, relaying equipment, high-voltage bus work, steel support structures, an underground grounding grid, and overhead lightning-suppression conductors.

The primary operational noise sources proposed at the Substation are anticipated to be transformers. A typical transformer would be estimated to generate a noise level of 72 dB at a distance of 6 feet during full load with fans and pumps running. With two transformers running simultaneously, the noise level would be 3 dB higher. Based on noise measurements made at the Bridgeville Substation in Humboldt County, California, steady state noise levels in the range of 47 to 54 dBA L_{eq} would be anticipated at the fence line of the Substation. Equipment-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain can provide an additional 5 to 10 dBA or more noise reduction at distant receptors. At a distance of 1.5 miles, Substation noise would be inaudible.

Corona Noise

The project proposes overhead transmission lines ranging from 34.5 kV to 230 kV to match the voltage of the existing PG&E 230 kV line. A short 230kv line interconnection to the existing system will be installed at the sub/switching. The remainder of the line that runs north to south within the Project Site would be a 34.5 KV.

The localized electric field near an energized conductor can be sufficiently concentrated to produce a small electric discharge, which can ionize air close to the conductors. This effect is called corona, and it is associated with all energized electric power lines. Corona can result in the production of small amounts of sound. Corona noise is typically characterized as a hissing or crackling sound, which may be accompanied by a 120-hertz hum. Slight irregularities or water droplets on the conductor and/or insulator surface accentuate the electric field strength near the conductor surface, making corona discharge and the associated audible noise more likely. Therefore, audible noise levels from transmission lines are generally higher during wet weather.

Using computer modeling software developed by the Bonneville Power Administration (BPA)[6], audible noise values can be calculated for transmission lines experiencing corona activity. This modeling indicates that, during wet weather conditions, audible noise levels of up to 46 dBA would occur within the ROW for a transmission line operating at 230 kV. The 34.5 kV lines would likely be inaudible outside the ROW. Noise from lower voltage lines and/or during dry conditions would be lower.

At the closest residence, located more than 2,000 feet from the proposed lines, noise levels from the 230 kV lines would be 25 to 35 dBA lower than the levels within the ROW, resulting in levels that are well below ambient noise levels and most likely inaudible.

Shielding by buildings or terrain can provide an additional 5 to 10 dBA or more noise reduction at distant receptors.

Other Operations and Maintenance Activities

The Project anticipates employing up to 12 full-time employees. Operation and maintenance activities would generally occur during normal workday hours from Monday to Friday. Turbines would be monitored and controlled 24 hours a day, seven days a week, using a remote off-site monitoring system. This system would allow a remote operator to perform self-diagnostic tests and system checks, establish operating parameters, and ensure that the turbines are operating at peak performance. In the event of winds or gusts above the maximum operating parameters, the turbines would automatically shut down.

Routine maintenance activities are expected to include, but not be limited to: checking torque on tower bolts and anchors; checking for cracks and other signs of stress on the turbine tower and other turbine components; inspecting for leakage of lubricants, hydraulic fluids and other hazardous materials, and replacing them as necessary; inspecting the grounding cables, wire ropes and clips, and surge arrestors; cleaning; and repainting. Most routine maintenance activities would occur within and around the tower and the nacelle. Cleanup from routine maintenance activities would be performed at the time maintenance was performed. While performing most routine maintenance activities, staff would travel via pickup or other light-duty trucks.

Each turbine would also be serviced twice a year, or as needed. Turbine servicing would require maintenance staff to climb towers and service turbine parts by performing activities such as removing the turbine rotor and replacing generators and bearings. Scheduled maintenance may require the use of a crane within the 65- to 95-foot diameter areas around the turbines.

Although unlikely, non-routine maintenance such as repair or replacement of rotors or other major components could become necessary. Such maintenance would involve use of one or more cranes and equipment transport vehicles, though the cranes would not be as large as the track-mounted cranes needed to erect the turbine towers. Permanent access roads would be periodically graded and compacted in order to minimize erosion. Catch basins, roadway ditches, and culverts would be cleaned and maintained regularly

The addition of 12 vehicles daily spread throughout the existing logging roadway network in the vicinity of the Project would not be anticipated to measurably change the noise environment (increase would be less than 1 dBA L_{dn}). Maintenance operations would be located as close as about 2,000 feet from existing residences. Maintenance noise levels were calculated using the Federal Highway Administration (FHWA) software - Roadway Construction Noise Model (RCNM). A crane is calculated to generate a maximum instantaneous noise level of 49 dBA L_{max} and 41 dBA L_{eq} at a distance of 2,000 feet, not taking into account any noise reduction from intervening shielding by structures or terrain. Maintenance operations would be occasional at each individual turbine, with servicing occurring only twice a year. Although maintenance operations may occasionally be audible during quiet ambient conditions when located nearest noise sensitive locations, ambient noise levels would not be affected on an hourly or daily average basis.

NOISE GENERATED DURING CONSTRUCTION

Neither Shasta County nor the State of California specify quantitative thresholds for the impact of temporary increases in noise due to construction. The threshold for speech interference indoors is 45 dBA. Assuming a 15 dB exterior-to-interior reduction for standard residential construction with windows open and a 25 dB exterior-to-interior reduction for standard commercial construction, assuming windows closed, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses. Therefore, the Project would be considered to generate a significant temporary construction noise impact if Project construction activities exceeded 60 dBA L_{eq} at nearby residences and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

The Project construction period is expected to last 18 to 24 months. Construction would be completed during daylight hours, typically from 7:00 am to 5:00 pm but may be earlier or later during the summer months. There may be circumstances where these hours need to be extended earlier or later, such as during the delivery of superloads, and nighttime construction may occur to avoid traffic, adjust for high winds during daylight hours, and to facilitate schedule. The construction workforce is estimated to include up to 400 construction workers at any given time.

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

Project construction activities would include grading, widening of existing and construction of new access roads, transportation of turbine components, clearing of laydown areas, construction of turbine foundations, assembly and erection of turbines, construction of substation and O&M Building, and installation of the underground and overhead collection system. Blasting and helicopters may be necessary in some areas. Pile driving is not anticipated as a method of construction.

Heavy Equipment Use

During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at 50 feet for equipment likely to be used in the construction of a wind facility are shown in Table 9. Most demolition and construction activities at a wind turbine facility generate noise levels in the range of 80 to 85 dBA L_{max} at 50 feet from the source. Hourly average noise levels would also be in the range of 80 to 85 dBA L_{eq} during periods of heavy construction.[7] Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain can provide an additional 5 to 20 dBA noise reduction at distant receptors.

TABLE 9 Construction Equipment 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Backhoe	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Grader	85	Continuous
Paver	85	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Truck (dump, delivery)	84	Continuous
Vibratory Compactor	80	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

[1] Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.

[2] Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

[3] Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

Source: Mitigation of Nighttime Construction Noise, Vibrations and Other Nuisances, National Cooperative Highway Research Program, 1999.

The closest residences are located approximately 2,000 feet from turbine construction areas. At this distance, hourly average noise levels from heavy construction activities would be in the range of 48 to 53 dBA L_{eq}, not taking into account any shielding from intervening terrain or structures. These noise levels could, at times, be audible at receptors, particularly during nighttime construction activities, but would not be anticipated to cause sleep or speech interference or affect the overall ambient noise levels in these locations. Construction activities at any individual turbine location would be limited to a relatively short period of time as construction proceeds to other turbines throughout the Project Site.

The closest existing residences to Substation and O&M Building construction are 1.5 miles to the northwest and southwest from the Substation location. At this distance, construction noise levels would be less than 40 dBA L_{eq} and would not be anticipated to be distinguishable from ambient noise levels.

Roadway construction activities could occur as close as 580 (LT-2) to 1,170 (R-4) feet from the nearest residences. At a distance of 580 feet, noise from heavy construction activities would be in the range of 59 to 64 dBA L_{eq}, not taking into account any shielding from intervening terrain or structures. At 1,170 feet, noise from heavy construction activities would be in the range of 53 to 58 dBA L_{eq}. Roadway construction would typically occur for relatively short periods of time in any specific location as construction proceeds along the roadway. Although construction located nearest residences would not be expected to cause sleep or speech interferences, noise levels could exceed ambient levels by as much as 20 dBA at LT-2 when construction is located adjacent to noise sensitive locations.

Construction Truck Trips

Construction traffic entering the Project Site will comprise of trips by construction workers, material delivery, and equipment delivery. All traffic will reach the site using SR 299. Three access roads are proposed to coincide with existing logging roads at the intersections with SR 299. Based on the available traffic volumes from Caltrans,[8] SR 299 carries an existing peak hour traffic volume of about 320 vehicles per hour with a truck percentage of 13.79%.

During construction, the project will employ an estimated 400 construction workers, project management staff, equipment operators, survey staff, and delivery vehicle drivers during the peak period, with the average number of workers on-site in the range of 325 workers. The material delivery vehicle trips will be spread out throughout the day. The maximum number of aggregate deliveries per day is approximately 90 deliveries (180 trips), constrained by the loading and unloading times. The maximum number of concrete deliveries per day is approximately 50 deliveries (100 trips), constrained by the rate that ready mix plants can batch concrete, and the rate the contractor can unload trucks. The maximum rate of deliveries is approximately 6 to 8 per hour, equivalent to placing a wind turbine foundation during a single work shift. The estimated total number of construction trips occurring over the 18 to 24 month construction period is projected to be 93,088 trips.

Construction and post-construction traffic volumes were provided in the project's traffic study.[9] The post-construction scenario would be equivalent to existing conditions, as it includes only a minimal number (6) of employees accessing the site for maintenance and operations. Based on a comparison between provided construction peak hour volumes and post construction peak hour volumes, project construction is calculated to result in a traffic noise increase of about 2 dBA on SR 299 in the vicinity of the site. This increase would be below the County's 3 dBA L_{dn} and 5 dBA L_{dn} thresholds for noise increases due to permanent project operations.

Construction traffic peak hour volumes on the existing logging roads are anticipated to increase from 24 to 40 trips on the west access road, 12 to 128 trips on the north access road, and 12 to 273 trips on the east access road. Assuming a worst-case analysis with 50% of these vehicles (both existing and project construction vehicles) being heavy trucks, the calculated noise levels at a distance of 50 feet from the center of the road would be 58 dBA L_{eq} on the west access road, 63 dBA L_{eq} on the north access road, and 66 dBA L_{eq} on the east access road.

Ambient noise levels at receptors along local access roads are below 60 dBA L_{dn}; therefore, the 5 dBA increase threshold would apply. The closest residence to the west access road (represented by LT-1) is located about 300 feet from the center of the road. At this distance, the peak hour noise level generated by the 28 project construction related trips (14 light vehicles and 14 heavy trucks) would be 44 dBA L_{eq}. The existing daytime peak hour noise level at this residence ranges from 43 to 49 dBA L_{eq} (see Table 5 and Appendix A). The resulting peak hour noise levels with combined ambient and project construction traffic noise levels would be 47 to 50 dBA L_{eq}. This would equate to a 1 to 4 dBA noise increase above existing ambient levels, which would be below the 5 dBA threshold. Considering construction is proposed to occur during daytime hours, noise increases on a day-night average (L_{dn}) basis would be lower. If construction activities were required during nighttime hours, construction traffic could be redirected to use alternative access routes such as the north and east access roads to avoid construction-related noise near residential uses. There are no noise sensitive

receptors adjacent to the north and east access roads, therefore use of these roads, even during night time hours would not exceed ambient noise standards for residential uses.

Helicopter Use

Helicopters may be used to string overhead collector lines. Helicopter overflights could generate noise levels of up to 100 dBA at a distance of 100 feet.[10] Helicopter overflights and activities would be intermittent and would not be located at a single location for any extended period. Noise levels, attenuating at approximately 6 dBA per doubling of distance, would be approximately 74 dBA at 2,000 feet. This noise level would be anticipated to cause speech interference outdoors and sleep disturbance indoors, assuming a 15 dBA exterior-to-interior noise reduction with windows partially open.

Blasting

In rocky areas, blasting may be necessary to loosen rock before excavation. If blasting is necessary, a Blasting Plan would be prepared to identify the locations that are anticipated to require blasting. All applicable federal, state, and local regulations for blasting procedures would be identified in the Blasting Plan and would be followed. The Blasting Plan also would specify the times and distances where explosives would be permitted to avoid impacts to environmental sensitivities and the human environment. The County and emergency responders would be notified in accordance to the blasting plan, but at the very least no later than at least 24-hours in advance of blasting.

When blasting occurs at large distances from sensitive structures, the primary concern is cosmetic damage to structures. Cosmetic damage (e.g., minor cracking in plastered walls) can occur as a result of ground-borne vibration or acoustic overpressures. The US Bureau of Mines has analyzed the effects of blast-induced vibration on buildings in USBM RI 8507[11], and these findings have been applied to vibrations emanating from construction equipment on buildings[12]. Figure 6 presents the damage probability as reported in USBM RI 8507 and reproduced by Dowding. California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for structurally sound buildings designed to modern engineering standards, and 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern. The more conservative limit (0.3 in/sec PPV) is used in this analysis. As indicated in Figure 6, the US Bureau of Mines studies indicate no observations of “threshold damage” (referred to as cosmetic damage elsewhere in this report), “minor damage” or “major damage” at vibration levels of 0.4 in/sec PPV or less.

<u>Blasting Vibration Levels</u>
Vibration from blasting events on the Project Site were calculated using methods established by the former US Bureau of Mines. Ground vibration levels were calculated using the following equation, representing the upper range of levels established by the US Bureau of Mines for various soil conditions:

$$PPV = 300 \times (D/W^{1/2})^{-1.6}$$

Where: PPV = Peak Particle Velocity (in/sec)
D = Distance from explosive charge to receptor (ft)
W = Weight of explosive charge per delay (lbs)

Blasting could be located as close as 2,000 feet from existing residential areas. Calculated ground vibration levels are summarized in Table 10 for a variety of charge weights and distances. Receptors located further from blasting activities would experience lower vibration levels.

TABLE 10 Worst-Case Blasting Ground Vibration Levels, in/sec PPV

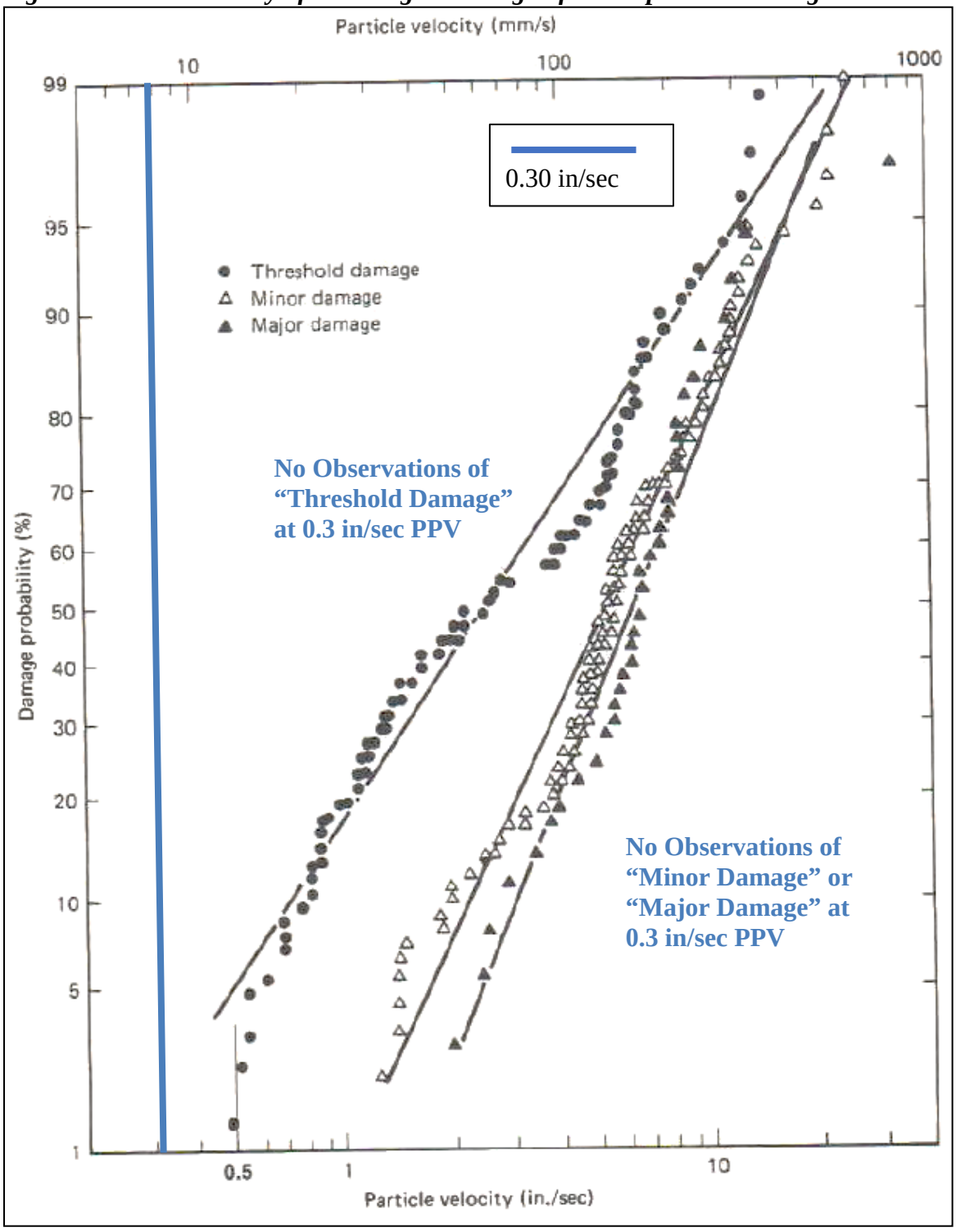
Distance, ft	Blasting Level (in/sec PPV) for Various Explosive Charge Weights per Delay (lbs)		
	175 lbs	**350 lbs**	**700 lbs**
2,000 feet	0.098	0.170	0.296
3,000 feet	0.051	0.089	0.155
4,000 feet	0.032	0.056	0.098

As shown in Table 10, worst-case blasting, using a charge weight of 700 lbs/delay within 2,000 feet of sensitive structures, could generate groundborne vibration levels as high as 0.296 in/sec PPV. These vibration levels would be below the 0.3 in/sec PPV threshold. As indicated in Figure 6, structures adjacent to potential blast areas would be unlikely to experience any level of cosmetic or structural damage, assuming a maximum vibration level of 0.3 in/sec PPV. Vibration levels would be lower at locations further from blasting or when lower charge weights are used.

Blasting Noise Levels

For blasts previously monitored by Illingworth & Rodkin, Inc. in Northern California, the highest peak overpressure was 116 dB(L) at 2,240 feet. Noise from blasting events would be anticipated to drop off at a rate of about 6 dB per doubling of distance. At the closest residences to potential blasting, located 2,000 feet from the nearest wind turbine construction area, peak overpressures of about 117 dB(L) would be anticipated, which are well below the 133 dB(L) criteria to avoid damage. Peak overpressure is controlled by charge confinement. The standard procedure for confining the charge is to place the explosives deep in the drilled blast hole and then to backfill the remainder of the hole with crushed rock. Assuming standard blast confinement techniques are used, Project-related damage from acoustic overpressures is not expected for any residence. Although these low frequency overpressures could potentially be audible, the Shasta County noise criteria do not apply to this type of impulsive noise. While residents may occasionally hear sounds from blasting events, these sounds would occur on an infrequent basis during construction. These brief intermittent events would not be expected to substantially increase hourly average or daily average noise levels.

Figure 6 Probability of Cracking and Fatigue from Repetitive Loading



Source: Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996 as modified by Illingworth & Rodkin, Inc., March 2019.

RECOMMENDED NOISE REDUCTION MEASURES

Implementation of the following best management practices for construction would reduce construction noise levels emanating from the site and minimize disruption of nearby residents.

- Limit construction operations located within 2,500 feet of residences to daytime hours only.

- Minimize helicopter use, as feasible.

- Prohibit nighttime helicopter use.

SUMMARY

Based on the above findings, noise associated with Project operations is not expected to exceed Shasta County noise standards or the supplementary criteria for low frequency and infrasonic noise at any residential property in the site vicinity. However, use of helicopters during construction and any nighttime construction located within 2,500 feet of residences would have the potential to cause sleep and/or speech interference. Noise reduction measures, including limiting helicopter and heavy construction near residential areas to daytime hours and minimizing helicopter use, are provided to minimize disruption and annoyance during construction.

REFERENCES

[1] International Electrotechnical Commission, "Wind Turbine Generator Systems- Part 11: Acoustic Noise Measurement Techniques", IEC 61400-11, IEC, Geneva Switzerland, 2002.

[2] K. Waye, "Perception and Environmental Impact of Wind Turbine Noise", Proceedings of Inter Noise 2009, International Institute of Noise Control Engineering, Ottawa, Canada, August 2009.

[3] Standard Conditions of Approval for Wind Farm Permits, Item 16, Alameda County, May 1998.

[4] Development Standards and Conditions, Section 19.64.140, Chapter 19.64 Wind Energy (WE) Combining District, Title 19 Zoning, the Ordinance Code of Kern County, California, June 15, 2006.

[5] Montezuma Wind Project Draft & Final Environmental Impact, Noise Technical Report available at: http://www.co.solano.ca.us/resources/ResourceManagement/Montezuma/Volume%20II%20-%20Appendices/08%20-%20Appendix%20F%20-%20Noise.pdf.

[6] Bonneville Power Administration, Field Effects Calculation Tool, 1977.

[7] U.S. E. P. A., Legal Compilation on Noise, Volume 1, 1973.

[8] CalTrans Traffic Census Program, https://dot.ca.gov/programs/traffic-operations/census/traffic-volumes/2017/route-280-405, 2017.

[9] Traffic Study, Fountain Wind Project, Westwood, November 22, 2019.

[10] Federal Agency Review of Selected Airport Noise Analysis Issues, Federal Interagency Committee e on Noise, August 1992.

[11] Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding, Structure Response and Damage Produced by Ground Vibration form Surface Mine Blasting, RI 8507, Bureau of Mines Report of Investigations, U.S. Department of the Interior Bureau of Mines, Washington, D.C., 1980.

[12] Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996.

Appendix H
Transportation

Westwood

TRAFFIC STUDY

Fountain Wind Power

Shasta County, California

February 11, 2020

Prepared For:

ConnectGEN

Westwood

Traffic Study

Fountain Wind Project

Shasta County, California
Project Number: 0023714.00
Date: 2/11/2020

ADMINISTRATIVE DRAFT

Prepared for:

ConnectGEN

Prepared by:

Westwood

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1.0 INTRODUCTION

The Fountain Wind project is proposed as a 216 MW wind project consisting of up to 72 wind turbines with associated access roads, collection system, meteorological (MET) towers, operations and maintenance facility (O&M), staging yards, substation, and interconnection. The construction of the Fountain Wind project will generally require conventional construction worker personal vehicles, logging trucks, aggregate dump trucks, concrete ready-mix trucks, and single unit and semi-tractor trailer trucks, crawler cranes and a few specialized transportation vehicles for the oversize/overweight vehicles associated with the delivery of wind turbine components. The other anticipated oversized deliveries will be the substation main power transformers (MPTs).

The scope of this report is to determine the total number of vehicles entering the project site from public roads and to calculate the approximate peak hourly traffic entering the site from public roads. Trips are summarized as trips each way. Trips for both the delivery and removal of equipment, field offices, and temporary aggregate surfaces are shown.

2.0 TRAFFIC PROJECTION

Traffic entering the project site will comprise trips by construction workers, materials delivery, and equipment delivery. Materials deliveries include aggregate, concrete, and water, as well as turbines, electrical equipment and cables, and items such as reinforcing steel and forms for concrete foundations.

All traffic will reach the site using State Route (SR) 299 (See Exhibit 1). Manufactured components will likely originate from Interstate 5 (I-5) to the west or from US 395 and SR 139 to the east. The direction of turbine component deliveries is assumed to be from the Port of Stockton, CA. Locally sourced materials such as aggregate and water will likely come from Burney, approximately 6 miles to the east of the project site, or from pits and quarries east of Burney. If the concrete is not batched on-site, there are several concrete plants in Redding about 35 miles to the west of the project site that will likely be the source. Project workers will most likely commute from both east and west of the project. Redding is the largest town in the region. Other towns west of the project are very small and not likely to be able to accommodate many project workers. Several small towns including Burney, Fall River Mills, and McArthur are located east of the project and may also accommodate some project workers. For this study the split for commuting traffic is assumed to be 60 percent from the west and 40 percent from the east on SR-299. (See Exhibit 1.)

Three access roads are proposed to coincide with existing logging roads at the intersections with SR-299. The West Access is proposed along a road called G Line, which intersects with SR-299 approximately 37 miles east of the interchange with I-5 in Redding. There is a widened shoulder at this intersection, but no turn lanes.

The North Access is approximately three miles east of the West Access. This access is proposed along an existing and unnamed logging road that intersects SR-299 just to the east of Little Hatchet Creek. As with the West Access, there is a widened shoulder at this access, but no turn lanes.

The East Access is approximately two miles east of the North Access and approximately eight miles west of Burney. This access is proposed along an existing and unnamed logging road that provides access to the area south of SR-299. As with the other access points, there is a widened shoulder at this access, but no turn lanes.

The West and East Access roads will serve the majority of the turbines of the Fountain Wind project. The North Access will serve only a few wind turbines. As a result, the heaviest direction for peak hour traffic (eastbound) will make right turns from SR-299 onto the access roads, and the lighter direction of traffic (westbound) will make left turns from SR-299 into the project site.

As points of reference, the Shasta Green plant lies along SR-299 approximately 4.4 miles east of the East Access, and the Sierra Pacific Industries plant lies another 1.2 miles to the east of that. The Shasta Green plant has both eastbound and westbound turn lanes along SR-299. The Sierra Pacific Industries plant has no turn lanes.

The nearby Hatchet Ridge Wind Farm accesses SR-299 at Bunch Grass Lookout Road. This access is approximately one mile east of the East Access road for the Fountain Wind project. Both eastbound and westbound turn lanes serve the Hatchet Ridge access. It is noted that this is a four-way intersection on SR-299, with Terry Mill Road accessing to the south.

3.0 EXISTING TRAFFIC CONDITIONS

According to the Caltrans 2017 listing of traffic volumes (see Exhibit 2), urban centers on each end of SR 229 record the highest traffic volumes, then diminish significantly in the rural and mountainous areas in between. Between I-5, in Redding and Plumas Street, in Burney, California, there are 9 daily and peak hour count locations listed.[1]

The highest existing annual average daily traffic (AADT) on SR-299 is 21,000 vehicles per day at I-5 in Redding where the highway has a four-lane freeway alignment.[2] The peak hour volume is 2,150 vehicles per hour. The base capacity of a freeway segment is

[1] CalTrans Traffic Census Program.
[2] CalTrans Traffic Census Program, https://dot.ca.gov/programs/traffic-operations/census/traffic-volumes/2017/route-280-405, 2017.

2,300 passenger cars/hour/lane; which, for a four-lane section, would equal 9,200 vehicles per hour.[3]

The base capacity of a two-lane rural roadway segment is 2,000 passenger cars/hour/lane; which, for a two-lane section, would equal 4,000 vehicles per hour. In the two-lane rural section of SR-299 between Deschutes Road (on the east edge of Redding) and Elm Street (on the west edge of Burney), the peak hour volume never exceeds 490 vehicles per hour (See Exhibit 2).

The three access roads for the Fountain Wind project are all located within the segment of SR-299 between Big Bend Road and Tamarack Road. CalTrans has listed AADT and peak hour volumes for this segment as 3,000 vehicles per day and 320 vehicles per hour, respectively. (See Tamarack Road volumes in Exhibit 2.)

Heavy vehicle traffic does constitute a notable percentage of the background traffic on this segment of SR-299. At Mile Post 72.64 west of Burney, the heavy vehicle percentage on SR-299 was recorded in 2014 as 13.79%.[4]

4.0 CONSTRCUTION TRAFFIC OVERVIEW

Westwood estimated the full construction period traffic volume based on the types of delivery, construction, operations, maintenance and worker vehicles required during the various phases of the project. Westwood estimated trips into and out of the development area based on the projected number of deliveries, the required types of equipment and material, and the projected number of employees necessary to complete the project over the estimated construction period. Typically, the selected construction contractor will determine the project timeline. These volumes of trips were calculated using a spreadsheet that lists every known phase of construction with corresponding equipment, material and numbers of employees, which are then averaged over the course of the project period.

During construction, the project will employ an estimated 400 construction workers, project management staff, equipment operators, survey staff, and delivery vehicle drivers during the peak period, with the average number of workers on-site in the range of 325 based on preliminary schedule development. The calculation of workers and delivery vehicles was developed using a construction estimation based on time and materials and using crew productivity data from RS Means. The total number of trips was determined by using the number of employees in each of the categories listed above, dividing that number by an estimated vehicle occupancy (2.0 for survey crews;

[3] Highway Capacity Manual, 6th Edition (2018), c(basic freeway segment) = 2,200 + 10 * (Free-Flow Speed$_{adj}$ – 50) = 2,300 passenger cars/hour/lane
[4] CalTrans Planning Profile, ArcGIS.

1.5 for all other categories, except for delivery vehicles with an occupancy of 1.0) and multiplying by the number of work days for each employee category.

As a result, the estimated number of work days and total number of trips for each category are:

- 100 days for survey (400 total trips);
- 250 days for construction trades (24,000 total trips);
- 250 days for project management staff (2,500 total trips);
- 200 days for equipment operators (6,267 total trips);
- 250 days for small equipment on flatbed trailers (1,250 total trips); and
- 230 days for deliveries (56,079 total trips).

Thus, over the estimated two-year construction period, the total number of all trips could be approximately 93,088 trips.

After construction of the wind farm, operations and maintenance traffic will be limited to a few passenger vehicle trips per day.

General summaries of the construction work tasks and related delivery and construction vehicles are listed below.

4.1 WORK TASKS

Work Tasks are generally listed in chronological order, but extensive overlap can be expected depending on the contractor scheduling.

- Survey project site and set construction stakes
- Install and maintain erosion and sediment control
- Timber removal/clear and grub laydown, substations, O&M, access roads, and turbine pads areas
- Grade field office and O&M locations
- Deliver and Install Field Office trailers
- Grade temporary laydown areas
- Improve logging roads/construct access roads – grade and place aggregate
- Erect security fencing – enclosing laydown yards and facilities
- Excavate turbine foundations
- Place foundation mud mat
- Place foundation reinforcing
- Place foundation forms
- Place foundation concrete
- Strip forms
- Backfill foundations
- Unload turbine components
- Erect turbine tower sections using base crane

- Erect top turbine tower section, nacelle, hub, and blades using topping crane
- Grade transformer pad areas
- Install turbine transformers
- Connect turbine to transformer wiring
- Grade substation and switching substation areas
- Construct substation and O&M foundations
- Trench underground collector system (34.5kV)
- Install overhead collection system lines (34.5kV)
- Construct O&M Facility
- Construct substation and switching substation equipment and main power transformer foundations
- Install step-up substation and switching substation equipment and Supervisory Control and Data Acquisition (SCADA)
- Place step-up substation and switching substation aggregate
- Install security fence around step-up substation and switching substation
- Connect step-up substation to switching substation
- Connect switching substation to transmission line
- Test and commission equipment
- Remove field offices, security fencing, and replace topsoil
- Remove staging area security fences and replace topsoil
- Restore, revegetate, and remove temporary erosion and sediment control

4.2 CONSTRUCTION EQUIPMENT

Examples of the types of equipment generally used in wind farm construction are listed below. Exhibit 3 in the Appendix lists the number and type of equipment assumed for construction:

- Survey – one pick-up truck for each 2 person crew
- Erosion and sediment control – silt fence trenchers
- Timber harvest/removal – typical forestry equipment such as feller-bunchers, shears, skidders, hydro-axe, and logging trucks
- Grading (field office location, staging areas, O&M facility, step-up substation, and switching substation) – medium bulldozers, scrapers, road grader, compaction rollers, and water trucks
- Logging road/access road improvements – medium bulldozers, road grader, scrapers, compaction rollers, and water trucks
- Materials handling equipment (unloading wind turbine components) – hydraulic (helper) cranes, small flat-bed trailers pulled by pick-up trucks, heavy crawler cranes
- Security fencing – skid-steer with auger attachment, and hydraulic post driver attachment, and hand tools for each crew
- Turbine foundations – medium bulldozer, excavator, hydraulic crane, and concrete pump truck

- Tower base erection – hydraulic (helper) cranes and base crane
- Tower top/nacelle/hub/blades erection – hydraulic cranes and topper crane
- Pad mounted transformers at each turbine – truck mounted or mobile hydraulic crane
- Turbine wiring – hand tools
- 34.5 kV underground collector trenching – specialized trenching equipment, cable plows, and back hoes, cable reel trailers
- 34.5 kV overhead collection line – backhoe with auger attachment, specialized pole setting equipment (boom trucks), bucket trucks, cable reel trailers
- O&M and substation equipment foundations – back hoe
- Substation construction – bulldozer, backhoe, compaction roller, water trucks, mobile hydraulic crane, large crane (MPT)
- Switching substation construction – bulldozers, backhoes, compaction rollers, water trucks, mobile hydraulic crane
- Substation to interconnect transmission line – foundation auger mounted on back hoe, mobile hydraulic crane
- O&M Building – mobile hydraulic crane
- Removal of temporary aggregate (field office location and staging areas) – Front end loader
- Revegetation and removal of erosion and sediment control – chisel plow (decompaction), small tractor and tilling equipment, skid steer loader, hydro seeding/hydro-mulching equipment

4.3 MATERIALS

Examples of materials used in the construction of wind farms is listed below. Exhibit 3 in the Appendix lists the materials assumed for construction:

- Silt fence, bio log, and other erosion and sediment control materials
- Aggregate (access roads, staging areas, O&M facility, substations)
- Security fencing (field office location, staging areas, substations)
- Field Offices and storage trailers
- Formwork for foundations (equipment pads, O&M, substation transformers and equipment, and switching substation equipment)
- Rebar for above concrete foundations
- Concrete for wind turbine foundations and transformer pads
- Concrete for O&M facility foundation
- Concrete for substation foundations (Main Power Transformer (MPT), electrical equipment, and control building)
- O&M Building materials
- Collection system wiring (underground and overhead)
- Electrical equipment (transformers, switch gear, circuit breakers, junction boxes, conduit, SCADA, etc.)
- Structural steel for substation racking

- Structural steel poles for overhead collection line
- Main power transformers
- Transmission line cables (from switching substation to transmission line)
- Water for aggregate/backfill compaction, vegetation establishment, and dust control
- Miscellaneous consumables
- Plant stock, seed, and mulch

4.4 MATERIAL DELIVERY VEHICLES

The types of vehicles used for material deliveries is listed below. Exhibit 3 in the Appendix lists the material delivery vehicles assumed for construction:

- Semi-Trailer Flatbed Trucks for hauling logs off of site
- Single Unit Flatbed Trucks - Erosion and sediment control materials, plant stock, seed, and mulch, miscellaneous consumables
- Gravel Semi-Trailer Dump Trucks with a 16 cubic yard load capacity (loose volume) with an approximate gross vehicle weight of 80,000 pounds and a load weight of approximately 40,000 pounds.
- Field office trailers (one 40’ x 12’ for PM use; 12’ x 36’ triple wide for subs use)
- Concrete Trucks- with a 10 CY capacity, weighing approximately 69,000 pounds
- Semi-Trailer Flat Bed – security fence, concrete forms, rebar, O&M building components, transformers, miscellaneous turbine materials, structural steel for substations, electrical equipment for substation, - Non-permit load size 8’-6” x 8’-6” x 48’-0”, gross vehicle weight 80,000 pounds, up to 45,000 pound loads
- Cable trailers – 34.5 kV underground, 34.5 kV overhead, and overhead transmission from switching substation to transmission line
- Overhead collection system pole trailers
- Water trucks – 4000 gallon capacity, single unit tank trucks, weighing approximately 59,000 pounds
- Lowboy Multi-Axel Trailer –Main power transformer, substation control building
- Workers’ trucks (Pick-up trucks –average 1.5 occupants)

4.5 EQUIPMENT DELIVERY VEHICLES

Types of vehicles used for the delivery of construction equipment:

- Lowboy semi-trailer – Logging equipment, bulldozers, scrapers, compaction rollers, road grader, excavator, trenching equipment, backhoes, hydraulic (helper) cranes, crawler cranes, skid steer loaders, trenchers, cable plows, agricultural plows
- Single unit flatbed truck – Hydro much/hydro-seed equipment
- Small flatbed trailers towed behind pick-up trucks for small equipment and tools

5.0 CONSTRUCTION SCHEDULE

Construction of wind farms requires that a few tasks be repeated across the project site. Some sequencing of tasks is required, but many tasks may overlap across the site for efficient scheduling. The construction of the operations and maintenance facility, substation, switching substation, and underground and overhead collection systems can overlap with other tasks, or can be exceptions, depending on scheduling of and priority of precedent activities.

For the purpose of determining the daily volume of traffic, construction time is estimated to take approximately two years, with construction occurring only during the spring, summer and fall. Wind farm sites are large and allow many crews to work simultaneously without interfering with one another. Nevertheless, the size of the project (number of wind turbines) impacts the construction time significantly because the cost of mobilizing the large cranes required for turbine erection is high, and because the cranes are in such high demand that mobilizing a small number of cranes is typical on wind projects.

6.0 OVERSIZED LOADS AND PERMITTING

The logistics of delivering the oversized loads for the wind turbines, with the use of specialized transportation vehicles, also creates schedule constraints. A Transportation Management Plan would be prepared to minimize impacts from transportation of oversized loads and to direct deliveries to off-peak hours.

Trucks carrying turbine components such as blades and nacelles will be oversized and will be required to be accompanied by pilot cars. Oversized load transportation permits will be required from CalTrans.

These oversized trucks would likely be required to travel over bridges and overpasses. Weight and size limits may require detours in accordance with CalTrans direction. A logistical route analysis that focuses more on geometrics and bridge capacity will be performed following final selection of the turbine model to be used for the project. Because there is direct project access to the state highway, and the fact that the adjacent Hatchet Ridge project delivered oversized components along this same infrastructure indicates that the existing highway and bridge geometrics will likely be able to accommodate the planned deliveries. This will be verified by a logistical route survey when a turbine manufacturer, turbine model and contractor have been selected.

Westwood has contacted Caltrans' Office of Transportation Permits. This office reviews and approves oversize/overweight permits along state highways. They have responded that any specific weight and height limitations would only be determined once a contractor has been selected and a Route Request Permit defining the origin and

destination of the equipment/components is requested. The Caltrans variance coordinator will then review the request and issue the permit.

Variance permits are required for anything over 53 feet in length with a maximum kingpin of 43 feet. A variance permit would be required for each blade or component delivery.

Once the requested route permit has been received by Caltrans, it will take up to thirty days to review and issue the permit. Bridge ratings will be tested depending on the loads forecast for each component and delivery vehicle.

Also, the Transportation Permit office states that even though SR-299 is identified as a "Blue Route" and pilot cars will be assumed for each blade delivery vehicle, the contractor will likely be required to contract with the California Highway Patrol (CHP) for escorts.

As far as roadway connections to SR-299, Caltrans Transportation Permits Office noted that coordination with the District 2 Encroachments Office will be required to determine what additional planning or roadway improvements would be needed to accommodate the oversized loads. A "Swept Path Analysis" must be completed that shows turn-by-turn impacts that might be experienced by the oversized loads along SR-299 or at side road intersections.

In summary, the sizes and weights of the selected components, the dimensions of the vehicles delivering them, the delivery routes and the route surveys will be completed as part of the Caltrans application process.

Nevertheless, all deliveries of components and materials for the Fountain Wind project will be similar to those of the Hatchet Ridge project, with the exception of turbine blade deliveries. Fountain is proposing WTG ranging from 3-5.7MW. WTG models in the lower size range of those proposed will have similar blade lengths as the 2.3 MW Siemens WTGs constructed on Hatchet Ridge. The largest blade length proposed for Fountain would be approximately 261' in length, which would be approximately 90' longer than those delivered to Hatchet Ridge. Although Fountain may utilize longer blade lengths, the haul trucks will include rear-axle steering capabilities, thereby mitigating potential turning constraints.

CalTrans roads are designed to comply with the state Highway Design Manual. Vehicular design speeds are listed for various highway types. For conventional rural highways, the following design speeds are listed:

- Flat terrain 55-70 mph
- Rolling terrain 50-60 mph
- Mountainous terrain 40-50 mph

It is uncertain as to which design speed SR-299 is designed. It is likely that the design speed varies throughout its length – flat to rolling near Redding, rolling to mountainous near Montgomery Creek and Hillcrest.

According to the Caltrans Highway Design Manual, the k-value is the distance in feet required to achieve a 1% change in grade. Thus, the following k-values are listed under each condition:

- For stopping sight distances on crest vertical curves, the k-value = 68 feet when design speed is 40 mph
- For stopping sight distances on crest vertical curves, the k-value = 139 feet when design speed is 50 mph
- For stopping sight distances on sag vertical curves, the k-value = 62 feet when design speed is 40 mph
- For stopping sight distances on sag vertical curves, the k-value = 97 feet when design speed is 50 mph

According to a "desktop review", there appear to be no underpasses along SR-299 east of I-5. There are two overpasses, however – one at Churn Creek Road and one at Old Oregon Trail on the east side of Redding. Further to the east, there appear to be two creek crossings (Salt Creek Bridge 6-49 and Cedar Creek Bridge 6-20) along SR-299 between I-5 and the proposed access roadways for Fountain Wind. There is one creek crossing along SR-299 between the proposed access roads for Fountain Wind and Burney (Burney Creek Bridge 6-12). As of this writing, weight limits for these bridges have not been determined.

Regarding horizontal curves, a "desktop review" of SR-299 show two curves with radii less than 1,000 feet. SR-299 has a curve with a radius of approximately 600-foot near Montgomery Creek. SR-299 has a curve with a radius of approximately 700-foot near Hillcrest. Near Burney, there appears to be a curve with a radius of approximately 650 feet.

The speed limit along SR-299 is 55 mph for trucks with three or more axles, but there are places along SR-299 where the advisory speed drops to 40 and 45 mph approaching the sharper curves. Also, there are passing lanes at some of the steeper inclines.

The geometry resulting from the basic highway design criteria appears to exceed the requirements for turbine component delivery, which requires a minimum k-value in the range of 20 (and which comfortably falls within the k-values of the highway design above). Further, turbine component delivery specifications require a minimum horizontal curve of 200'. Therefore, while it appears there is little risk that the turbine delivery vehicles will not be able to navigate the existing geometry of the highway, a

route survey by a permit service and a "swept path" analysis will be able to verify this statement and support Caltrans permit authorizations.

Upon approach to the site, turbine deliveries will be directed to proceed directly to the appropriate turbine pad sites for offloading. Construction access points off SR-299 will provide adequate turning radii to ingress/egress the site with minimal time required for turning maneuvers. Because the turbine pad sites are distributed throughout the site and not directly adjacent to state SR-299, if queuing were to occur, it is expected that the queues would take place on access roads near the turbine pad sites – wholly within the project site.

7.0 CONSTRUCTION TRAFFIC MANAGEMENT PLAN

A Construction Traffic Management Plan (CTMP) will be developed and presented once the construction contractor has been selected. Upon selection, the contractor will review the site and available aggregate and water sources. The contractor will provide input on project staging and equipment delivery that will be incorporated and used to define the CTMP. Therefore, the CTMP will be specific to the construction approach and phasing, as well as specific to the location and environment, of the project area.

Specifically, the CTMP will be implemented for the Fountain Wind Project site during construction to address the safety requirements of the project. This plan will reflect the assessment conducted to define the plan, as well as the details of the plan itself. The CTMP will include:

- A consideration of the existing traffic, pedestrian, and cycling activity along SR-299 as well as the related road/intersection operations;
- A determination of the route from a safety perspective and emergency access perspective between staging/loading sites and proposed wind turbine sites;
- An articulation plan to manage construction traffic in a manner that minimizes the potential impact on local wildlife;
- The specific measures to be implemented during the construction phase of the project, which incorporate the principles and guidelines of the Caltrans Transportation Permits Manual; and
- Any additional environmental protection measures that the project proposed to further avoid or minimize potential impacts to traffic and safety. Appendix A of this report includes a list of potential Environmental Protection Measures (EPMs) that may be applicable for inclusion in the CTMP prepared for the Fountain Wind project.

The ConnectGen/Westwood Team will work with the contractor to ensure that key transportation considerations related to residents and businesses along SR-299 and within Shasta County and the planned construction of wind turbines are sensitive to the following:

- Potential conflicts between construction-related traffic and the day-to-day activities associated with the local area, including local travel by car, school bus, bicycle, or on foot as well as the movement of logging equipment;
- The need to ensure that local residents and emergency response agencies are aware of the temporary conditions during construction that could affect traffic mobility and safety on various parts of the county depending on the location of the work sites; and,
- The need to ensure that local wildlife and its habitat are not adversely impacted by the construction traffic associated with the project.

The ConnectGen/Westwood Team will work with the contractor to develop a public information strategy to ensure that communication of the traffic plan will be shared with the residents and businesses in the area. This includes installing Road Restriction Notice Signs near all work sites a minimum of one week prior to any lane closures or detours. This will allow residents to effectively plan their routes, and mitigate the overall impact caused by the work and deliveries to the site. An activity forecast report shall be provided to Shasta County outlining construction activity a minimum of two weeks prior to any work commencing.

8.0 ANALYSIS

Two forms of traffic analysis were conducted. Both **Level of Service** (LOS) and **Vehicle Miles Traveled** (VMT) were calculated for the three Project intersections during construction and post-construction. Westwood also tested each access for left turn warrants along SR-299.

A **Level of Service** (LOS) analysis measured delay per vehicle and operational performance. The LOS analysis was performed using the traffic engineering industry-standard software package *Synchro/SimTraffic* for AM and PM peak hour conditions for periods during and after construction. It is noted that LOS-A generally represents free-flow conditions, while LOS-F generally represents gridlock conditions.

To estimate peak hour conditions, Westwood reviewed historical traffic volumes for the segment, and found that peak hour volumes have not changed appreciably over the years.[5] Therefore, it is assumed background volumes will stay constant during and after construction of the wind farm. It was assumed that 60% of the peak hour background traffic would be coming to and from the west, while 40% would be coming to and from the east. Therefore, 192 background peak hour trips would approach from the west while 128 background peak hour trips would approach from the east.

Directional distribution of the construction, equipment and material delivery trips was made based on the number of projected wind turbines along each access road.

[5] Comparison of 2014 and 2017 CalTrans Traffic Volume Books.

Therefore, it was assumed that 62% of the construction trips would use the East Access road, 29% would use the West Access road and 9% would use the North Access road. Construction trips were assigned based on these percentages.

Figure 1 shows the resulting turning movements projected during the construction phase of the project. The red numbers indicate the a.m. peak hour directional flow (either left turn, through traffic or right turn). Likewise, blue numbers represent the p.m. peak hour turning volumes. Table 1 lists the resulting levels of service by both intersection and movement in the construction phase of the project.

Table 1 – Level of Service – During Construction

Intersection	Lane Assignment	Intersection Traffic Control	Construction Conditions							
			AM PEAK				PM PEAK			
			Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)	Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)
West Access & SR 299	EB Thru	N	4.8 sec/veh = LOS A	A	5.3	n.a.	2.2 sec/veh = LOS A	A	1.0	n.a.
	EB Right			A	3.9	n.a.		-	0.0	n.a.
	WB Left			A	4.2	77		-	0.0	n.a.
	WB Thru			A	3.8	77		A	1.4	n.a.
	NB Left			-	0.0	n.a.		A	7.6	55
	NB Right			-	0.0	n.a.		A	3.9	55
North Access & SR 299	EB Left	N	3.8 sec/veh = LOS A	A	5.0	46	2.6 sec/veh = LOS A	-	0.0	n.a.
	EB Thru			A	4.2	46		A	2.4	n.a.
	WB Thru			A	3.2	n.a.		A	2.5	n.a.
	WB Right			A	0.5	n.a.		-	0.0	n.a.
	SB Left			-	0.0	n.a.		A	7.7	46
	SB Right			-	0.0	n.a.		A	3.9	46
East Access & SR 299	EB Thru	N	7.2 sec/veh = LOS A	A	6.7	13	4.4 sec/veh = LOS A	A	2.3	n.a.
	EB Right			A	2.6	13		-	0.0	n.a.
	WB Left			B	11.2	94		-	0.0	n.a.
	WB Thru			A	8.8	94		A	1.3	n.a.
	NB Left			-	0.0	n.a.		A	8.8	108
	NB Right			-	0.0	n.a.		A	6.9	108

(Source: Westwood Professional Services, 2019)

Figure 2 shows the resulting turning movements projected during the post-construction phase of the project. Table 2 lists the resulting levels of service by both intersection and movement in the day-to-day operation and maintenance of the project.

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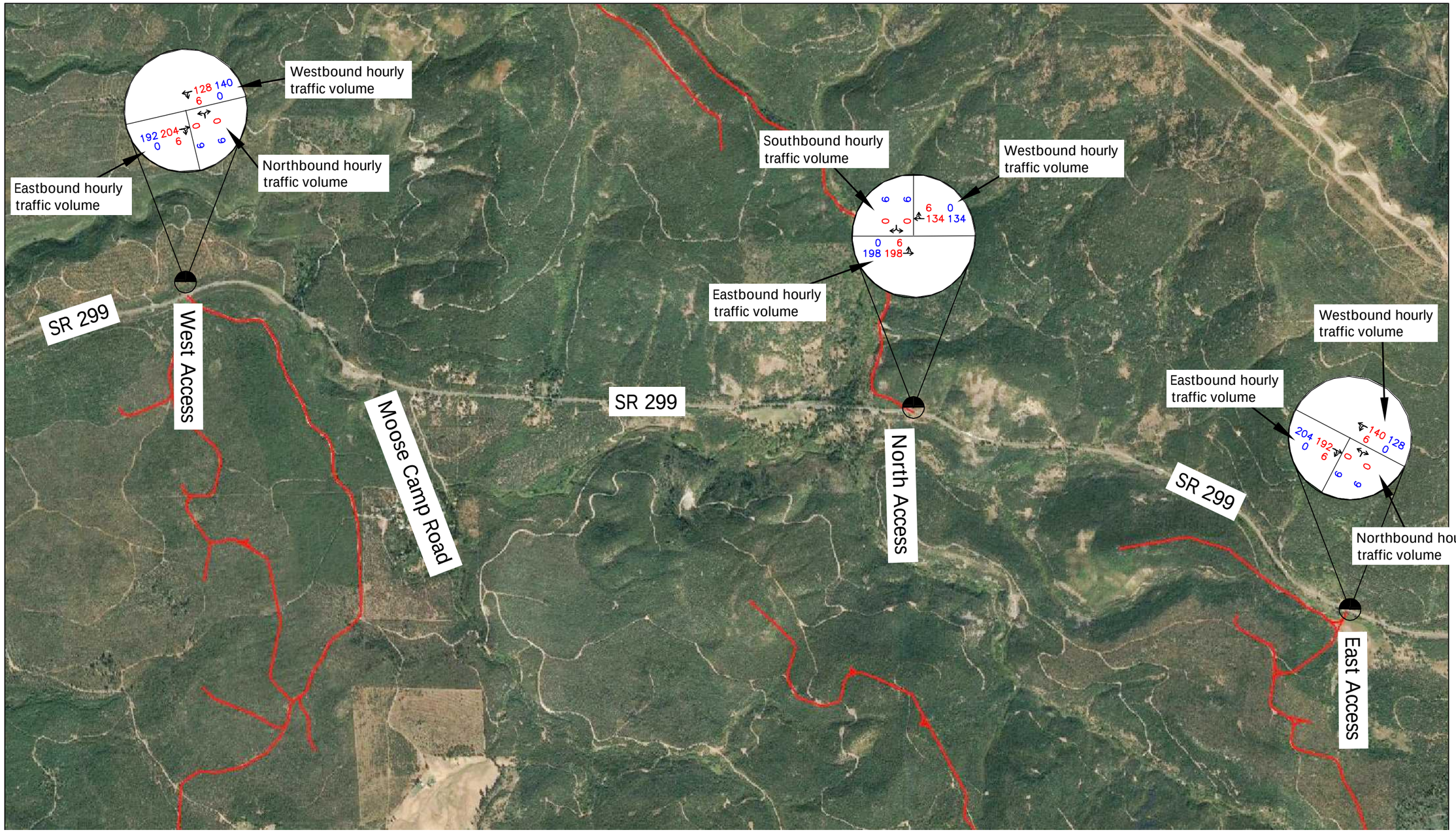

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Legend

LANE DESIGNATION	
AM PEAK HOUR TRAFFIC VOLUME	XX
PM PEAK HOUR TRAFFIC VOLUME	XX
SIGNALIZED INTERSECTION	
UNSIGNALIZED INTERSECTION	

0’ 2000’ 4000’

Fountain Wind Power

Shasta County, CA

Post Construction Peak Hour Conditions

Figure 2

Date: 11/14/19

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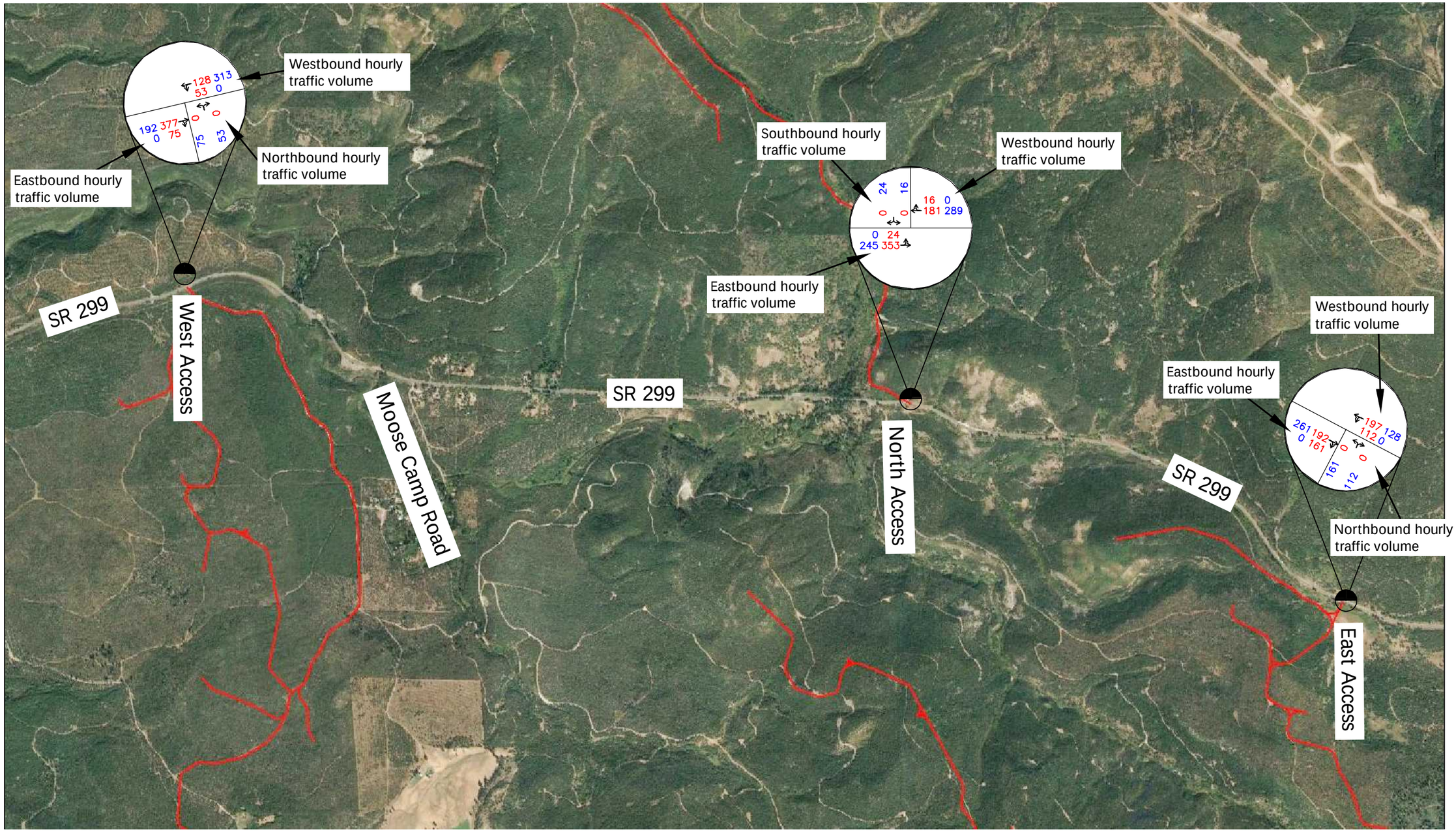

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AM PEAK HOUR TRAFFIC VOLUME	XX
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SIGNALIZED INTERSECTION	
UNSIGNALIZED INTERSECTION	

0' 2000' 4000'

Fountain Wind Power

Shasta County, CA

Construction Peak Hour Conditions

Figure 1

Date: 11/14/19

Table 2 – Level of Service – Post-Construction

Intersection	Lane Assignment	Intersection Traffic Control	Post Construction Conditions							
			AM PEAK				PM PEAK			
			Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)	Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)
West Access & SR 299	EB Thru	N	2.2 sec/veh = LOS A	A	2.9	n.a.	0.6 sec/veh = LOS A	A	0.4	n.a.
	EB Right			A	3.4	n.a.		-	0.0	n.a.
	WB Left			A	0.5	n.a.		-	0.0	n.a.
	WB Thru			A	1.0	n.a.		A	0.8	n.a.
	NB Left			-	0.0	n.a.		A	4.2	18
	NB Right			-	0.0	n.a.		A	1.9	18
North Access & SR 299	EB Left	N	2.7 sec/veh = LOS A	A	1.3	9	2.1 sec/veh = LOS A	-	0.0	n.a.
	EB Thru			A	2.6	9		A	2.1	n.a.
	WB Thru			A	2.8	n.a.		A	1.9	n.a.
	WB Right			A	1.4	n.a.		-	0.0	n.a.
	SB Left			-	0.0	n.a.		A	3.2	28
	SB Right			-	0.0	n.a.		A	2.4	28
East Access & SR 299	EB Thru	N	2.1 sec/veh = LOS A	A	1.5	n.a.	1.1 sec/veh = LOS A	A	1.3	n.a.
	EB Right			A	0.5	n.a.		-	0.0	n.a.
	WB Left			A	0.3	9		-	0.0	n.a.
	WB Thru			A	2.9	9		A	0.7	n.a.
	NB Left			-	0.0	n.a.		A	4.2	36
	NB Right			-	0.0	n.a.		A	2.1	36

(Source: Westwood Professional Services, 2019)

In the post-construction scenario, there are a minimal number of employees accessing the site for operations and maintenance activities. Therefore, it was assumed a total of six (6) operations and maintenance workers daily would be entering any of the access points during the AM peak hour from the east and west, and six would be exiting east/westbound during the PM peak hour.

Westwood also estimated **Vehicle Miles Traveled** (VMT). California Senate Bill 743 was signed into law in 2013 in order to utilize VMT to review the potential impact of land use projects on the State Highway System.

VMT is calculated by multiplying the amount of daily traffic on a roadway segment by the length of the segment, then summing all the segments (See Exhibit 3). Westwood estimated the number of trips taken by trucks and other vehicles to haul equipment, material, aggregate, turbines, concrete, water and employees. Westwood then estimated the mileage that would be logged to perform these trips during the two-year construction period.

For this analysis, it was assumed that turbine equipment and material would be delivered from the Port of Stockton, CA. The turbine equipment pick-up location will be finalized prior to construction, upon the selection of the turbine type to be used for the Project; however, the Port of Stockton provides a feasible and realistic turbine delivery location for the purpose of assessing transportation impacts. Similarly, the Project will identify the locations from where other equipment or material would be delivered prior

to construction, therefore, the VMT estimations were limited to the city of Redding on the west and the town of Burney on the east. From these calculations, it is estimated that the total VMT during the construction period will be **2,168,492 vehicle miles traveled**.

The material delivery vehicle trips will be spread out throughout the day. The maximum number of aggregate deliveries per day is approximately 90 deliveries, constrained by the loading and unloading times. The maximum number of concrete deliveries per day is approximately 50 deliveries (100 trips), constrained by the rate that ready mix plants can batch concrete, and the rate the contractor can unload trucks. The maximum rate of deliveries is approximately 6 to 8 per hour, equivalent to placing a wind turbine foundation during a single work shift.

The post-construction VMT will be much less. Westwood assumed there would be six (6) trucks per day utilized for operations and maintenance of the wind farm. It is assumed that each truck would be traveling 50 miles per day from their place of origin, to the wind farm for inspection, maintenance and operation, and then return. Therefore, the total VMT per day post-construction is assumed to be **300 vehicle miles traveled**. Per capita daily VMT for the permanent employees at the facility is estimated to be approximately **50 vehicle miles per day**.

It is unknown what VMT significance thresholds the County of Shasta will adopt for the construction and operational phases of the project, pursuant to the California Environmental Quality Act (CEQA). Naturally, travel to and from wind farms is increased during construction. However, travel to the wind farms is negligible post-construction. Any potential reduction in VMT would likely occur in the construction phase, through the implementation of carpooling and ridesharing, as applicable.

No significant environmental impacts are anticipated from the use of oversized vehicles to transport large turbine components.

To test whether any access required left turn lanes, Westwood utilized AASHTO Green Book, 2018 Edition Table 9-25, "Suggested Left-Turn Treatment Guidelines Based on Results from Benefit-Cost Evaluations for Intersections on Two-Lane Highways in Rural Areas".[6] Westwood calculated whether any project intersection met the guidance for left turns on the two-lane highway. Appendix B of this document shows that during the a.m. peak hour of the construction phase, each of the three intersections will meet the warranted volumes for left turn lanes on the two-lane highway. None of the intersections meets the warrants for left turn lanes during the p.m. peak hour.

[6] Table 9-25, Suggested Left-Turn Treatment Guidelines Based on Results from Benefit-Cost Evaluations for Intersections on Two-Lane Highways in Rural Areas, A Policy on Geometric Design of Highways and Streets, 7th Edition, American Association of State Highway and Transportation Officials, Washington, DC, 2018.

During the a.m. peak hour of the post construction phase, only the West Access and the East Access roads warrant left turn lanes on SR-299. Warrants for a left turn lane on SR-299 at the North Access road are only marginally met during the post construction phase. Again, none of the intersections meets the warrants for left turn lanes during the p.m. peak hour. The number of trips generated by the wind farm reduces significantly after construction, since this phase comprises operations and maintenance activities.

9.0 SIGNAGE

The number of trucks turning from SR-299 onto the access roads may require advance warning signs based on sight distance. CalTrans may require any of the following to signs to be installed along SR-299 in advance of the access roads during construction.

C44 W2-2 W2-3

(These signs may be black on orange for construction)

10.0 SUMMARY

The Appendix shows the types and numbers of vehicles projected for the construction of the Fountain Wind Project. The design of the project is preliminary, so material quantities are based on information contained in the permitting documents and preliminary CADD design files used to determine the feasibility of grading access roads and turbine pads. The specific assumptions for each line item are shown in the Notes/Assumptions column.

The project could generate approximately 93,100 trips during the duration of the 250 construction day period. Approximately 68,800 of these trips are commuting trips by the construction workers and project management staff. Aggregate is responsible for the largest portion of the material trips. Construction equipment deliveries account for a small amount of the trips, and turbine component deliveries account for only about 2,744 trips in the two-year period (excluding pilot cars). The maximum number of turbine component delivery trips is approximately 10 deliveries per day. These deliveries can be scheduled to avoid the peak hours.

For this analysis, it was assumed that turbine equipment and material would be delivered from the Port of Stockton, CA. Use of oversized trucks is anticipated to be

required to carry turbine components such as nacelle and turbine blades. It is assumed I-5 will be the primary delivery route to State Route 299 in Redding. Appropriate permits will be required from CalTrans.

SR-299 west of the project site will likely be the source for concrete, and other components, and a majority of the commuting trips. State Route 299 east of the project site will see a lesser percentage of trips than SR-299 west of the project site. Delivery of aggregate, water, and a share of the worker commuting trips may originate within, and to the east of Burney. Nevertheless, based on the relative sizes of, and distances to Redding and the small towns east of the project site, this traffic study estimated 60 percent of the construction worker traffic using SR-299 from the west, and 40 percent using SR-299 from the east of the project.

Based on a project duration of approximately 250 work days, peak hour vehicle counts would be approximately 453 trips each way per day, with the highest hourly volume of approximately 260 vehicles per hour during the morning and afternoon peaks on SR-299 from the west, and 181 vehicles per hour from the east. The majority of the peak hour project related trips are commuting trips. A portion of the commuting trips are likely to occur before the peak hour since it is customary on construction projects to begin work earlier than other types of work.

Left turn lanes are projected to be warranted on SR-299 at each of the access roads during the construction period. During the operations and maintenance phase post construction, only the East and West Access roads will warrant left turn lanes along SR-299. The North Access road only marginally warrants a left turn lane along SR-299 post construction.

Westwood looked at both levels of service (LOS) and vehicle miles traveled (VMT) in this analysis. In estimating LOS, Westwood assigned peak hour trips at each access road intersections with SR-299. In each case, the intersection level of service was acceptable in the construction and post-construction phase at each access.

Westwood also estimated vehicle miles traveled (VMT). Westwood projected the number of trips taken by trucks and other vehicles to haul equipment, material, aggregate, turbines, concrete, water and employees. Westwood then estimated the mileage that would be logged to perform these trips during the two-year construction period. It is estimated that the total VMT during the construction period could be **2,168,492 vehicle miles traveled**. The total VMT per day post-construction is assumed to be **300 vehicle miles traveled**. Per capita daily VMT during operations is estimated to be **32.49 miles per day**.

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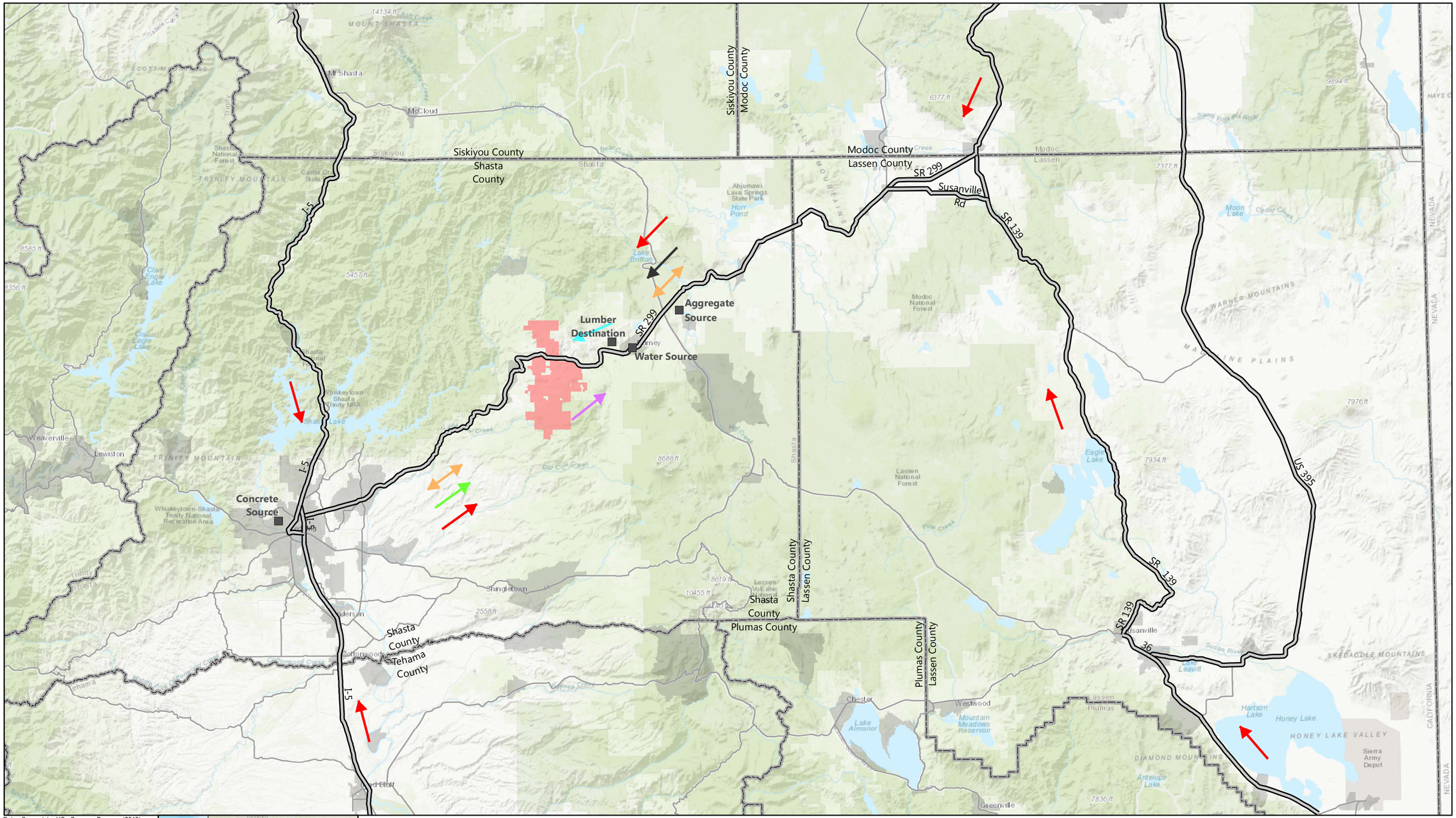

Data Source(s): US Census Bureau (2018); Westwood (2019); .

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Legend

- Worker Commute Route
- Aggregate Delivery Route
- Concrete Delivery Route
- Timber Removed Route
- Turbine/Other Delivery Route
- Water Delivery Route
- Project Boundary
- Material Location

N

0 Miles 10

Fountain Wind Project

Shasta County, California

Delivery Route

EXHIBIT 1

Map Document: N:\0012693.00\GIS\FW_DeliveryRoute_811_190315.mxd 3/15/19 1:40:33 PM NEObrien

Exhibit 2

Dist	Route	County	Post Mile	Description	Back Peak Hour	Back Peak Month	Back AADT	Ahead Peak Hour	Ahead Peak Month	Ahead AADT
1	299	HUM	7.139	OLD HIGHWAY	480	5400	4700	490	5400	4700
1	299	HUM	19.05	BAIR ROAD	380	4800	4300	530	5600	5300
1	299	HUM	38.833	WILLOW CREEK, JCT. RTE. 96 NORTH	530	5600	5300	490	5300	5000
1	299	HUM	38.9	WILLOW CREEK, RIVER ROAD	500	5300	4400	500	5300	4400
1	299	HUM	41.86	GAMBI VILLAGE, EAST	560	5500	4450	470	4500	3900
1	299	HUM	43.035	HUMBOLT/TRINITY COUNTY LINE	400	5000	3450			
2	299	TRI	0	HUMBOLT/TRINITY COUNTY LINE				420	4300	3100
2	299	TRI	1.3	EAST LIMITS SALYER	330	3750	2950	250	2950	2500
2	299	TRI	11.53	BURNT RANCH ROAD	250	2750	2350	210	2200	1850
2	299	TRI	21.731	DEL LOMA	210	2200	1850	210	2150	1800
2	299	TRI	24.263	LITTLE FRENCH CR	200	2150	1800	190	2150	1800
2	299	TRI	31.45	BIGFLATCMP-WHEELGLUCHRD	190	2150	1800	340	3700	2550
2	299	TRI	51.03	WEAVERVILLE, WEST CITY LIMITS	490	4950	3100	490	4950	3400
2	299	TRI	52.07	WEAVERVILLE, WASHINGTON STREET	1100	11500	10700	1100	11500	10700
2	299	TRI	52.72	MARTIN/NUGGET ROAD	730	9000	8800	340	7000	6600
2	299	TRI	58.11	EAST JCT. RTE. 3	550	6100	4750	430	4900	4150
2	299	TRI	63.51	LEWISTON ROAD	430	4900	4150	420	4750	3950
2	299	TRI	67.425	NEW LEWISTON ROAD	440	4950	3950	440	4900	3900
2	299	TRI	72.246	TRINITY/SHASTA COUNTY LINE	440	4900	3900			
2	299	SHA	0	TRINITY/SHASTA COUNTY LINE				450	5000	3900
2	299	SHA	8.648	FRENCH GULCH ROAD	450	5000	4000	540	6100	4900
2	299	SHA	16.47	KENNEDY DRIVE	590	6200	4950	830	7600	6700
2	299	SHA	17.739	ROCK CREEK ROAD	830	7600	6700	1200	13900	10400
2	299	SHA	21.648	REDDING, WEST CITY LIMITS	1200	14100	10500	1200	14100	10500
2	299	SHA	22.226	REDDING, BUENAVENTURA BLVD	1200	14100	10500	1700	18700	14200
2	299	SHA	23.81	REDDING, COURT STREET	2150	22500	20400	2050	22500	20300
2	299	SHA	24.088	JCT. RTES. 273 AND 299	2050	21600	20300	2050	21600	20300
2	299	SHA	24.822	REDDING, JCT. RTE. 5	2050	21600	20300	2150	22800	21000
2	299	SHA	25.54	HAWLEY ROAD	2150	22800	21000	1150	12600	11600
2	299	SHA	27.239	OLD OREGON TRAIL	1150	12600	11600	940	10500	9700
2	299	SHA	31.46	DESCHUTES ROAD	580	8000	6200	490	5600	4850

Exhibit 2

Dist	Route	County	Post Mile	Description	Back Peak Hour	Back Peak Month	Back AADT	Ahead Peak Hour	Ahead Peak Month	Ahead AADT
2	299	SHA	53.263	TERRY MILL ROAD	360	4750	3550	360	4900	3650
2	299	SHA	60.05	BIG BEND ROAD	310	4450	3200	320	3800	2850
2	299	SHA	73.13	TAMARACK ROAD	320	3550	3000	320	3550	3000
2	299	SHA	74.48	ELM STREET	380	3900	2450	370	9400	3300
2	299	SHA	74.98	BURNEY, PLUMAS STREET	370	9400	3300	880	9300	8400
2	299	SHA	76.181	BLACK RANCH ROAD	880	9300	8400	550	6400	5200
2	299	SHA	78.65	PINE ST LT	530	6600	5500	440	5200	4100
2	299	SHA	80.085	FOUR CORNERS, JCT. RTE. 89	490	5300	4500	370	3900	3200
2	299	SHA	91.08	GLENBURN/DANA ROAD	370	3900	3200	370	3800	3300
2	299	SHA	91.56	FALL RIVER MILLS, MAIN STREET	370	3800	3300	490	5300	4200
2	299	SHA	95.24	MCARTHUR-GLENBURN RD	420	4300	3900	360	3750	3250
2	299	SHA	96.78	PITTVILLE ROAD	360	3750	3250	160	1700	1400
2	299	SHA	99.361	SHASTA/LASSEN COUNTY LINE	160	1700	1400			
2	299	LAS	0	SHASTA/LASSEN COUNTY LINE				160	1700	1400
2	299	LAS	10.407	CEMETERY ROAD	160	1700	1400	180	1900	1600
2	299	LAS	15.101	LOOKOUT ROAD	190	2100	1800	120	1200	970
2	299	LAS	25.635	LASSEN/MODOC COUNTY LINE	120	1200	970			
2	299	MOD	0	LASSEN/MODOC COUNTY LINE				120	1200	970
2	299	MOD	0.332	ADIN, JCT. RTE. 139, SOUTH	100	1100	960	150	1900	1450
2	299	MOD	21.749	JCT. RTE. 139 NORTH	140	1600	1100	160	2000	1450
2	299	MOD	22.435	CANBY RANGER STA LT	170	1850	1450	170	1850	1450
2	299	MOD	40.276	ALTURAS, JUNIPER STREET	160	1850	1450	420	3600	2750
2	299	MOD	40.64	ALTURAS, JCT. RTE. 395	530	5300	4400	110	990	850
2	299	MOD	57.354	LAKE CITY ROAD	90	790	700	40	290	250
2	299	MOD	66.632	NEVADA STATE LINE	20	120	75			
8	330	SBD	28.696	JCT. RTE. 210				1550	13200	11000
8	330	SBD	29.605	SAN BERNARDINO, HIGHLAND AVENUE	1550	13200	11000	1700	14400	12000
8	330	SBD	44.118	RUNNING SPRINGS, JCT. RTE. 18	1700	14400	12000			
8	371	RIV	56.467	JCT. RTE. 79				620	6600	6300
8	371	RIV	60.23	WILSON VALLEY ROAD	740	7400	7100	780	7800	7500
8	371	RIV	67.657	CARY ROAD	740	7600	7300	740	7600	7300
8	371	RIV	71.31	ANZA, CONTRERAS ROAD	720	7400	7100	720	7400	7100

Exhibit 3 - Fountain Wind Project - Estimated Vehicle Trips During Construction

	Number of Truck Trips	Estimated Gross Vehicle Weight (Pounds)	Load Weight (Pounds)	Miles	VMT	Notes/ Assumptions
Pick-Up Trucks						
Survey	400	7,000	500	0	0	
Construction Trades	24,000	7,000	500	0	0	Average number of crews (30)
Project Management Staff	2,500	7,000	500	0	0	Includes inspectors
Equipment Operators	6,267	7,000	500	0	0	
Small Equipment on Flatbed Trailer	1,250	12,000	5,000	0	0	
Total Pick-up Trucks	34,417				0	
Peak Number of Pick-up Truck Trips/Day	173					
Total Pick-up Trucks	20650			50	1,032,500.00	Assume 60% SH 299 West
Peak Number of Pick-up Trucks/Day	104					Assume 60% SH 299 West
Total Pick-up Trucks	13766.667			10	137,666.67	Assume 40% SH 299 East
Peak Number of Pick-up Trucks/Day	69					Assume 40% SH 299 East
Equipment						
Feller Buncher (logging)	2	71,711		20	40	Cat 522B
Logging Trucks	8	35,000		50	400	Flat-Bed Semi Trailer and Tractor
Bulldozer (medium)	4	57,440		50	200	Cat D7
Scraper	2	93,000		50	100	Cat 627K
Drum Compactor	4	41,000		50	200	Cat CS41B
Skid Steer Loader	4	4,000		50	200	Cat 272D2
Road Grader	1	42,647		50	50	Cat 12M
Excavator	1	66,250		50	50	Cat 326F
Trenching Equipment	4	52,000		50	200	Wolfe 7000
Backhoe Loader (includes setting collector system poles)	4	24,000		50	200	Cat 415F2
Cable Reel Truck (Includes auger for pole foundations)	2	46,000		50	100	Includes manlift basket for rigging poles
Concrete Pump Truck	1	46,000		50	50	Schwing 31 XT
Mobile Hydraulic Crane	6	117,235		50	300	Grove RT890E
Large Crawler Crane	2	794,000		50	100	Terrex Demag CC2800-1
Equipment Operators	47				2,190	Assume all trips on SR 299 West
Mobile Home (Field Office)	11	60,000	40,000	50	550	Assume all trips on SR 299 west - Schedule to avoid peak hours
Materials						
Erosion and Sediment Control Materials	4	45,000	10,000	20	72	Based on perimeter control on one side of road length
Public Road Aggregate	0	80,000	40,200	20	0	Based on 4832 feet of public road improvements, 6" depth
Access Road Aggregate	0	80,000	40,200	20	0	Based on 40 miles of access roads
Temporary Laydown Area Aggregate	1,923	80,000	40,200	20	38,451	Based on 18 staging areas totaling 44 acres
Substation Aggregate	218	80,000	40,200	20	4,369	Based on a 5 acre substation
O&M/Field Office Aggregate	218	80,000	40,200	20	4,369	Based on a 5 acre O&M/Field Office Area
Switching Substation Aggregate	655	80,000	40,200	20	13,108	Based on an 15 acre switching substation
Total Aggregate for Compaction Deliveries	3,019				60,370	Assume all trips on SR 299 East
Substation Rock	328	80,000	40,200	20	6,560	Based on a 3.5 acre substation
Field Office/O&M Rock	0	80,000	40,200	20	0	Based on a 3.5 acre O&M/Field Office Area
Switching Substation Rock	721	80,000	40,200	20	14,420	Based on an 11 acre battery storage system
Concrete Aggregate	9	80,000	40,200	20	185	Based on Aggregate equal to 76% of weight
Total Aggregate Deliveries	1,058	21,497	Tons		21,165	Assume all trips on SR 299 East
Wind Turbine Tower Base	72		153,400	270	19,440	Based on GE 3.4 137, HH 110m
Wind Turbine Tower Lower Mid-Section	72		120,100	270	19,440	Based on GE 3.4 137, HH 110m
Wind Turbine Tower Upper Mid-Section	72		112,850	270	19,440	Based on GE 3.4 137, HH 110m
Wind Turbine Tower Top Section	72		86,900	270	19,440	Based on GE 3.4 137, HH 110m
Wind Turbine Nacelle	72		150,700	270	19,440	Based on GE 3.4 137
Wind Turbine Hub	72		88,050	270	19,440	Based on GE 3.4 137
Wind Turbine Blades (3)	216		37,750	270	58,320	Based on GE 3.4 137
Wire and Cable - Underground Colletion System	38	80,000	45,000	270	10,260	Based on 3 conductors, 1.9 pounds/foot
Wire and Cable - Overhead Collection System	12	80,000	45,000	270	3,240	Based on 3 conductors, 2.1 pounds/foot
Overhead Collection Line Poles	85	30,000	15,000	270	22,883	Assume 250' wire span, 4 - 2000 pound Poles per trailer
Transmission Line Poles	77	27,000	12,000	270	20,790	Assume 750' wire span, 1 - 8000 pound Pole per trailer
Met Poles	5			270	1,350	Assume 1 Met Pole can be carried on a single truck
Transformers	72	80,000	45,000	270	19,440	Based on 3.5 MW transformer
Miscellaneous Turbine Components	288	80,000	45,000	270	77,760	Based on 4 miscellaneous deliveries per turbine
Formwork	3	80,000	45,000	50	144	Based on 25 reuses of forms
Reinforcing Steel (Rebar)	144	80,000	45,000	50	7,200	Based on 45 tons per turbine
Pilot Cars (Front and Back)	1,296			270	349,920	Pilot Cars for Wind Turbines
Total Turbine Related Deliveries	2,668				687,947	Assume all trips on SR 299 west and I-5 from Stockton - Schedule to avoid pe
Concrete for Turbine Foundations	3,600	69,000	40,000	50	180,000	
Concrete Pump Trucks	2			50	100	
Concrete for Substation Foundations	41	69,000	40,000	50	2,050	Based on 2 MPT - Foundation 8'-6" x 24'-0" x 1'-4"
Concrete for Switching Station Foundations	41	69,000	40,000	50	2,050	Based on 40' container each with 6 foundation pies
Concrete for Overhead Collection System Pole Foundations	36	40,332	11,332	50	1,800	Assume 1 concrete foundations (terminations & angles)
Concrete for Transformer Pads	72	41,180	12,180	50	3,600	Assume Pad 9' x 9' x 1'
Concrete for O&M Building	13	69,000	40,000	50	650	Based on foundation wall 78' x 70' x 1' thick x 5' deep + 4" floor slab
Total Concrete Deliveries	3,805	36,946	CuYds		190,250	Assume all trips on SR 299 west

Cement for Concrete Batch Plant	2	80,000	40,000	50	99	Based on Aggregate equal to 16% of weight
Building Materials	20	80,000	45,000	50	1,000	Based on 5460 square foot prefabricated metal building
Structural Steel - Substation	4	80,000	45,000	50	222	Based on 200,000 Pounds of Structural Steel
Structural Steel - Switching Substation	4	80,000	45,000	50	200	Based on 200,000 Pounds of Structural Steel
Elecrical Equipment - Substation	10	80,000	45,000	50	500	Includes Control Building, switch gear, capacitors, etc.
Elecrical Equipment - Switchingsubstation	10	80,000	45,000	50	500	Includes Control Building, switch gear, capacitors, etc.
CMP Culverts	4	80,000	45,000	50	200	Culvert Extensions and new culverts
Chain Link Fence	7	80,000	45,000	50	362	Based on 30,600 linear feet of fence at 10.65 pounds/ ft
Micellaneous Consumables	26	60,000	20,000	50	1,300	
Fuel Deliveries	25	26,000	7,000	50	1,250	Based on 2000 Gallons/week ea. of diesel on-road & off road
Sanitation	52	50,000	10,000	50	2,600	Based on weekly maintenance visits
Plant Stock, Seed and Mulch	17	52,600	12,800	50	859	Based on 2.5 tons/acre
Total Miscellaneous Deliveries	182				9,093	Assume all trips on SR 299 West
Water (Compaction)	307	33,400	0	20	6,140	Based on 20 gallons/ton of aggregate (Roads, Laydown, etc.)
Water (Dust Control)	919	33,400	0	20	18,380	Based on 300 gallons/acre/day of Road, staging, and field office area areas
Water (Vegetation establishment)	110	33,400	0	20	2,200	Based on 10,000 gallons/acre of Laydown areas
Water (Concrete Batching)	2	33,400	0	20	40	Based on Aggregate equal to 8% of weight
Total Water	1,338	5,345,014	Gallons		26,760	Assume all trips on SR 299 East

	Trucks	Trips			
SR 299 West	27,362	54725			1,922,529
SR 299 East	19,181	38363			245,962
Total Trips	46,544	93,088		TOTAL VMT	2,168,492

Exhibit 3 - Fountain Wind Project - Estimated Vehicle Trips - Post-Construction

Vehicles	Number of Truck Trips	Estimated Gross Vehicle Weight (Pounds)	Load Weight (Pounds)	Miles	VMT	Notes/ Assumptions
Pick-Up Trucks						
Survey	0	7,000	500	0	0	
Construction Trades	0	7,000	500	0	0	Average number of crews (30)
Project Management Staff	0	7,000	500	0	0	Includes inspectors
Equipment Operators	6	7,000	500	50	300	
Small Equipment on Flatbed Trailer	0	12,000	5,000	0	0	
Total Pick-up Trucks	6				300	
Peak Number of Pick-up Truck Trips/Day	173					
Total Pick-up Trucks	3.6			50	180	Assume 60% SH 299 West
Peak Number of Pick-up Trucks/Day	104					Assume 60% SH 299 West
Total Pick-up Trucks	2.4			10	120	Assume 40% SH 299 East
Peak Number of Pick-up Trucks/Day	69					Assume 40% SH 299 East
Equipment						
Equipment Operators	0				0	Assume all trips on SR 299 West
Mobile Home (Field Office)	0	60,000	40,000	50	0	0
Materials						
Total Aggregate for Compaction Deliveries	0				0	Assume all trips on SR 299 East
Concrete Aggregate	0	80,000	40,200	0	0	Based on Aggregate equal to 76% of weight
Total Aggregate Deliveries	0	21,309	Tons		0	Assume all trips on SR 299 East
Total Turbine Related Deliveries	0				0	Assume all trips on SR 299 west - Schedule to avoid peak hours
Total Concrete Deliveries	0	38,946	CuYds		0	Assume all trips on SR 299 west
Cement for Concrete Batch Plant	0	80,000	40,000	0	0	Based on Aggregate equal to 16% of weight
Total Miscellaneous Deliveries	0				0	Assume all trips on SR 299 West
Total Water	0	1,679,962	Gallons		0	Assume all trips on SR 299 East

	Trucks	Trips		
SR 299 West	4	8		180
SR 299 East	2	5		120
Total Trips	6	13	TOTAL VMT	300

APPENDIX A – Potential Transportation Environmental Protection Measures for the Fountain Wind Project

Resource Category	Measure	Implementation			
		Preconstruction	Construction	Operations	Decommissioning
Transportation					
TRANS-1	[Project] will coordinate with CalTrans and Shasta County to implement a Transportation and Traffic Management Plan that minimizes risks and inconvenience to the public, while ensuring safe and efficient construction of the Project. The plan will focus on turbine component deliveries, traffic and circulation primarily within and in the vicinity of the Project area. It will be designed to minimize potential hazards from increased truck traffic and worker traffic and to minimize impacts to traffic flow in the vicinity of the Project.	X	X		
TRANS-2	To minimize conflicts between Project traffic and background traffic, deliveries of project components will be scheduled around local volume peaks to the extent feasible.		X		
TRANS-3	Road clearances may include temporarily blocking road intersections via construction cones and/or staffing blocked intersections with a traffic-control flagger to allow haul trucks sole access to the road while delivering Project components. If required, public road closures are not expected to exceed 15 minutes during each/any road closure event.		X		X
TRANS-4	The Project will coordinate with CalTrans to determine whether temporary speed limit reductions during construction are applicable where Project access points intersect with State Highway 299.	X	X		
TRANS-5	Construction deliveries would be coordinated to avoid major traffic-generating events in Redding, to the extent practicable.		X		
TRANS-6	The Project would coordinate with local law enforcement, to manage traffic flows and monitor traffic speed during deliveries.		X		X
TRANS-7	All staging activities and parking of equipment and vehicles would occur within the Project Area and would not occur on maintained State Highways or County roads.		X		

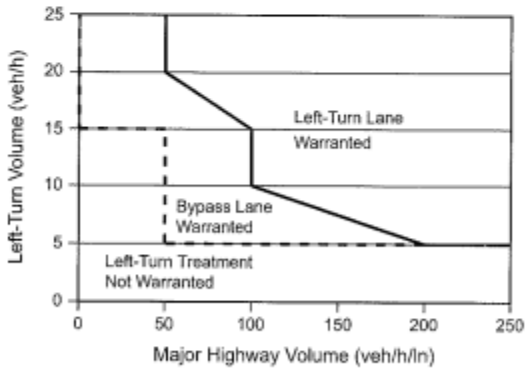
Resource Category	Measure	Implementation			
		Preconstruction	Construction	Operations	Decommissioning
TRANS-8	Equipment and material deliveries to the site would be performed by professional transportation companies familiar with the type of equipment, loads involved, and U.S. DOT, CalTrans, and Shasta County regulations.		X		X
TRANS-9	Road signs would be erected to notify travelers and local residents that construction is occurring in the area and provide information regarding the timing and route for oversized vehicle movements and deliveries. The erection/placement of road signs and the Project construction activities would be performed in accordance with the Shasta County and CalTrans requirements.		X		
TRANS-10	Escort vehicles would assist delivery of oversized turbine components to give drivers additional warning of oversized loads.		X		

APPENDIX B – AASHTO Guidance for Left Turn Lanes on Two Lane Highways (AASHTO Green Book, Seventh Edition)

Table 9-25. Suggested Left-Turn Treatment Guidelines Based on Results from Benefit–Cost Evaluations for Intersections on Two-Lane Highways in Rural Areas (*16*)

Left-Turn Lane Peak-Hour Volume (veh/h)	Three-Leg Intersection, Major-Road Two-Lane Highway Peak-Hour Volume (veh/h/ln) that Warrants a Bypass Lane	Three-Leg Intersection, Major-Road Two-Lane Highway Peak-Hour Volume (veh/h/ln) that Warrants a Left-Turn Lane	Four-Leg Intersection, Major-Road Two-Lane Highway Peak-Hour Volume (veh/h/ln) that Warrants a Left-Turn Lane
5	50	200	150
10	50	100	50
15	< 50	100	50
20	< 50	50	< 50
25	< 50	50	< 50
30	< 50	50	< 50
35	< 50	50	< 50
40	< 50	50	< 50
45	< 50	50	< 50
50 or More	< 50	50	< 50

Note: These guidelines apply where the major road is uncontrolled and the minor-road approaches are stop- or yield-controlled. Both the left-turn peak-hour volume and the major-rad volume warrants should be met as shown in Figure 9-36.



(a) Three-Leg Intersections

NOTE: The analysis on the following page shows that SR 299 either meets warrants or is marginally warranted for left turn lanes at the access roads. The RED shading above indicates the warrant guidelines that were met, while the PURPLE shading above indicates that warrants were marginally met for one access.

Figure 9-36. Suggested Left-Turn Treatment Warrants Based on Results from Benefit–Cost Evaluations for Intersections on Two-Lane Highways in Rural Areas (*16*)

The construction and post construction volumes have been applied using the AASHTO warrants above, and have yielded the following results:

DURING CONSTRUCTION

West Access

A.M. Peak Hour

		128 Westbound Through
		53 Westbound Left
Eastbound Through	377	
Eastbound Right	75	
Total	**452**	

Therefore Left Turn Lane **IS WARRANTED**

P.M. Peak Hour

		313 Westbound Through
		0 Westbound Left
Eastbound Through	192	
Eastbound Right	0	
Total	**192**	

Therefore Left Turn Lane **IS NOT WARRANTED**

North Access

A.M. Peak Hour

		16 Westbound Right
		181 Westbound Through
		197 Total
Eastbound Left	**24**	
Eastbound Through	353	

Therefore Left Turn Lane **IS WARRANTED**

P.M. Peak Hour

		0 Westbound Right
		289 Westbound Through
		289 Total
Eastbound Left	**0**	
Eastbound Through	245	

Therefore Left Turn Lane **IS NOT WARRANTED**

East Access

A.M. Peak Hour

		197 Westbound Through
		112 Westbound Left
Eastbound Through	192	
Eastbound Right	161	
Total	**353**	

Therefore Left Turn Lane **IS WARRANTED**

P.M. Peak Hour

		128 Westbound Through
		0 Westbound Left
Eastbound Through	261	
Eastbound Right	0	
Total	**261**	

Therefore Left Turn Lane **IS NOT WARRANTED**

POST CONSTRUCTION

West Access

A.M. Peak Hour

		128 Westbound Through
		6 Westbound Left
Eastbound Through	204	
Eastbound Right	6	
Total	**210**	

Therefore Left Turn Lane **IS WARRANTED**

P.M. Peak Hour

		140 Westbound Through
		0 Westbound Left
Eastbound Through	192	
Eastbound Right	0	
Total	**192**	

Therefore Left Turn Lane **IS NOT WARRANTED**

North Access

A.M. Peak Hour

		6 Westbound Right
		134 Westbound Through
		140 Total
Eastbound Left	**6**	
Eastbound Through	198	

Therefore Left Turn Lane **IS NOT WARRANTED**

P.M. Peak Hour

		0 Westbound Right
		134 Westbound Through
		134 Total
Eastbound Left	**0**	
Eastbound Through	198	

Therefore Left Turn Lane **IS NOT WARRANTED**

East Access

A.M. Peak Hour

		140 Westbound Through
		6 Westbound Left
Eastbound Through	192	
Eastbound Right	6	
Total	**198**	

Therefore Left Turn Lane **IS MARGINALLY WARRANTED**

P.M. Peak Hour

		128 Westbound Through
		0 Westbound Left
Eastbound Through	204	
Eastbound Right	0	
Total	**204**	

Therefore Left Turn Lane **IS NOT WARRANTED**

Appendix I
Water Supply Assessment

Water Supply Assessment

Fountain Wind Energy Project

June 8, 2020

Prepared for:

Shasta County Planning Division
1855 Placer Street, Suite 103
Redding, CA 96001

Prepared by:

Stantec Consulting Services Inc.
735 East Carnegie Drive Suite 280
San Bernardino, CA 92408

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Abbreviations

af	Acre-feet
afy	Acre-feet per year
BWD	Burney Water District
CAL FIRE	California Department of Forestry and Fire Protection
Caltrans	California Department of Transportation
CASGEM	California Statewide Groundwater Elevation Monitoring
CEQA	California Environmental Quality Act
DWR	California Department of Water Resources
ft bgs	Feet below ground surface
gpcd	Gallons per capita per day
GSA	Groundwater Sustainability Agency
Fountain Wind	Fountain Wind, LLC
GSP	Groundwater Sustainability Plan
NFPA	National Fire Protection Agency
O&M	operations and maintenance
Project	Fountain Wind Energy Project
SB	Senate Bill
SGMA	Sustainable Groundwater Management Act of 2014
SR	State Route
SRRA	Safety Roadside Rest Area
SWRCBDDW	State Water Resources Control Board Division of Drinking Water
UWMP	Urban Water Management Plan
WSA	Water Supply Assessment

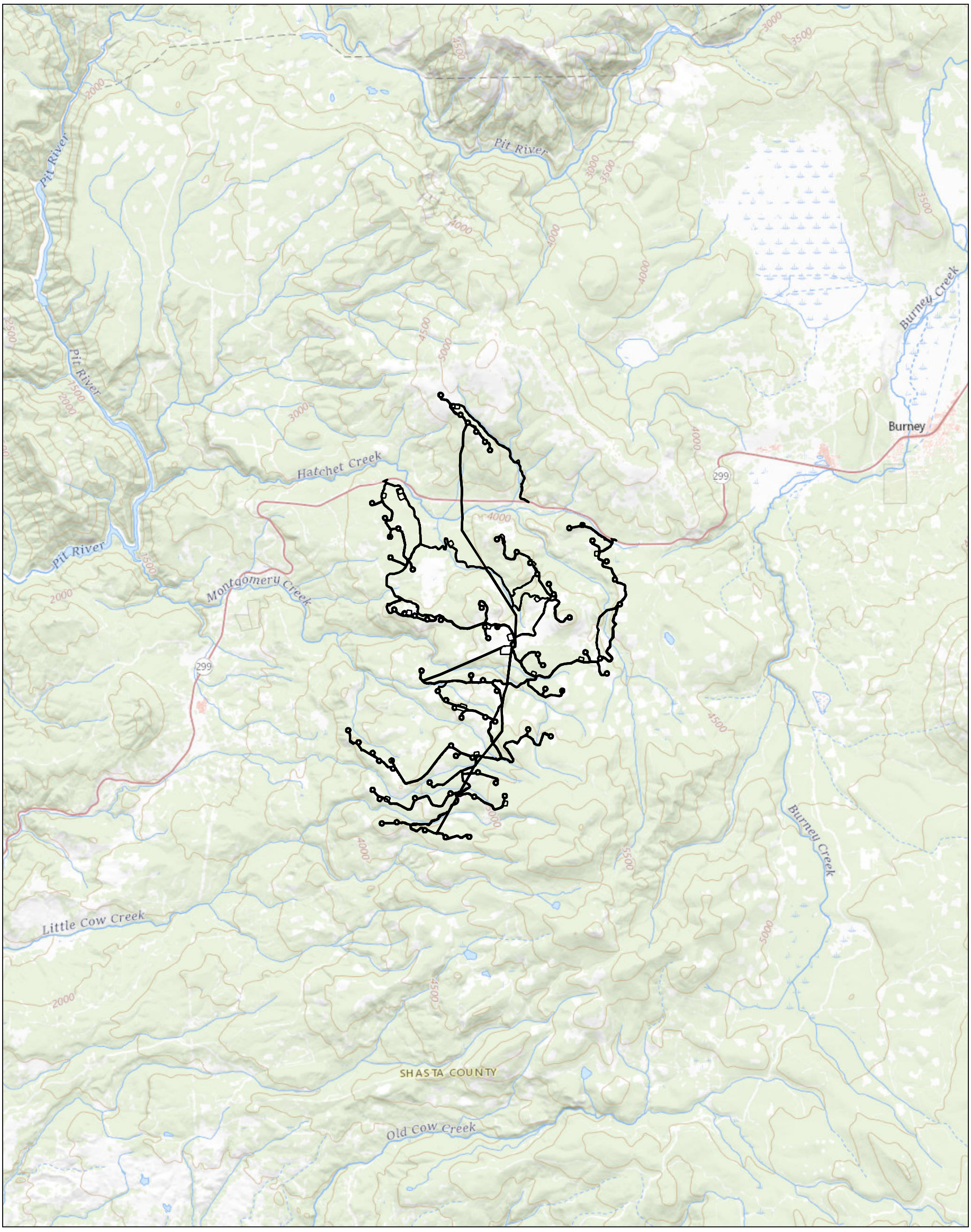
1.0 SUMMARY

Stantec Consulting Services Inc. (Stantec) has completed a Water Supply Assessment (WSA) for Report Title (Project) on behalf of Shasta County, the CEQA Lead Agency for the Project. The Project would span approximately 4,600 acres of forested land in unincorporated Shasta County, California. Project construction and long-term operation includes the use of potable water from one or more new onsite water supply wells or the importation of water by truck from the Burney Water District (BWD). This WSA was conducted in conformance with the requirements of the California Water Code.

The Project is located in eastern Shasta County approximately six miles west of the unincorporated town of Burney and about 35 miles northeast of Redding. The Project is accessed by State Route (SR) 299, which bisects the Project. The Project area and boundaries are presented on Figure 1-1.

Stantec analyzed water supplies available to serve the project, as well as the water demand anticipated during construction and through operation of the facility. According to the requirements of Water Code Section 10910(c)(4):

> "*If the city or county is required to comply with this part pursuant to subdivision (b), the water assessment shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses.*"



Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: Fountain Wind LLC, Stantec
3. Background: The National Map - USGS Topographic Base Map

Legend

Project Site

0 1 2 Miles

(At original document size of 11x17)
1:126,720

N

Stantec

Project Location
Shasta County
California

Prepared by GC on 2020-06-02
Reviewed by CB on 2020-06-02

Client/Project
185804576

Fountain Wind Project
Fountain Wind LLC

Figure No.
1-1

DRAFT

Title
Project Vicinity

V:\1956\active_Task Owner and other Non-BC\1956 Jobs\185703743303_data\gis_cad\gis\mxd\WaterAssessment2020\185804576_1-1_Location.mxd Revised: 2020-06-02 By: gcarpenter

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

WATER SUPPLY ASSESSMENT

Summary

The following are primary conclusions of the WSA:

- The project meets the definition of a "project" under Water Code Section 10912(a)(5).
- The project is located in a rural setting and will not be served by a public water system. Therefore, under Water Code section 10910(b), Shasta County is preparing this water supply assessment in accordance with the guidance in Water Code section 10910(c)(4).
- There is no current Urban Water Management Plan (UWMP) that accounts for the project or other demand.
- The groundwater supply would be extracted from fractured volcanic bedrock terrain not affiliated with any California Department of Water Resources (DWR) Bulletin 118 groundwater basin. As a result, no groundwater sustainability agency (GSA) has been formed to serve this Basin, and management of this Basin is assumed by Shasta County.
- Owing to the absence of a DWR Bulletin 118 designated groundwater basin in the Project Site, a Groundwater Sustainability Plan (GSP) is not required under the Sustainable Groundwater Management Act (SGMA).
- Groundwater production in the Project Site is not adjudicated and there are no know groundwater rights holders.
- Groundwater storage on the Project Site cannot be estimated due to the lack of a definable groundwater basin and because the Project Site is underlain by thick accumulations of volcanic rock. Groundwater is assumed to occur in fractures and possible thin semi-permeable layers in some volcanic rocks beneath the Project Site. However, well yields in these rocks are relatively low and range between 1.5 and 63 gallons per minute (gpm) based on available well completion report data (DWR, 2018) for wells located within 1 mile of State Route (SR) 299 and within 2 miles of the proposed O&M facility.
- It is understood and believed that water demand from other uses overlaying this fractured volcanic bedrock terrain is very low and is limited to scattered residences. The County is not aware of any historic or current concerns about groundwater shortages for any existing users and is not aware of any future development that is planned for this area that would create a new large source of demand for groundwater.
- Water to be used for the construction of project facilities, dust control, soils compaction, and concrete manufacture will consist of groundwater pumped from one or more new, onsite water supply wells located at the project Operations and Maintenance (O&M) facility or from an offsite public water system such as BWD located six miles east-northeast of the Project. Potable water supplies may also be met by pumping from one or more new onsite wells at the proposed O&M facility.
- Estimated total water demand for construction of the Project, dust control, soils compaction, and concrete manufacture is 49 acre-feet (af).
- Estimated annual water demand for operations and maintenance at the Project is up to 5.6 acre-feet per year (afy) for vehicle and equipment washing and maintenance, potable water supplies for 12 full-time employees, and water storage to meet Shasta County fire flow requirements.
- According to State Water Resources Control Board Division of Water Rights (SWRCBDWR) there is one surface water rights adjudication in the southern portion of the Project for Cedar Creek and North

Fork Cow Creek, and one surface water adjudication in the eastern portion of the Project for Burney Creek. However, operation of a proposed onsite water supply well at the proposed O&M facility is not expected to impact these surface water rights holders because the proposed well(s) will be more than five, six, and seven miles from Cedar Creek, North Fork Cow Creek and Burney Creek, respectively.

- It is our conclusion that there is sufficient water supply available to serve the Fountain Wind Energy Project as proposed as well as existing and planned future uses, including agricultural and manufacturing uses during a 20-year projection and no further analysis is required.

2.0 WATER SUPPLY PLANNING

2.1 PROJECT WATER SUPPLY AND DEMAND

Most of the water to be used by the Project will be during wind turbine, collector line, and related facilities construction for dust suppression, soil backfill compaction, and concrete manufacture. An estimated 49-acre feet (af) of water will be required for construction-related activities. Construction water will consist of groundwater pumped from the underlying fractured volcanic bedrock using one or more proposed new, onsite water supply wells located at the proposed Operations and Maintenance (O&M facility) facility, or delivered by a water supply contractor from an offsite, existing public water system, such as the nearby Burney Water District (BWD) located approximately 6 miles east-northeast of the project.

Estimated O&M annual water demand for the Project is up to 5.6 afy (approximately 5,000 gallons per day [gpd]) for the proposed O&M facility including potable water demands for 12 full-time employees, equipment maintenance and washing, and emergency fire suppression. The estimated potable water demand is relatively low at 30 gallons per capita per day (gpcd) (equivalent to 0.4 afy) because the O&M employees will be working throughout the Project site and only occasionally visit the O&M facility. In addition, the restroom and other potable water facilities at the O&M building will be designed to conserve water (e.g. low flush toilets, low flow sinks, etc.).

O&M water demand also includes onsite fire flow water storage to meet fire flow requirements in accordance with Shasta County Code of Ordinances Title 16 Buildings and Construction, Chapter 16.04.130 Fire Standards and Equipment (Ordinance No. 2019-06 (2019) and 2019 California Fire Code (California Code of Regulations Title 24 Part 9). The estimated minimum fire flow water supply required for the proposed O&M facility per National Fire Protection Association (NFPA) 1142 (NFPA, 2017) Equation 4.3.1 for structures with exposure hazards is 28,665 gallons (0.09 af) but may range up to 2,000 gpm for two hours or 240,000 gallons (0.74 af) depending on final Shasta County fire flow water storage requirements. Together, the resulting first year O&M potable and fire flow water demand is estimated to range between approximately 0.5 af and 1.14 af, depending on final Shasta County fire flow water storage requirements. The potable and fire flow requirements may decline in subsequent years to 0.4 afy.

Construction and operation of one or more water supply wells for construction and long-term O&M activities will also comply with all federal, state, and local laws and ordinances and will be in conformance with applicable mitigation measures for this Project. If delivery of off-site water from BWD is pursued, all deliveries of water to the site will also comply with all federal, state, and local laws and ordinances and will be in conformance with applicable mitigation measures for this Project.

2.2 WATER SUPPLY ASSESSMENT

SB 610 was passed into law on January 1, 2002. This legislation identified the need to incorporate water supply and demand analysis at the earliest possible stage in the planning process. SB 610 amended

portions of the California Water Code (Water Code), including Section 10631, which contains the Urban Water Management Planning Act, as well as adding Sections 10910, 10911, 10912, 10913, and 10915, which describe the required elements of a WSA.

2.2.1 "Is it a Project Under SB 610?"

The first step in the WSA process is determining whether the project is subject to CEQA. SB 610 amended Public Resources Code Section 21151.9 to read: *Whenever a city or county determines that a project, as defined in Section 10912 of the [California] Water Code, is subject to this division [i.e., CEQA] it shall comply with part 2.10 (commencing with Section 10910 of Division 6 of the Water Code).* The proposed project is currently under environmental review pursuant to the requirements of CEQA; therefore, the information contained in this assessment may be used to support the analysis contained in the CEQA document.

The second step in the SB 610 process is to determine if a project meets the definition of a "Project" under Water Code Section 10912(a) and (b). Under this section,

(a) *"Project" means any of the following:*

1) *A proposed residential development of more than 500 dwelling units.*

2) *A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.*

3) *A proposed commercial building employing more than 1,000 persons or having more than 250,000 square feet of floor area.*

4) *A hotel or motel with more than 500 rooms.*

5) *A proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.*

6) *A mixed-use project that includes one or more specified in this subdivision.*

7) *A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500-dwelling unit project.*

(b) *If a public water system has fewer than 5,000 service connections, then "project" means any proposed residential, business, commercial, hotel or motel, or industrial development that would account for an increase of 10 percent or more in the number of the public water system's existing service connections, or a mixed use project that would demand an amount of water equivalent to, or greater than, the amount of water required by residential development that would represent an increase in 10 percent or more in the number of the public water system's existing service connections.*

The Project will occupy approximately 4,463 acres and will include a proposed permanent O&M facility that will be less than 6,000 square feet (5,460 square feet) within a 5-acre parcel. The proposed Fountain Wind Energy Project is considered to be a project pursuant to Section 10912(a)(5) of the Water Code because it is an industrial plant occupying more than 40 acres of land. Parcels crossed for turbine installation and conveyance are zoned as Timber (T) and Timber Production (TP).

2.2.2 "Is There a Public Water System?"

The second step in the WSA process is determining if there is a "public water system" to serve the project. Section 10912(c) of the California Water Code (Water Code) states: *"[A] public water system means a system for the provision of piped water to the public for human consumption that has 3,000 or more service connections."*

The proposed project is not within the service area of a public water system but the project may purchase water from the BWD and truck it on site. The closest public water system to the proposed Project is the BWD located approximately 6 miles east-northeast of the Project. BWD operates a public water system (CA4510003) and sewer system in the unincorporated town of Burney. BWD is an independent special district formed as a county water district under California Water Code Section 30000 et seq. In 2019, BWD served a population of 3,154 persons from 1,267 service connections (BWD, 2020).

Municipal water demands are met by the extraction of local groundwater through the operation of three water supply wells, Wells 6, 7 and 8, according to the State Water Resources Control Board Division of Drinking Water (SWRCBDDW) State Drinking Water Information System (SDWIS) website (accessed on May 26, 2020), and the Burney Water District Water Master Plan (PACE, 2014). Total groundwater pumped from the three wells and metered groundwater deliveries in 2019 were 1,353 af and 1,145 af, respectively (BWD, 2020). The current production capacity of the three BWD wells is 4,600 gpm or 7,420 afy, if operated continuously. Therefore, if water is obtained from the BWD, there is sufficient water supply capacity to meet the estimated additional temporary water supply demand of 49 af for the construction of project facilities.

2.2.3 "Is There a Current UWMP That Accounts for the Project Demand?"

Step four in the WSA process involves determining if there is a current UWMP that considers the projected water demand for the Project Site. The Project is not within the service area of a public water system and there is no applicable UWMP. Construction water demands are estimated to be approximately 49 af.

Estimated O&M annual water demand for the Project is up to 5.6 afy for the proposed O&M facility including potable water demands for 12 full-time employees, equipment maintenance and washing, and emergency fire suppression. The estimated potable water demand is 30 gpcd (0.4 afy). The estimated O&M water demand also includes onsite fire flow water storage to meet Shasta County Code of Ordinances Title 16 Buildings and Construction, Chapter 16.04.130 Fire Standards and Equipment (Ordinance No. 2019-06 (2019) and 2019 California Fire Code (California Code of Regulations Title 24 Part 9) fire flow requirements. The estimated minimum fire flow water supply required for the proposed

O&M facility per NFPA 1142 (NFPA, 2017) Equation 4.3.1 for structures with exposure hazards is 28,665 gallons (0.09 af), but could also be conservatively assumed to be 2,000 gpm for 2 hours or 240,000 gallon. Annual O&M water of approximately 0.4 af will be supplied by an onsite water supply well with an estimated minimum production capacity of approximately 11 gpm. However, water demand during the first year of operation may be considerably higher to account for the filling of a fire flow water storage tank which may range between 30,000 and 240,000 gallons depending on Shasta County final fire flow water storage requirements.

2.2.4 "Is Groundwater a Component of the Supplies for the Project?"

This section addresses the requirements of Water Code Section 10910(f), paragraphs 1 through 5, which apply if groundwater is a source of supply for a proposed project. Pursuant to Water Code Section 10910(f); the groundwater analysis presented in this WSA focuses on the volcanic terrain underlying the Project Site and the wells operated by the BWD.

2.2.4.1 Geologic and Hydrogeologic Conditions

The Project is in rural, mountainous terrain that is not within a defined DWR Bulletin 118 (2016) groundwater basin. The Project Site is also located in the Sacramento River Hydrologic Region (DWR, 2013, 2019). The closest DWR 118-designated groundwater basins to the Project include the Burney Creek Valley Basin (Basin No. 5-047), Goose Valley Basin (Basin No. 5-047), and Dry Burney Creek Valley Basin (5-049). These groundwater basins are listed as Very Low Priority on the SGMA Basin Prioritization Dashboard.

The Project occurs within the Cascade Range Geomorphic province of California (California Geological Survey, 2002). The Cascade Range consists of a northerly trending chain of volcanoes and related deposits extending from northern California to southern British Columbia. In northern California, the Cascade Range extends from south of Mount Lassen (Lassen Peak) to the Oregon border. The subsurface geology within the Project Site is predominantly ash, lava flows of various chemical composition (predominantly basalt and andesite), and debris flows (lahars), the latter, containing chaotic mixtures of sand, silt, clay, ash and rock. The Project Site is underlain by a thick accumulation of individual layers of these varying types of volcanic deposits.

Groundwater in the underlying volcanic deposits is primarily contained within fractures and in discontinuous layers of weathered volcanic rocks or debris flows and is largely derived from the infiltration of direct precipitation and snowmelt, and infiltration along creeks and downstream of spring discharges. The thickness of the volcanic deposits underlying the Project has not been determined but is considered to be relatively thick based on the relatively long period of volcanism in the area. Owing to the highly fractured nature of the underlying volcanic rocks, numerous springs have developed throughout the Project Site and contribute to streamflow.

Lithologic logs of 33 domestic wells drilled within 1 mile of SR 299 and within 2 miles of the proposed O&M facility are of inconsistent quality, but indicate the underlying geology to a maximum depth of 364 feet below ground surface (ft bgs) consists of highly variable thicknesses and sequences of layers and

mixtures of lava, cinders, ash, gravel, sand, silt, and clay (DWR 2020a). Descriptions of some of the mixed layers of gravel, silt and clay may constitute volcanic mudflow deposits or lahars. In addition, some deposits are reported to contain clay from the chemical weathering of certain minerals in lava flows and ash layers or lava and ash fragments in lahars.

All 33 wells were drilled for domestic use. Well completion depths generally matched the drilled depth or contained well casing to a lesser depth and the remainder of the borehole was open to the natural rock formations. Initial well yield (by airlifting or pumping) reported in wells located within 1 mile of SR 299 is relatively low and varies between 1.5 and 66 gpm. Initial estimated well yield in the nine wells (one destroyed) located within 2 miles of the proposed O&M facility and water supply well(s), ranges between 6 and 60 gpm and averages 20.2 gpm.

Depth to groundwater in 29 of the 33 wells located within 1 mile of SR 299 is highly variable and ranges between 5 and 238.5 ft bgs. Groundwater levels in the nine wells (one destroyed) located within 2 miles of the proposed O&M facility range between 10 and 238.5 ft bgs. The highly variable nature of the water level data precludes the development of a groundwater contour map or an understanding of the direction(s) of groundwater flow. There are no California Statewide Groundwater Elevation Monitoring (CASGEM) wells monitored under Senate Bill x7-6 (2009) for groundwater levels due to the lack of groundwater basin designation.

2.2.4.2 Water Demands

There are two sources of demand drawing groundwater from existing wells in the area where the new wells would be drilled to serve the Project. According to the SWRCBDDW SDWIS (SWRCBDDW v. 3.2.1), two small, public water systems are located adjacent to or near the Project Site, including California Department of Transportation (Caltrans) Hillcrest Safety Roadside Rest Area (SRRA)(Water System No. CA4500283), and Moose Camp (Water System No.CA4500017). Caltrans Hillcrest SRRA owns and operates one public (domestic) water supply well, Well 1 (listed as Well WW-2 on the Well Completion Report). This well is located less than 2 miles west of the proposed O&M facility. The initial estimated well yield was reported to be 29 gpm. The estimated annual population served at the Hillcrest SRRA per the SWRCBDDW SDWIS is 2,500 through one service connection.

Moose Camp owns and operates two domestic water supply wells, Wells 2 and 3. According to a water system map on the Moose Camp website, Wells 2 and 3 are located about 1 mile southeast of the proposed O&M facility (Moose Camp 2007). The Well Completion Report for Well 2 was not included in the online DWR Well Completion Report Application or was not properly identified by the drilling contractor. As a result, the initial estimated yield at Well 2 was not determined. The initial estimated yield at Well 3 was reported to be 12 gpm. According to SWRCBDDW SDWIS, the estimated population served at Moose Camp is 77 persons through 51 service connections.

Although not listed on SWRCBDDW SDWIS public water system link, a domestic well was installed at California Department of Forestry and Fire Protection (CAL FIRE) Hillcrest Forest Fire Station No. 75 in May 1974. This facility is located on SR 299 about 1.5 miles west of the proposed O&M facility. The initial estimated yield at this well was reported to be 30 gpm; it is uncertain if the well is still operating.

BWD's municipal water demands are met by the extraction of local groundwater through the operation of three water supply wells, Wells 6, 7 and 8, according to the State Water Resources Control Board Division of Drinking Water (SWRCBDDW) State Drinking Water Information System (SDWIS) website (accessed on May 26, 2020), and the Burney Water District Water Master Plan (PACE, 2014). Total groundwater pumped from the three wells and metered groundwater deliveries in 2019 were 1,353 af and 1,145 af, respectively (BWD, 2020). The current production capacity of the three BWD wells is 4,600 gpm or 7,420 afy, if operated continuously. Therefore, if water is obtained from the BWD, there is sufficient water supply capacity to meet the estimated additional temporary water supply demand of 49 af for the construction of project facilities.

Groundwater purchased from BWD or withdrawn from a new well at the O&M facility, is anticipated to provide the estimated 49 af of water supply for site development and construction of Project facilities. Either option would be considered a *de minimis* water use (see Section 2.2.5.2 for further analysis). Groundwater is also anticipated to provide the estimated O&M, potable, and fire flow water demands for the Project. This estimated long-term water demand is up to 5.6 afy. Based on the existing groundwater levels within and near the Project Site and the projected future annual population served by existing wells, the estimated quantity of groundwater to be extracted for the proposed Project for O&M, potable and fire flow purposes is considered to be a *de minimis* water use.

2.2.4.3 Groundwater Sustainability Plans

As noted, the Project is not located within a DWR Bulletin 118-designated groundwater basin and is not subject to SGMA. Therefore, no GSP is required.

2.2.5 "Are There Sufficient Supplies to Serve the Project Over the Next Twenty Years?"

The next step in the WSA process is to prepare the actual assessment of the available water supplies, including the availability of these supplies in all water-year conditions over a 20-year planning horizon, and an assessment of how these supplies relate to project-specific and cumulative demands over that same 20-year period. To be consistent, the analysis horizon of this WSA extends to 2040. Water Code Section 10910(c)(4) states:

> *"If the city or county is required to comply with this part pursuant to subdivision (b), the water assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."*

The amount of groundwater in storage in the fractured volcanic deposits underlying the Project Site is unknown owing to the lack of defined basin boundaries and saturated layers for the storage of groundwater.

Development of a water budget to account for surface water and groundwater inflow and outflow is not

feasible owing to the general lack of data on inflow (e.g., precipitation and streamflow recharge) and outflow components (e.g., groundwater production and consumptive use [population served]). In addition, none of the springs or streams in the Project Site possess flow gauges to measure outflow. However, a preliminary estimate of current annual local non-Project groundwater production is presented below in Table 2-1 based on the population served estimates and water use assumptions indicated in the table.

Table 2-1: Estimated Annual Current Local Non-Project Groundwater Production From Existing Nearby Wells

Site	Use Type	Population Served (persons)	GPCD[1]	Estimated Total Water Use Per Day (gpd)	Estimated Total Annual Water Use (afy)
Moose Camp	Continuous occupancy	129	224	28,896	32.4
CAL FIRE Forest Fire Station No. 75		4	224	896	1.0
Site	**Use Type**	**Visitors Per Year (persons)**	**Estimated Annual Water Use Per Person (gal)**		**Estimated Total Annual Water Use (afy)**
Caltrans Hillcrest SRRA	Intermittent	2,500	15		0.1
Site	**Use Type**	**Area (acres)**	**Estimated Unit Consumptive Use Per Acre (af/acre)**		**Estimated Total Annual Water Use (afy)[2]**
Irrigated land (T35N/R1E-34R)	Irrigation	3	3.5		10.5
Grand Total					**44**

Notes:
1. Based on City of Redding 2015 Urban Water Management Plan 2020 per capita water use target (City of Redding, 2016)
2. Calculation assumes one crop growth per year
af = acre-foot
afy = acre-feet per year
gal = gallons
GPCD = gallons per capita per day
gpy = gallons per year
gpd = gallons per day
SRRA = Safety Roadside Rest Area

As shown in Table 2-1, the total estimated current annual local non-Project groundwater production near the Project Site is approximately 44 afy.

2.2.5.1 Project-Site Demands

Historically, there has been localized consumptive demand in the vicinity of the Project Site. Operation and maintenance of the Project will require an annual demand of up to 5.6 afy for potable use and to meet fire flow requirements, with an actual expected demand of 0.5 afy. This demand is anticipated to remain constant throughout the life of the Project.

2.2.5.2 Comparison of Available Water Supplies Versus Demand

Section 10910 (c)(4) of the Water Code states:

> *"If the city or county is required to comply with this part pursuant to subdivision (b), the water assessment shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses."*

Onsite Well Option

The Project does not overlie a defined groundwater basin or subbasin, and, as a result, there is no GSA or GSP, and limited quantifiable data exist to support groundwater storage or budget estimates. However, the Project will require 49 af of water for up to 24 months of construction (24.5 afy), which is approximately half the combined annual groundwater production of the four closest non-Project groundwater users to the proposed O&M facility (Table 2-1). In addition, the long-term, O&M water use is projected to be as much as 5.6 afy, which is approximately one-eighth the combined annual groundwater production of the four closest non-Project groundwater users to the proposed O&M facility (Table 2-1). Though existing water supplies have not been quantified, the estimated annual O&M water demand of the Project represents a de minimis use compared with existing groundwater withdrawals, and will have a negligible contribution to existing groundwater supplies under all water year conditions.

Burney Water District Option

The current production capacity of the three BWD wells located approximately seven miles east-northeast of the project, is 4,600 gpm, or 7,420 afy, if operated continuously, with only one foot of drawdown (PACE, 2014). This indicates that the impact to groundwater supplies is negligible even with all three wells operating at capacity. In addition, the BWD's current effective system source capacity is 4.3 million gallons per day, or 4,816 afy. Because the project will only temporarily require 49 af of water for construction and up to 5.6 afy for O&M, the estimated annual demand for the Project represents a de minimis use compared with existing production capacity. Therefore, there are adequate supplies available to serve the proposed Fountain Wind Energy Project under all water year conditions.

3.0 REFERENCES

Burney Water District (BWD). 2020. Public Water System Statistics. Available at: https://www.burneywater.org/files/9909aca85/Item+7-+January.pdf. Accessed May 2020.

California Department of Water Resources (DWR). Originally published 1981. Revised 1991. Water Well Standards: State of California, Bulletin 74-81. Available at: http://wdl.water.ca.gov/well_standards/well_standards_content.html.

_____. 2002. Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001. Available at: https://water.ca.gov/LegacyFiles/pubs/use/sb_610_sb_221_guidebook/guidebook.pdf.

_____. 2003. Bulletin 118, Burney Creek Valley Groundwater Basin, Goose Valley Groundwater Basin, Dry Burney Creek Valley Groundwater Basin. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/B118-Interim-Update-2016_ay_19.pdf. Accessed May 2020.

_____. 2013. California Water Plan Update 2013, Volume 2 Regional Reports, Sacramento River Hydrologic Region.

_____. 2018. SGMA Basin Prioritization Dashboard. Available at: https://gis.water.ca.gov/app/bp2018-dashboard/p1/. Accessed May 2020.

_____. 2019. California Water Plan Update 2018. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/California-Water-Plan/Docs/Update2018/Final/California-Water-Plan-Update-2018.pdf

_____. 2020a. Well Completion Report Map Application. Available at: https://www.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37. Accessed May 22 and 29, 2020.

_____. 2020b. Well Completion Report map Application. Available at: https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37. Accessed May 23 and 28, 2020.

California Geological Survey. 2002. California Geomorphic Provinces, Note 36. Available at: https://www.coastal.ca.gov/coastalvoices/resources/California_Geomorphic_Provinces.pdf. Accessed May 27, 2020.

City of Redding. 2016. 2015 Urban Water Management Plan. Available at: https://www.cityofredding.org/home/showdocument?id=8963. Accessed May 27, 2020.

Clynne, Michael A., and L. J. Patrick Muffler. 2017. Geologic Field Trip Guide to the Lassen Segment of the Cascades arc Northern California, USGS Scientific Investigations Report 2017-5022-K2.

References

Moose Camp. 2007. Moose Camp Water Improvements. http://moosecamp.net/Site/Records_files/MC%20Water.pdf. Accessed June 1, 2020.

National Fire Protection Association (NFPA). 2017. NFPA 1142 Standard on Water Supplies for Suburban and Rural Fire Fighting.

PACE, 2014, Burney Water District Water Master Plan. Prepared for the Burney Water District. March 2014. 148 pp.

State Water Resources Control Board Division of Drinking Water (SWRCBDDW v. 3.2.1). CA Drinking Water Watch Water System Details – Burney Water District. https://sdwis.waterboards.ca.gov/PDWW/JSP/WaterSystemDetail.jsp?tinwsys_is_number=4422&tinwsys_st_code=CA&wsnumber=CA4510003. Accessed May 26, 2020.

_____. CA Drinking Water Watch Water System Details – Caltrans-Hillcrest SRRA. Available at: https://sdwis.waterboards.ca.gov/PDWW/JSP/ContactUs.jsp?tinwsys_is_number=4414&tinwsys_st_code=CA. Accessed May 28, 2020.

Appendix J
Scoping Report

Shasta County Department of Resource Management Planning Division

FOUNTAIN WIND PROJECT
ENVIRONMENTAL IMPACT REPORT

SCOPING REPORT

March 20, 2019

Use Permit No. UP 16-007
State Clearinghouse No. 2019012029

Prepared for:
Shasta County Department of Resource Management Planning Division

Prepared by:
Environmental Science Associates

Shasta County Department of Resource Management Planning Division

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ESA

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FOUNTAIN WIND PROJECT
Scoping Report

1. Introduction

The Shasta County Department of Resource Management Planning Division (County) is preparing an Environmental Impact Report (EIR) for the Fountain Wind Project as part of the County's consideration of the application for Use Permit No. 16-007 filed by Pacific Wind Development, LLC (Applicant), a subsidiary of Avangrid Renewables, LLC (Project).[1] This scoping report documents input contributed by agencies, Tribes, and members of the public during the EIR scoping period (January 15, 2019 to February 22, 2019). As the public agency with principal responsibility for carrying out or approving the Project, the County is the Lead Agency for purposes of complying with the California Environmental Quality Act (CEQA).

CEQA Guidelines Section 15083 provides that a "Lead Agency may…consult directly with any person…it believes will be concerned with the environmental effects of the project." Scoping is the process of early consultation with affected agencies and the public prior to completion of a Draft EIR. Section 15083(a) states that scoping can be "helpful to agencies in identifying the range of actions, alternatives, mitigation measures, and significant effects to be analyzed in depth in an EIR and in eliminating from detailed study issues found not to be important." Scoping is an effective way to bring together and consider the concerns of affected State, regional, and local agencies, the Project proponent, and other interested persons (CEQA Guidelines §15083(b)). Scoping is not conducted to resolve differences concerning the merits of a project or to anticipate the ultimate decision on a proposal. Rather, the purpose of scoping is to determine the scope of information and analysis to be included in an EIR and, thereby, to ensure that an appropriately comprehensive and focused EIR will be prepared that provides a firm basis for informed decision-making. Comments not within the scope of CEQA will not be addressed through the CEQA process but will be included as part of record of information for consideration by the County as part of its decision-making process for the Project.

This report is intended for use by the County in preparing the EIR as formal documentation of initial input received from governmental agencies, Tribes, and members of the public regarding the range of actions, alternatives, mitigation measures, and potential significant effects to be analyzed in depth in the EIR. It also provides access for other agencies and members of the public to see the comments received during the scoping period.

[1] The County is conducting the EIR process, including the preparation of this Scoping Report, pursuant to the requirements of CEQA (Pub. Res. Code §21000 et seq.) and its implementing regulations, the CEQA Guidelines (14Cal. Code Regs. §15000 et seq.).

2. Description of the Project

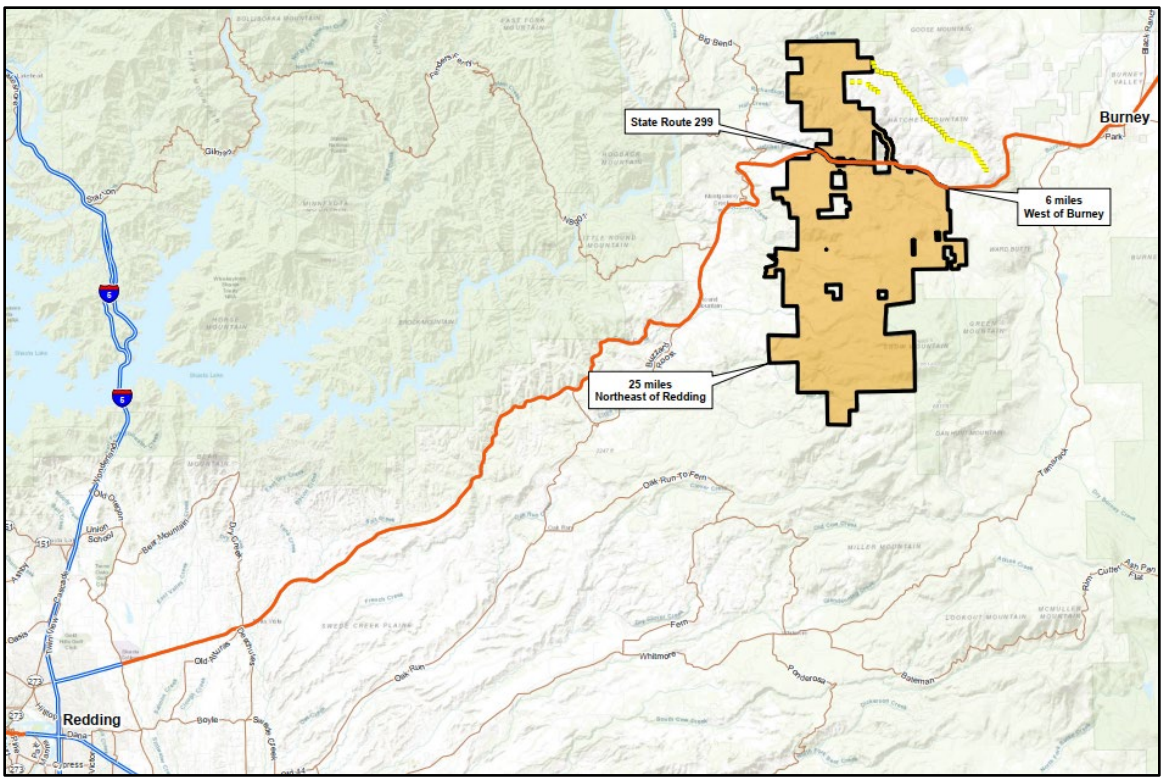
2.1 Project Summary

The Fountain Wind Project is a renewable wind energy generation development proposed by Pacific Wind Development, LLC, within an approximately 30,532-acre, privately-owned area in unincorporated Shasta County. The Applicant has applied for a Use Permit (UP 16-007) to construct, operate, maintain, and ultimately decommission up to 100 wind turbines and associated transformers together with associated infrastructure and ancillary facilities. Each turbine would be no more than 591 feet tall, as measured from ground level to vertical blade tip (total tip height), and would have a generating capacity of 2 to 4 megawatts (MW). The Project would have a maximum total nameplate generating capacity of up to 347 MW. Associated infrastructure and ancillary facilities would include: a 34.5-kilovolt (kV) overhead and underground electrical collector system to connect turbines together and to an onsite collector substation; overhead and underground fiber-optic communication lines, an onsite switching station to connect the Project to the regional grid operated by the Pacific Gas and Electric Company (PG&E), a temporary construction and equipment laydown area, 17 temporary laydown areas distributed throughout the Project site, an operation and maintenance (O&M) facility, permanent meteorological (MET) towers and either Sonic Detection and Ranging (SoDAR) or Light Detection and Ranging (LiDAR) capability, storage sheds, and temporary batch plants. New access roads would be constructed within the project boundary, and existing roads would be improved.

2.2 Project Location

The Project would be located approximately 1 mile west of the existing Hatchet Ridge Wind Project, approximately 6 miles west of Burney, 35 miles northeast of Redding, immediately north and south of California State Route 299 (SR 299), and near the community of Moose Camp and other private inholdings. See **Figure 1**, *Project Location*. Other communities near the Project area include Montgomery Creek, Round Mountain, and Wengler (each approximately 3 miles from the Project area) and Big Bend (approximately 7 miles from the Project area). The Lassen National Forest lies adjacent to the Project area southeast and the Shasta-Trinity National Forest borders the Project site to the north; other surrounding lands are privately owned.

The Project would be constructed on an up-to 2,167-acre Project site (outlined in Figure 1) located within the approximately 30,532-acres that comprise 76 Shasta County Assessor's parcels (APNs). The 76 APNs consist exclusively of private property operated as managed forest timberlands.



SOURCE: Avangrid Renewables, 2019 Fountain Wind Project

Figure 1
Project Location

3. Opportunities for Agency and Public Input

3.1 Pre-scoping Activities

The County initiated pre-scoping activities following receipt of the application for Use Permit No. 16-007. Pre-scoping activities included initial agency and community outreach, the results of which efforts were documented in an Initial Study, and consultation with Tribes pursuant to Assembly Bill (AB) 52 (Gatto, 2014). The Initial Study, initial outreach efforts, and the AB 52 consultation process are summarized below.

Initial Study

Pre-scoping activities included the preparation of an Initial Study. On the basis of the Initial Study, the County determined that preparation of an EIR would be required.

Initial Agency and Community Outreach

Initial agency outreach included communications with: The Burney Fire Protection District, California Department of Fish and Wildlife, California Department of Transportation, Central Valley Regional Water Quality Control Board, Shasta County Assessor/Recorder, Shasta County

Air Quality Management District, Shasta County Fire Department, Shasta County Office of the Sheriff, and the Shasta Mosquito and Vector Control District. Initial community outreach included communications with: The Pit Rive Tribe, Frontier Communications, and the Wintu Audubon Society. Correspondence with these agencies and members of the community is documented in the Initial Study.

Tribal Consultation Pursuant to AB 52

Pursuant to the AB 52 Tribal consultation process, CEQA lead agencies consult with tribes that are traditionally and culturally affiliated with the project area and that have requested consultation pursuant to Public Resources Code section 21080.3.1. The purpose of the consultation is to determine whether a proposed project may result in a significant impact to tribal cultural resources that may be undocumented or known only to the tribe and its members. As set forth in Public Resources Code Section 21080.3.1(b), the law requires:

> *Prior to the release of a negative declaration, mitigated negative declaration, or environmental impact report for a project, the lead agency shall begin consultation with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project if: (1) the California Native American tribe requested to the lead agency, in writing, to be informed by the lead agency through formal notification of proposed projects in the geographic area that is traditionally and culturally affiliated with the tribe, and (2) the California Native American tribe responds, in writing, within 30 days of receipt of the formal notification, and requests the consultation.*

The County's AB52 contact list consists of Native American tribes that had submitted written requests for notification of CEQA projects within their geographic area of traditional and cultural affiliation as of December 8, 2017, when the County initiated consultation. The County sent letters by certified mail on December 8, 2017 to two representatives of the Pit River Tribe: Mickey Gemmill[2] and Morning Star Gali.[3] Each letter identified the area within which the Project is proposed as within the Tribe's geographic area of traditional and cultural affiliation. Return receipts for the certified letters indicate the letters were delivered on December 8, 2017. The County received no response to either letter.

[2] Shasta County, 2017a. Letter of Bill Walker, AICP, Senior Planner, Shasta County Department of Resource Management, to Mickey Gemmill, Chairman, Pit River Tribe, regarding Tribal Cultural Resources under the California Environmental Quality Act, AB 52 (Gatto, 2014). Formal Notification of Determination that a Project Application is Complete, pursuant to Public Resources Code §21080.3.1. Available online: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/projects/fountain-wind-project/ab52/ltrpitrivertribemorningmickeygemmillchairman120717.pdf. December 8, 2017.

[3] Shasta County, 2017b. Letter of Bill Walker, AICP, Senior Planner, Shasta County Department of Resource Management, to Morning Star Gali, Tribal Historic Officer, Pit River Tribe, regarding Tribal Cultural Resources under the California Environmental Quality Act, AB 52 (Gatto, 2014). Formal Notification of Determination that a Project Application is Complete, pursuant to Public Resources Code §21080.3.1. Available online: https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/projects/fountain-wind-project/ab52/LtrPitRiverTribeMorningStarGaliTribalHistoricOfficer120717.pdf. December 8, 2017.

3.2 Scoping Activities

Notifications

On January 15, 2019 the County published and distributed a Notice of Preparation (NOP) accompanied by the Initial Study described above, to advise interested local, regional, state, and federal agencies, as well as the public, that an EIR would be prepared for the Project. The County sent the NOP package to trustee, responsible, and potentially affected federal agencies; to the Governor's Office of Planning and Research/ State Clearinghouse; and to three libraries in the Project area. The NOP and NOP mailing list are provided in **Appendix A**.

The County sent separate notice to a mailing list of 603 recipients that included Tribes, property owners within 2 miles of the Project site, and other interested parties. The direct-mail notification and its mailing list are provided in **Appendix B**.

The County also posted an electronic copy of the NOP and the direct-mail notice on its website: https://www.co.shasta.ca.us/index/drm_index/planning_index/eirs/fountain-wind-project. A screen shot of the website as of January 16, 2019 is included in **Appendix C**. In addition to the NOP, direct mail notifications, and web posting, the County notified the public about the public scoping meeting through newspaper advertisements published in the Record Searchlight on January 15 2019, in the Mountain Echo on January 15, 2019, and in the Intermountain News on January 16, 2019. The newspaper notices are provided in **Appendix D**.

Agency Scoping Meeting

The County held an agency-specific scoping meeting on Thursday, January 24, 2019 at 2 p.m. at the Shasta County Administration Building, located at 1450 Court Street in Redding. Notes of the agency-specific scoping meeting are provided in **Appendix E**.

Public Scoping Meeting

The County held a scoping meeting for members of the public on Thursday, January 24, 2019, at the Montgomery Creek Elementary School, located at 30365 State Route (SR) 299 East in Montgomery Creek. Doors opened to view project information at 6:30 p.m.; the public scoping meeting began at 7 p.m. The presentation slides and "story boards" that were displayed at the meeting were posted on the County's website after the meeting and are provided in **Appendix F**. A transcript of comments made by speakers at the meeting is provided in **Appendix G**.

4. Summary of Scoping Input Received

The NOP and other notifications solicited comments on the scope, content, and format of the EIR. Agencies and members of the public were encouraged to submit their comments to the County by U.S. mail, e-mail, via an on-line tool, or in person at the public scoping meeting. In addition to the oral comments made at the public scoping meeting (Appendix G), written input was received from approximately 150 entities. **Table 1** identifies the agencies, Tribes, and members of the public who submitted input on or before the close of the scoping period. Copies of all written input received is provided in **Appendix H**. All input received on or before end of the scoping period is documented in this Scoping Report.

TABLE 1A
AGENCIES WHO SUBMITTED SCOPING INPUT
FOR THE FOUNTAIN WIND PROJECT

Name	Affiliation	Letter ID	Date
Curt Babcock	California Department of Fish and wildlife	A1	2/19/19
William Solinsky	California Department of Forestry and Fire	A2	1/25/29
Marcelino Gonzalez	California Department of Transportation	A3	2/12/19
Patricia Nelson	California Governor's Office of Emergency Services	A4	2/7/19
Gayle Totton	Native American Heritage Commission	A5	2/12/19
John Waldrop	Shasta County Air Quality Management District	A6	1/16/19

TABLE 1B
TRIBES AND TRIBAL MEMBERS WHO SUBMITTED SCOPING INPUT
FOR THE FOUNTAIN WIND PROJECT

Name	Affiliation	Letter ID	Date
Anguiano, James	Atsuge Band-Pit River Tribe	T1	2/14/19
Davis, Radley	Illmawi Band-Pit River Tribe	T2	2/22/19
Wolfin, Gregory	Illmawi Band-Pit River Tribe	T3	2/14/19
Yiamkis, Tony	Illmawi Band-Pit River Tribe	T4	1/24/19
McDaniels, Brandy	Madesi Band-Pit River Tribe	T5, H	2/15/19
Walters, Raquel	Madesi Band-Pit River Tribe	T6	2/7/19
Cawker, Donna	Pit River Tribe	T7	1/28/19
Forrest-Perez, Natalie	Pit River Tribe THPO	T8	2/14/19
Riggins, Patricia	Pit River Tribe	T9	2/14/19
Johnson, Melany	Susanville Indian Rancheria THPO	T10	2/14/19

NOTE: In identifying individuals as Tribal members, this report relies on self-identification by the correspondents; except for those identified as Tribal Historic Preservation Officers, tribal membership has not been confirmed. Within the Column "Letter ID," the letter "T" refers to the designation of the letter or other communication included in Appendix H, whereas the letter "H" indicates that scoping input also was received at the public scoping meeting as documented in the transcript included in Appendix G.

TABLE 1C
ORGANIZATIONS AND MEMBERS OF THE PUBLIC WHO SUBMITTED SCOPING INPUT FOR THE FOUNTAIN WIND PROJECT

Name	Letter ID	Date
Alward, Lon	P1	2/04/19
Alward, Lori	P2	2/10/19
Alward, Lyda	P3	2/08/19
Sheila	P4	2/14/19
Baga-Weaver, Angel	P5	2/14/19
Baier, Edmond and Irene	P6, H	2/04/19
Baker, Bryce	P7	2/19/19
Baker, Douglas	P8	2/18/19
Baker, Nadine	P9	2/19/19
Baker, Traci	P10	2/18/19
Bales Mountain Quarry	P11	2/11/19
Bates, Linda	P12	2/19/19
Beaver, Linda & Marvin	P13	2/06/19
Benton, Crystal	P14	2/14/19
Billings, Bruce	P15	1/30/19
Bond Weiland, Susan	P16	2/5/19
Bond, Richard & JoAnne	P17	2/18/19
Boyan, Barbara and Craig	P18	2/04/19
Brown, Erin	P19	2/14/19
Brown, Jeremy	P20	2/18/19
Brown, Naomi and Greg	P21	1/19/19
Bucholz, John	P22	2/05/19
Buelow, Teri	P23	2/03/19
Byers, Brook	P24	2/10/19
Carreno, Sabrina	P25	1/24/19
Carter, Nancy	P26	1/30/19
Chamberlain, Mark	P27	1/28/19
Coughlin, Dan	P28	2/16/19
Danielson, Jeanne	P29	2/11/19
Dickson, Kelly	P30	2/18/19
Dorroh, Lynn	P31	2/11/19
Epperson, Ron	P32, H	2/06/19
Evans, William	P33	2/11/19
Fenimore, George	P34	2/13/19
Ferguson, Jon	P35	2/14/19
Ferguson, Lynn	P36	2/13/19
Flood, Laurie	P37	2/12/19
Forster, Carol	P38	2/14/19
Forster, Carol and James	P39	2/14/19
Freeman, Jonathon	P40	2/22/19
Frolich, Jennifer	P41	2/14/19
Gable, John	P42, H	2/02/19
Gheen, Pat	P43	2/13/19
Gifford, Jennifer	P44	2/16/19
Good, Mike and Kathy	P45	2/19/19
Hall, Mike	P46	2/21/19
Henning, Nick	P47	2/22/19
Henrich, Pedro	P48	2/14/19
Holden, Richard	P49	2/22/19
Humphreys, Robert	P50	2/14/19
Jenkins, Deever	P51	1/28/19
Johnson, Steven	P52	2/10/19
Karabats, Janis	P53, H	2/15/19
Kauer, Rick	P54	2/02/19
Kay Douglas, Lorrie	P55	2/20/19
Kloeppel, Robert	P56	2/08/19
Knauer, Chuck	P57	2/6/19
Lammers, John	P58	2/12/19
Lammers, Prudence and Robert W	P59	2/19/19
Lammers, Robert	P60	2/7/19
Lancaster, Gail and Dwayne	P61	2/21/19
Langlois, Lionel	P62, H	2/11/19
Larson, David	P63	1/26/19
Lattin, Jess	P64	2/22/19
Leaf, Seabrook	P65	2/14/19
Loveness, Linda	P66	2/22/19
Lynch, Gina	P67	2/10/19
Lynch, Robin	P68	2/10/19
Lynch, Ryan	P69	2/10/19
MacDonald, Keith	P70	2/22/19
Maher, Mary	P71	2/14/19
Martin, Lindsay	P72	2/14/19
Mazzini, Jessie	P73	1/28/19
McDonald, Lisa	P74	2/08/19

TABLE 1C (CONTINUED)
ORGANIZATIONS AND MEMBERS OF THE PUBLIC WHO SUBMITTED SCOPING INPUT FOR THE FOUNTAIN WIND PROJECT

Name	Letter ID	Date
McVey, Susan	P75	1/24/19
Messick, Elizabeth	P76, H	2/12/19
Micheletti, Monica	P77	2/20/19
Miller, Carol	P78	1/28/19
Murphy, Doug	P79	2/14/19
Murphy, Elizabeth	P80	2/10/19
Murphy, Hannah	P81	2/11/19
Murphy, Morgan	P82	2/10/19
Murphy, Spencer	P83	2/10/19
Narducci, Gary and Sharon	P84	2/11/19
Oliveira, Laureen	P85	2/14/19
Osa, Joseph and Maggie	P86, H	2/13/19
Osa, Maggie	P87, H	2/08/19
Owens, L.A	P88	2/19/19
Palatino, Charles and Cynthia	P89, H	1/31/19
Popejoy, Bill and Brenda	P90	2/04/19
Rains, Randal	P91	1/23/19
Reed, Kevin	P92	2/14/19
Sierra Club	P93	1/27/19
Simonis, Angela	P94	2/14/19
Skalland, Shari	P95	2/22/19
Sours, Judy	P96	1/29/19
Sours, Stan	P97	1/27/19
Spackman, Jeff	P98	2/11/19
Stanford, David	P99	2/22/19
Stapp, John and Sandra	P100	2/11/19
Stein, Bruce	P101	2/10/19
Stoneback, Keith	P102	2/22/19
Stremple, Susan	P103	2/10/19
Stremple, Theresa	P104	2/11/19
Sublette, Karen	P105	2/22/19
Swarts, Myra and Orvil	P106	2/10/19
Swarts Stremple, Myrna	P107	2/10/19
Tassen, Paula	P108	1/30/19
Tavares, Trudy	P109	2/11/19
Taylor, Patricia	P110	2/21/19
Tinkler, Candace	P111	1/28/19
Waldkirch, Lori	P112	1/28/19
Watson, Evan	P113	2/11/19
White, Jaclyn	P114	2/12/19
Wiegand, Jim	P115	2/14/19
Willett, Kathy	P116	2/14/19
Williams, Marvin & Linda	P117	2/4/19
Williams, Ralph	P118	2/14/19
Wintu Audubon Society	P119	2/14/19
Woodward, Anne Marie M.D.	P120	1/20/19

NOTE: Within the Column "Letter ID," the letter "P" refers to the designation of the letter or other communication included in Appendix H, whereas the letter "H" indicates that scoping input also was received at the public scoping meeting as documented in the transcript included in Appendix G.

4.1 Approach to the Consideration of Scoping Input

The County has reviewed the full text of all scoping input received and will consider it in preparing the EIR. Summaries of the issues raised are provided below for ease in review by other agencies and members of the public.

Input Received on Issues Outside the Scope of CEQA

CEQA requires lead agencies in preparing an EIR to analyze significant effects on the environment. For purposes of CEQA, the term "environment" means the physical conditions that exist in the area that will be affected by a proposed project including "land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance…. The 'environment'

includes both natural and man-made conditions" (Pub. Res. Code §21060.5; CEQA Guidelines §15360). Input on topics that are beyond the scope of CEQA was received during the scoping period. Examples of such input include comments about:

a. Economic changes, such as financial benefits to the community (such as a desire to receive donations from the applicant to support scholarships or community programs, or lower energy costs) or others (such as potential workers or suppliers of Project materials) if the Project is approved (including the owner of the Project site and whether the applicant is a foreign or domestic entity), or declines in tourism-related income. CEQA is clear that potential impacts to property values are beyond the scope of CEQA, no matter how potentially severe they may be [*Porterville Citizens for Responsible Hillside Development v. City of Porterville* (2007) 157 Cal.App. 4th 885, 903].

b. Perceptions of unfair distribution of benefits and burdens of the local community relative to more distant, urban areas in terms of renewable energy production and energy demands;

c. Psychological and social impacts on community character also are beyond the scope of CEQA. *Preserve Poway v. City of Poway* (2016) 245 Cal.App.4th 560. The character of the communities that would be affected by the Project have been described generally in scoping input as reflective of "country living, quiet, pure and clean", "undisturbed by civilization," and as "a refuge from city life." Community character input also was received in connection with changes being experienced in people's expectations regarding the ability to use their neighbors' land (such as increasingly strict anti-trespassing policies);

d. Expressions of favor or disfavor for renewable energy, the Project, an aspect of the Project, or a potential alternative without reference to a change in the environment that would be attributable to the Project; and

e. Non-project-specific comments, including quotations from legal requirements without providing a stated connection to the project, and general feelings about renewable energy, the wind industry, or comments about other energy projects where questions about the reliability of data or other issues may remain.

The County acknowledges its receipt of input that is beyond the scope of CEQA and has included it in the record of materials for consideration by decision-makers even though it will not be addressed in the EIR. The environmental consequences of a project are but one of multiple factors that may be taken into consideration when a Lead Agency is deciding whether or not to approve a proposal.

Input Received on Issues Within the Scope of CEQA

The purpose of scoping is to solicit input as to the scope and content of the EIR, including potential impacts of concern and mitigation measures or alternatives to be considered. This type of input was received during the scoping period and is summarized below. These summaries include "raw" input that has not been vetted for accuracy; they represent to the greatest extent possible commenters' actual input.

a) Aesthetics

Scoping input was received regarding the existing environmental setting, which includes: Daytime and nighttime views of the Hatchet Ridge Wind Project, which are described as visible

from Interstate (I)-5 and locations in Modoc and Siskiyou counties; two major transmission lines that are described as "crisscrossing" the Montgomery Creek/ Round Mountain community before connecting to the regional grid PG&E's Round Mountain substation; the Fountain Fire burn scar; and SR 299. Scoping input regarding regulatory setting suggests that the County consider the General Plan section that addresses the visual effects of all new development.

Scoping input expressed general concerns about impacts to existing daytime and nighttime views, the potential to limit the possibility of SR 299 being designated a scenic highway at some point in the future; and requests to analyze potential changes to views from nearby homes (including private properties in Moose Camp) and to views from geographic locations (including SR 299, Round Mountain, Oak Run, Burney, Mount Shasta, Castle Crags State Park, Redding, Bella Vista, Palo Cedro, Anderson, Cottonwood and I-5, Fall River Mills, Lassen Volcanic National Park, and Big Valley Point).

Commenters suggested that project elements that could trigger changes in aesthetic resources include site preparation activities (e.g., timber removal, road construction), and construction, operation, maintenance, and decommissioning of the proposed turbines, meteorological towers, and overhead power lines. Commenters identified the density and proximity of the proposed turbines to viewers as causing potential impacts, as well as the introduction the motion of turbine blades in the landscape and as perceived as "shadow flicker." Commenters identified the potential for FAA-required safety lighting to affect existing night-sky conditions as a concern for affected residents and other observers. Commenters suggested that temporary disturbances would change views during the time needed for the temporarily disturbed areas to be reclaimed and that permanently-cleared or minimally-revegetated areas (e.g., for the underground and above ground transmission lines) are to be considered. Commenters also suggested that the addition of truck traffic where now there is very little traffic at all would affect the scenic character of the area.

To assess potential cumulative effects, commenters identified the following for inclusion as part of the cumulative scenario specifically with respect to aesthetics: The Hatchet Ridge Wind Project and its impacts, including shadow flicker across SR 299.

To mitigate anticipated impacts to aesthetics, commenters suggested consideration of the following measures: eliminating turbines, relocating them north of SR 299, relocating them further south of SR 299, increasing setbacks, and painting turbine towers and blades a color other than white or with a pattern would have less visual impact.

b) Agriculture and Forestry Resources

No scoping comments were received regarding agriculture resources. Scoping input received regarding forestry resources noted that the site is subject to herbicide use and thinning under existing (baseline) conditions and included expressions of concern that the development of a wind project on the proposed site would: 1) remove trees that have taken years to recover from prior wildfire events, 2) result in tree removal on a much greater scale than if commercial timber harvesting were approved, and 3) result conversion to non-timber-producing use, where the forest conversion could lead to loss of nutrient-rich topsoils, disrupted nutrient cycling, and increased erosion.

To assess potential cumulative effects, commenters identified the following for consideration as part of the cumulative scenario specifically with respect to forestry: the growing scarcity of productive forest lands through timberland conversion, harvesting associated with timber harvesting plans (THPs), and the devastating impacts of recent forest fires, drought, and tree mortality in Shasta County and nearby areas.

c) Air Quality

Scoping input from the Shasta County Air Quality Management District advises the County that the AQMD typically refers to California Health and Safety Code Section 41700 as the guideline when dealing with prohibited discharges, and nuisance complaints, but has not specifically defined "substantial." Regarding the regulatory setting, the AQMD also recommends the following for the County's consideration: Protocol for Review- Land Use Permitting Activities (Nov. 2003), Environmental Review Guidelines- Procedures for Implementing CEQA (Nov. 2003); and Rule 3:2 (Specific Air Contaminants), Rule 3:16- (Fugitive Emissions), Rule 3:31 (Architectural Coatings) and Rule 3:32 (Adhesives and Sealants). Further, all heavy equipment operating on site must be registered under the State of California Portable Equipment Registration Program; on site fuel dispensing and storage must meet California Phase 1 vapor recovery requirements; and, in the event that operations are being conducted in an area containing naturally occurring asbestos, a plan shall be submitted that meets the requirements of the Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations.

Other air quality-related scoping comments related to the proximity of residential receptors to project emissions from construction materials delivery vehicles (including wide or "super" loads for turbine components) originating outside the county, secondary impacts resulting from increased emissions from other vehicle delays resulting from traffic controls and lane closures required for materials delivery, emissions from construction worker commute trips and construction vehicles, on-site vehicle and equipment emissions for site preparation-related timber harvesting, and dust. Comments noted that dust would be caused by construction work, travel on Project roads in and near Moose Camp (resulting in declining attendance of functions at the social hall and events that include cooking and eating outdoors). One comment noted that the prevailing south-west winds of summer would exacerbate the Project's anticipated dust-related impacts. Another expressed concern that water truck-based applications would not be sufficiently effective in reducing dust impacts during construction or during the life of the Project thereafter.

d) Biological Resources

Scoping input received regarding the environmental setting for the analysis of biological resources identified the fact that the Project site that was replanted after the Fountain Fire, and is maintained with herbicide use and thinning. Existing invasive species in the area include: Scotch Broom, Pampas Grass, Star Thistle and Johnsongrass. Further, the Project area abuts both the Lassen National Forest and the Shasta-Trinity National Forest.

Regarding data inputs to be considered in the analysis, one scoping commenter questioned whether the Applicant's bird point count surveys adequately estimate all avian species that use the project area due to an inconsistency with recommendations in guidance published by the California Energy

Commission. Another commenter suggested that bird count surveys should (but so far do not) account for sand hill cranes' seasonal migration in early spring and late fall. More information was requested about why avian surveys were not conducted of nighttime migration for the Sandhill crane, in light of anecdotal evidence that the migration of this species descends into the proposed turbines' rotor range during storm events in winter. Nighttime migration survey methods (including radar, acoustical and near-infrared) were recommended. Further, scoping comments mention wolverine sitings on Hatchet Ridge, crossings of SR 299, and presence in the Tahoe National Forest, scoping comments suggest that these sitings could indicate recolonization of this species' California habitat may be in progress and, on this basis, request furbearer studies. Other input notes that site terrain and landforms are distinguishable from the Hatchet Ridge Wind Project site, and so information from that project site should be considered with caution in the context of this site. Finally, recognizing that the Project site has the potential to support aquatic, riparian, or wetland habitat, one commenter requested that a preliminary jurisdictional delineation be provided of lakes, streams, and associated riparian habitats potentially affected by the Project including wetlands identification pursuant to the U.S. Fish and Wildlife Service's definition of "wetland" as adopted by the California Department of Fish and Wildlife.

Regarding the regulatory setting, scoping input identifies the following laws as relevant to the analysis: The Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), and the Bald and Golden Eagle Protection Act (BGEPA).

Potential impacts of concern identified relate to all manner of flora and fauna, including:

- Vegetation, wetlands, and whether the analysis would consider streams, creeks, peats, bogs and meadows and aquatic habitat for brook trout and other fish;
- Rare, threatened, and endangered plants, and California rare plants that were identified as existing near the northern part of the Project area on U.S. Forest Service lands;
- Elderberry longhorn beetle identified in scoping comments as present along SR 299;
- Fully-protected animals (e.g., ring-tailed cat);
- The pack of gray wolf near Lassen National Park (federally/State endangered);
- Species of Special Concern;
- Invertebrates/insects, fish, amphibian (frogs, salamanders), reptiles, and other wildlife species (birds, mammals);
- common wildlife species (game, non-game, specially-protected species, etc.) also were identified in comments as present in the Project area, including rabbits, fox, raccoon, California Brown bear, wolverine, American marten, badger, mountain lion, bobcat, Rocky Mountain elk, and deer; and
- Wildlife corridor/movement areas and other key seasonal use areas.

Scoping input identifies several avian species in the Project area, including nesting and other raptors (i.e., bald eagles, golden eagles, red-tailed hawks, red kite, osprey, Northern goshawk, Northern spotted owl, great grey owl); Species of Special Concern (e.g., olive-sided flycatcher

and yellow-headed blackbird); yellow warbler, migrating and other waterbirds and fowl (i.e., Sandhill crane, which migrates in early spring and late fall, white pelican, heron, hooded merganser, swan, Canadian geese, and mallards) and other birds, including hummingbirds, woodpeckers, mountain jays and crows.

Scoping comments request that the analysis consider the potential for the proposed turbines to result in mortality, injury, or displacement or other adverse impacts to the avian species that inhabit, nest in, pass or migrate through, or forage within the Project area. Scoping comments request that the analysis estimate the number of birds that would be killed by collisions with different sizes of towers and at different tower densities and layouts and the potential for disturbance to nest sites and foraging habitat from increased human intrusion from traffic, noise, road widening, and the construction of ancillary facilities and structures. Regarding the hoary bat and other bats, scoping input recommends consideration of the work of Curt Babcock. Other input refers to studies suggesting that changes in electric field and air pressure effects in the vicinity of turbine blade tips can burst the capillaries in the lungs of bats that fly near them, and request that the analysis evaluate this potential impact.

Other temporary and permanent impacts of concern were identified as relating to forest habitat, habitat fragmentation, edge effects associated with new or wider roads and other cleared areas, and the potential for the proposed vegetation clearing to increase the amount of light that penetrates the forest floor, which may result in displacement and changes in species composition. Scoping input also suggests that the proposed diversion of water to construct the project would negatively impact biodiversity and that the Project could contribute to cyanobacteria/toxic algae that would harm members of the community. Other impacts identified as being of potential concern relate to Project activities' potential to spread invasive species; introduce noise that, at even moderate levels (40-60 dB) is associated with physiological and behavioral changes in birds, terrestrial mammals, amphibians, and bats; introduce "infrasound," which is sound waves with frequencies below the lower limit of 20Hz that may affect the behavior and well-being of animals including geese, worms, chickens and cows; introduce hazardous features that could trap, displace, or lead to death of wildlife; and introduce artificial lighting that could have adverse impacts to birds and nocturnal species. Scoping comments asked whether the proposed red blinking light technology would disrupt the normal, natural balance of the ecosystem based on comparability to products as "Nite Guard Solar-Powered Night Animal Predator Light," which is claimed to successfully deter and frighten nocturnal species such as owls, coyotes, opossum, raccoons, fox, bobcats, muskrats, bears, cougar, wild boar, mink and weasels. Fisheries dependent on the water quality afforded by the existing ecosystem, scoping input suggests, would be disrupted by the proposed construction activities.

For inclusion in and consideration as part of the cumulative scenario specifically for biological resources, scoping input identifies the permanent and temporary reduction of several thousand acres of habitat as a result of timberland conversion, fires, drought and tree mortality; other sources of avian mortality including buildings, windows, and domestic cats; other sources of bat mortality including mosquito abatement projects dating back to the 1960s; and trend data indicating declines in populations for species such as spotted owl, goshawk, and English peak greenbriar.

Scoping input identifies potential mitigation measures to avoid or reduce potential impacts to biological resources, including whether painting turbine towers and blades a color other than white or with a pattern could reduce bird strike impacts, whether the color of the FAA security lighting could be changed to reduce the attractiveness to birds; and whether a greater carcass search distance could be imposed than previously required to more accurately quantify avian mortality.

e) Communication Interference

Scoping input requests that the EIR analyze whether Project components such as wind turbines or meteorological towers could cause communications interference that adversely affects residents' and others' ability to coordinate with emergency service providers via cell phone, 2-way radio, landlines, or the internet. One comment also asked about potential interference with television reception. Concerns were raised specifically regarding potential interference with the communications infrastructure and communications needs of SHASCOM (the Shasta Area Safety Communications Agency), California Highway Patrol, air ambulance service providers such as PHI and REACH, aviation companies that use the flight path over the proposed site, and Valley Industrial Communications, which repairs and handles repeaters and radio problems for public safety entities such as the Sherriff's Office and SHASCOM.

f) Cultural

Scoping input received regarding Tribal Cultural Resources is summarized in subsection s), below. Scoping input about cultural resources more generally suggests that analysts inquire with the California Historical Research Information System (CHRIS) regarding archeological records, and with the Native American Heritage Commission regarding sacred lands file research and tribal consultation. Potentially affected historic resources were identified as including Moose Camp, official historical sites on the Buffum Homestead that were certified after the 1992 Fountain Fire, and a cabin within the Project site that was built in the 1800s that would have to be demolished. The potential to disturb human remains including Indian burials and burial sites also was identified. Mitigation measures were recommended relating to the potential for inadvertent discoveries and regarding the disposition of non-burial recovered cultural items. Caltrans asked whether a historic resource recordation area report would be required and, if so, requested inclusion in conversations regarding any proposal to include SR 299.

g) Economic and Social Impacts

Expressly in the context of CEQA Guidelines Section 15131(a)'s "chain of cause and effect" provision, the County received scoping input suggesting that the project's impacts to existing scenic vistas would have a detrimental effect on property values that would cause a reassessment of property values and corresponding loss in tax revenues relative to current conditions. Input from a forensic appraiser in Wisconsin was received, and requests for a guarantee of compensation against property loss relating to the Project were made. Additional input was received suggesting that a pattern of behavior exists of targeting socio-economically suppressed areas, and exploiting them for personal gain.

h) Energy

Scoping input received regarding the environmental setting for the analysis of energy, including energy efficiency, includes seven hydropower plants in the Project area (Pit #1 through Pit #7) with additional hydropower plants including the ones located at Shasta Dam, Spring Creek Power plant, Judge Francis Carr Powerhouse, Trinity Dam and Keswick Dam; as well as five privately owned hydropower plants in Shasta County, including Balta on Battle Creek, Kilarc on Cow Creek, Hat Creek, Roaring Creek and Haynes Burney Creek. The existing energy setting also includes Wheelabrator and cogeneration power plant facilities in Shasta County.

Scoping commenters request that the analysis consider fuel use for construction equipment, backup power generation, construction vehicles, and worker transportation to/from the Project site as well as for vehicles idling on SR 299 during materials delivery and as required to start/re-start a turbine. Other comments request disclosure of the difference between estimated and actual power generation from the turbines, including an explanation of the existing sources of energy that would be replaced by this Project; and consideration not only of whether water diverted for Project use would reduce the water going through existing hydropower plants, but also that the transmission of power over long distances is not efficient.

i) Geology and Soils

Scoping input received regarding the environmental setting for geology and soils suggest that landslides and road collapses are not uncommon in the project area and identify the presence of Montgomery Creek formations, which are described as “extremely permeable” primarily alluvial fan deposits of sand and mixed rocks. Comments question whether such deposits are suited for the proposed foundations, suggest that the compaction that would be needed to provide road access throughout the site could alter the current underground water flows to Class 1 streams, and note that applications of pesticides could degrade water quality. A “full geological investigation” is requested to address movement of water throughout the geology.

j) Greenhouse Gas Emissions and Climate Change

The County received scoping comments regarding the existing environmental setting for the evaluation of impacts relating to greenhouse gas (GHG) emissions and climate change, including about annual rainfall assumptions and annual average wind speed.

Input also expressed concern that operation of the wind turbines could result in “localized atmospheric warming” (also referred to as a “heat island effect”) that would affect the snow pack and temperatures required to grow apples. The possibility also was raised that the wind turbulence of turbines located along ridge lines could impact local weather by disrupting normal air flow over ridge tops, that spinning turbine rotors increase the vertical mixing of heat and water vapor, thereby affecting downwind meteorological conditions, including rainfall.

Multiple scoping comments requested disclosure of the Project’s net effect on GHGs, including any reduction of other green sources of energy production (such as local hydroelectric capacity that would have to be throttled back during the operation of the proposed turbines) and any reduction in the site’s GHG sequestration capacity caused by the temporary and permanent

removal of thousands of acres of forest. Comments also requested that the analysis provide a "cradle-to-grave" carbon lifecycle analysis that factors in emissions associated with the mining, manufacture, transportation, and construction of turbines, concrete, rebar, and other materials for the Project.

k) Hazards and Hazardous Materials

Scoping input relating to Hazards and Hazardous Materials suggest consideration of Shasta County's local hazard mitigation plan, which addresses wildfires and other hazards. Potential causes or contributors to hazards were identified as increased truck traffic on Moose Camp roads, activities that would disturb natural deposits of arsenic (which could be released to surface waters), and equipment that could leak of toxic chemicals or flammable oils (such as transformers, turbines, or batteries).

l) Hydrology and Water Quality

Scoping input regarding the existing environmental setting for Hydrology and Water Quality identify a host of headwaters, surface waters, and other sources of drinking water in the Snow Mountain area, including: Hatchet Creek, Montgomery Creek, the South Fork of Montgomery Creek, Goat Creek, Indian Springs, Willow Creek, Cedar Creek, Blue Lake, Little Cow Creek, the North Fork of Little Cow Creek, Mill Creek, Cheddar Creek, Sawdust Creek, and Buffum Creek. Drinking and agricultural water for the 20-family community of Wengler is pulled from Roaring Creek through the Vaughn Ditch. Area waters also are used for recreational activities (swimming and fishing) as well as for aquatic habitat.

There are three existing wells in Moose Camp that provide water for domestic use; an additional well is located at the Caltrans Hillcrest Rest Area. Existing groundwater quality is described as full of iron and minerals that make the water from some wells unsuitable for gardening or domestic use. There is one fire hydrant in the area; it is located at the Halcumb Cemetery in Montgomery Creek.

Regarding the regulatory setting, scoping input requests the use of current reports or other information from the water board regarding the present status of the water table and the Pit River watershed.

Many comments expressed concern about potential impacts to existing water rights and water supplies (including creeks, rivers, ditches, springs, and wells) resulting from hydrologic disturbance caused by construction and other stresses on the aquifer from temporary and permanent clearance of timber, road widening, application of gravel to ground surfaces, compaction of earth, cable trenching and related clearance, transmission line infrastructure and related clearance, excavation for foundations including the burying of concrete, blasting, and Project-caused vibration. Because soils in the area are broken "volcanic rock, fragile and extremely fast draining," there is widespread concern that the use of heavy equipment could change the direction of underground water flows. Concerns about potential impacts caused by Project-related water use (e.g., for dust suppression) were raised, as were concerns about the potential for Project activities to contaminate area waters due to erosion and runoff from

construction-related soil disturbance in the watershed, hazardous materials that could leak or drip onto the ground and then migrate to area waterways or wells, or the proposed use of Round Up, similar defoliants, soil sterilants, or herbicides to clear or maintain land within the Project site.

Regarding cumulative effects specifically to hydrology and water quality, scoping input recommends consideration of onsite and offsite water courses and springs, sediment yields, and water quality in light of existing stresses on area waters, including from illegal marijuana grow operations' water demand and pesticide use (e.g., carbofuran, and neurotoxic insecticide) which contaminate the water.

m) Land Use and Planning

Scoping input asked whether the Project would be consistent, or would conflict, with Shasta County Code Section 17.92.025 regarding use permits for high voltage electrical transmission and distribution projects.

n) Noise and Vibration

Scoping input identified existing potential receptors in Moose Camp that could be affected by increased noise and vibration during the Project's construction, operation, and maintenance. Comments suggested that noise could result from additional vehicles traveling along the main road proposed between the two substations (which would abut residential property) and along the three roads that surround Moose Camp's fence line, from heavy equipment and from the proposed concrete plant; from operation of the turbines (including low frequency sonic and infrasonic noise caused by the blades combined with the creaking and groaning of the structures) and from operation of the power lines (described in scoping comments as the "hissing sound," "constant buzz" and "sizzle and pop" audible in winter or when it is cold or moist). Vibration could be caused by operation of the turbines.

o) Public Health

Scoping input described the existing environmental setting for the EIR's consideration of potential impacts to human health as including the identification of Shasta County and the Round Mountain area as having the highest rates of cancer, neurological disorders, suicide, osteoporosis, and dementia in the state; and the fact that the intermountain community is made up primarily of older citizens, who may be more susceptible to health impacts.

Scoping comments specifically identified questions or concerns relating to blade throw, ice throw, the potential exacerbation of dust-related allergies, and for light pollution to compromise health. Other scoping comments identified concerns relating to electromagnetic radiation (EMF) from high voltage power lines and turbines and their potential to cause neurological problems, cancer, Alzheimer's disease, dementia, Parkinson's disease, and depression. Other comments identified shadow flicker and its potential to trigger epileptic seizures, migraines or affect mental health. Some comments focused on infrasound (i.e., sound waves with frequencies below the lower limit of 20Hz) and the potential it may have to cause neurological and physiological disorders resulting in feelings of sea sickness, annoyance, fatigue, pressure or tinnitus (ear ringing), sleep disturbance or sleeplessness, headaches, or vibroacoustic disease. Other scoping

input identified the use of glyphosate weed killers such as Roundup as having potential to cause cancer and/or deoxyribonucleic acid (DNA) disruption, resulting in sterility and deformities. Concerns about an unspecified condition called "wind turbine syndrome" also were raised as having the potential to cause sleep disturbance, headaches, tinnitus, a sense of quivering or vibration, dizziness, nausea, nervousness, high blood pressure or rapid heartbeat, difficulty with concentration, memory loss, irritability and anger, and seizures.

Potential mitigation measures proposed in scoping comments to address potential health impacts include not build high-powered lines within 1,000 feet of any existing residence and increasing setbacks to 1,500 feet, filtering inverters, and burying collector lines.

p) Public Services

Scoping input regarding Public Services in the Project area note that Cal OES provides community support, including disaster response and recovery, that the local community is served by a volunteer fire department (the Montgomery Creek Fire Company). Concerns expressed relating to Public Services include potential inhibition of the use of the emergency flight care helipad in Moose Camp for transport of sick or injured from Alturas to Redding, preclusion of the use for emergency egress to SR 299 of the road outside the yellow gate to the west of Moose Camp, and whether water diverted for Project use would reduce the water source serving the only fire hydrant in the Project area (located at the Halcumb Cemetery in Montgomery Creek).

q) Recreation

Although there are no parks in the project area, scoping input suggests that the Project would affect areas that provide recreation based on swimming, hunting and fishing, hiking, biking, cross-country skiing, snowmobiling, and bird watching.

r) Transportation

Scoping input received regarding the existing environmental setting for the EIR's analysis of transportation suggest that SR 299 is narrow, of steep grade in the Project area, and subject to commercial accidents on a regular basis. Further, there is a road located within 100 feet of Moose Camp that provides the owner of the Lammer Ranch access to SR 299, and has provided emergency ingress/egress for residents of Moose Camp since the 1930s; this road is "seldom used."

Concerns were expressed about the potential for the Project to result in impacts to transportation during construction, operation, and maintenance. During construction, potential impacts could result from the number and size of loads needed to transport and deliver of turbine components (SR 299) and gravel. Delays could adversely affect emergency vehicles trying to get through town; local users of SR 299 and adjoining roads; and commuters heading to Redding for work, entertainment or shopping. The analysis also should consider delays during the time to repair SR 299 post-materials delivery. Potential impacts during operation and maintenance could be caused by members of the general public wanting to get up close to the turbines (as they do for the Hatchet Ridge Wind Project), regular traffic to/from the O&M Facility (which is proposed on a road located within 100 feet of Moose Camp that provides the owner of the Lammer Ranch

access SR 299 and emergency ingress/egress to SR 299 for residents of Moose Camp) and use of the main road proposed between the two substations (which abuts residential property).

s) Tribal Cultural Resources

Scoping input regarding Tribal Cultural Resources note that natural and cultural resources are indistinguishable from the Pit River Peoples and are a central element of the spirituality, traditional ceremonial practices, religious expressions, history, and identity of the Tribe and Tribal members. Tribal members explain that the Tribe and its nation have deep ties to the area, which they describe as a place of refuge, ceremony, healing, prayer, fasting, hunting, gathering, and other sacred traditional uses. Burial grounds are believed to present in the Project area. Tribal members express concern that the construction, operation, and maintenance of the Project could infringe on the freedom of religion and the cultural practices of the Pit River Tribe and other Indian Tribal Nations in the region and that the Project could adversely affect sacred sites, traditional plants, and the viewshed of mountains held sacred by the Tribe including Yet-Tey-Cha-Na (Lassen Peak) and Kohm Yamani (Snow Mountain). Comments mention an old ridgetop trail connects the Pit River to Goose Valley to the Lassen area and has traditionally been, and continues to be, used to reach remote areas during vision quests. The ridge also is identified as a boundary between the Itsatawi, Madesi and Atsugewi Bands. Birds traditionally important to the Pit River culture (such as eagles and eagle nests, osprey, ducks, and geese) cross the ridge and could be injured or killed by the turbine blades. Deer also migrate across the ridge. Commenters suggest that sounds generated by the Project could disrupt bird and animal patterns, as well as human experiences in the area. Existing conditions identified in comments as contributing to ongoing impacts to tribal cultural resources include burdens from power generating activities associated with the Hatchet Ridge Wind Project, power lines, dams, and PG&E hydroelectric activities.

Scoping input identifies sources of information and relevant regulation of impacts to Tribal Cultural Resources as including federal and state statutes, declarations, executive orders, resolutions, decrees, and conventions; guidance documents provided by the Native American Heritage Commission; and, regarding the ridgetop trail, old General Land Office Maps. The Tribal Historic Preservation Officer (THPO) from the Susanville Indian Rancheria asked whether it is too late to request consultation under AB 52.

t) Utilities and Service Systems

Regarding Utilities and Service Systems, scoping comments ask whether existing electrical infrastructure is adequate to transmit electricity to be generated by the Project reliably and safely once it hits the Round Mountain station operated by PG&E. It is suggested that these lines are at or over electrical capacity during peak times 7 months or more of the year.

u) Wildfire

Scoping input received regarding the existing environmental setting for the EIR's analysis of potential impacts related to wildfire note that the Project is proposed in an area designated by the California Department of Forestry and Fire Protection as a "State Responsibility Area (SRA)," as

a "Very High Fire Hazard Severity Zone (VHFHSZ)," and as within approximately 1.5 miles of the 1992 Fountain Fire at Round Mountain. Existing conditions are windy; the terrain is (up to 25 percent grade). There is a history of lightning strikes and fires, both natural and human-caused, in the area. Options for ingress and egress are limited. Furthermore, the existing forest, which was planted after the Fountain Fire, is mostly pine. Trees are approximately 20-30 feet tall and grow 3-4 feet apart, deer brush and manzanita grow in the understory, and years of pine needles cover the forest floor. It is suggested that the current owners will not allow controlled burns to occur because of the timber value. Regarding the regulatory setting, scoping comments note that Shasta County recently prepared a local hazard mitigation plan that addresses wildfires and other hazards.

Potential Project-related ignition sources identified in scoping comments include: road-building activities (e.g., scraping, grinding, blasting), installation and operation of new electrical infrastructure, the use of existing transmission lines that may sag and reduce vegetative clearance, and addition of turbines in the landscape that might act as lightning rods or malfunction, igniting a fire at such a height that it cannot easily be extinguished. Commenters note that the largest wildfires in the State began under transmission lines, including the Fountain Fire for which this Project is named. Other potential impacts identified include the exacerbation of existing challenges to aerial firefighting by the Forest Service and others, including restrictions on flying near turbines or dropping fire retardant; wildfire impacts on equipment, roads, culverts, fencing, runoff (water quality), and wildfire visual impacts to adjacent landowners.

Suggested mitigation measures include tending the forest before any major construction starts and planting trees appropriate distances apart rather than brush (even if the brush is native to the area). Scoping input suggests that the cumulative scenario for wildfire-related impacts should include ongoing impacts of the Fountain Fire of 1992 and the Camp and Carr fires of 2018.

v) Alternatives

Scoping comments regarding potential alternatives suggested that the EIR evaluate:

i. No Project alternative

ii. Reduced-project alternative (i.e., with fewer turbines and/or a more concentrated placement of turbines);

iii. Modified project alternative that restricts turbines to at least 1 mile from the Moose Camp fence, or moves them to the south relative to the existing proposal or north of SR 299;

iv. Alternative sites, such as off-shore in Central California or on-shore in Modoc County, Tehama County, Contra Costa County's Altamont Pass, Kern County's Tehachapi Pass, Riverside County's San Gregorio Pass, or someplace with less carbon sequestration potential than the proposed conifer and deciduous forest location or repowering the Applicant's existing wind facilities (including Dillon, Tule Wind, Phoenix Wind, Manzana Wind, Mountain View III, and Shiloh);

v. Alternative technologies, such as solar, cogeneration, or increasing hydroelectric generating capacity at existing Shasta County facilities); and

vi. Alternative approaches, including conservation and demand side management and improving the efficiency of existing infrastructure for the delivery and storage of excess power already generated in California.

w) Cumulative Scenario

The EIR will analyze the potential for the Project's impacts to combine with the incremental impacts of other projects to cause or contribute to significant cumulative effects. The cumulative scenario will include ongoing impacts of past projects, as well as the impacts of other present and reasonably-foreseeable, probable future projects. Scoping input suggests that the cumulative scenario should include:

- Timber Harvesting Plans (THPs), including the Terry Cloth 144-acre 99 percent clear-cut THP approved in 2015 along Hatchet Ridge;
- Other wind energy projects, including the Hatchet Ridge Wind Project as well as wind projects in Solano County, the Altamont Pass, and Tehachapi Pass;
- Other power lines, including PG&E's lines into and out of the substation where the Project would connect;
- The area's fire history, including the Carr, Hirtz, and Delta fires as well as the Montgomery Creek fire that occurred in August 2018;
- Other natural events, including volcanic eruptions

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