FINAL-SUBMITTED FOR APPROVAL

Avian Protection Plan
Golden Hills North Wind Energy Facility Repowering Project

Prepared for

Golden Hills North Wind, LLC

August 13, 2018

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Contents

Tables

Acronyms and Abbreviations

ACCDA	Alameda County Community Development Agency
ADMM	adaptive management measures
AMP	adaptive management program
APP	Avian Protection Plan
APWRA	Altamont Pass Wind Resource Area
BGEPA	Bald and Golden Eagle Protection Act
CARE	Californians for Renewable Energy
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CEQA	California Environmental Quality Ace
CUP	Conditional Use Permit
DEM	digital elevation model
DOE	United States Department of Energy
EACCS	East Alameda County Conservation Strategy
EBRPD	East Bay Regional Park District
FAA	Federal Aviation Administration
Golden Hills North	Golden Hills North Wind, LLC
ICF	ICF International
kW	kilowatt
MBTA	Migratory Bird Treaty Act
MMRP	Mitigation Monitoring and Reporting Program
MW	megawatts
NextEra	NextEra Energy Resources
NREL	National Renewable Energy Laboratory
PEIR	Program Environmental Impact Report
Plan	Avian Protection Plan
Project	Golden Hills North Wind Energy Facility Repowering Project
rpm	revolutions per minute
RPS	Renewable Portfolio Standard
Settlement Agreement	Agreement to Repower Turbines at the Altamont Pass Wind Resource Area
TAC	Technical Advisory Committee
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
WEST	Western EcoSystems Technology, Inc.
WRRS	Wildlife Response and Reporting System
WTG	wind turbine generator

Introduction

1.1 Overview of Avian Protection Plan

This Avian Protection Plan (APP) has been prepared by NextEra Energy Resources (NextEra) in support of the Golden Hills North Wind Energy Facility Repowering Project (Project), located in portions of Alameda County in California (Figures 1 and 2), to address potential avian impacts resulting from the operation of the facility to reduce or avoid avian mortality. Golden Hills North Wind, LLC (Golden Hills North), a wholly owned subsidiary of NextEra, repowered the existing wind energy facility with 20 new wind turbine generators at new pad locations, new access roads, new underground electrical collector lines, and other improvements to related infrastructure (Figure 3). The old generation project is in the process of being decommissioned, which will involve the removal of approximately 324 existing WTGs and associated infrastructure (including concrete foundations, transformers, and electrical equipment).

In November 2014, the Alameda County planning board certified the *Altamont Pass Wind Resource Area Repowering Final Program Environmental Impact Report* (PEIR) for Alameda County's portion of the Altamont Pass Wind Resource Area (ACCDA, 2014). A conditional use permit (CUP) was also issued for the Project (Alameda County, 2014). Construction began in June 2017 and continued through December 2017. The Project was Phase III of three phases of repowering that NextEra is currently completing in Alameda and Contra Costa Counties.

The Project is located in the Altamont Pass Wind Resource Area (APWRA), which is designated by the State of California and recognized by Alameda County as a Wind Resource Area because reliable wind currents are present that support economically viable wind energy projects.

Overall, the process of repowering existing disturbed wind energy facilities has been identified as the most effective method for reducing avian fatality associated with wind energy facilities in the APWRA (CEC, 2007). For this Project specifically, the general benefits of repowering for avian species are enhanced by several features unique to the APWRA and NextEra, including:

- Developing site-specific avoidance and conservation measures using an extensive APWRA-wide base of avian data that includes the proposed Project areas to avoid high-use areas during Project design and construction. The longevity of commercially operating wind facilities in the Altamont Pass has resulted in numerous studies on impacts to birds, resulting in a substantive base of data that inform the siting of repowered facilities that avoid and minimize impacts to avian species. This robust collection of studies and data provides a documented baseline for considering potential avian issues resulting from the proposed repowering. These studies are discussed in greater detail in Section 2.
- Implementing monitoring and other conservation measures developed to address NextEra's planned repowering, as documented in a 2010 Settlement Agreement between the California Attorney General's Office, the Audubon Society, NextEra, and other interested stakeholders.
- Integrating relevant and current monitoring information from other existing repowered projects in the APRWA, including the Vasco Winds, Buena Vista, and Diablo repowering projects.

1.2 Plan Organization

The APP is structured with eight sections as outlined below:

- Section 1—Introduction
- Section 2—Regulatory Setting
- Section 3—Altamont Pass Wind Development
- Section 4—Altamont Pass Avian Baseline Studies

- Section 5—Golden Hills North Project Description
- Section 6—NextEra Standard Business Practices
- Section 7—Avian Protection Measures
- Section 8—References
- Appendices

1.3 Goals and Objectives of the Avian Protection Plan

This APP has been prepared by Golden Hills North to address potential avian impacts resulting from the Project. Avian impacts will be assessed and compared to the pre-repowered mortality rate estimates described in the PEIR (see Section 4.2 below). The APP includes (1) measures to avoid and minimize potential avian impacts and (2) conservation measures to benefit avian species.

The goal of this APP is to document measures taken to mitigate impacts in accordance with the PEIR. Furthermore, this APP provides a mechanism to implement specific measures outlined in the 2010 Settlement Agreement among the California Attorney General's Office, Audubon Society, Californians for Renewable Energy (CARE), and NextEra. It is the goal of the APP to have environmentally sustainable projects that result in no project-specific impacts leading to population level declines for bird species.

The specific purpose of this APP is to provide a mechanism where Golden Hills North can implement specific commitments to address wind and wildlife interactions that have been reviewed and approved by federal and state wildlife management agencies.

1.4 Corporate Policy

It is the intent of Golden Hills North to conduct its business in a manner consistent with responsible avian protection, including compliance with applicable regulations and proven design recommendations and standards. In order to achieve this goal, Golden Hills North has developed this APP with specific methods, approaches, and directives to minimize avian electrocutions and collisions. These include, but are not limited to:

- Proper siting of WTGs and electric utility structures based on comprehensive, site-specific studies
- Use of approved avian-adapted construction design standards
- Micro-siting structures to reduce avian risk
- Employee training in avian awareness and protection
- Non-operational mitigation and monitoring
- Operational mitigation and management
- Coordination with regulatory agencies
- Notification processes for interaction with regulatory agencies

As the project proponent, Golden Hills North proposes to undertake the following mitigation and management measures for sensitive avian populations. General conservation measures apply to actions within the designated project boundary.

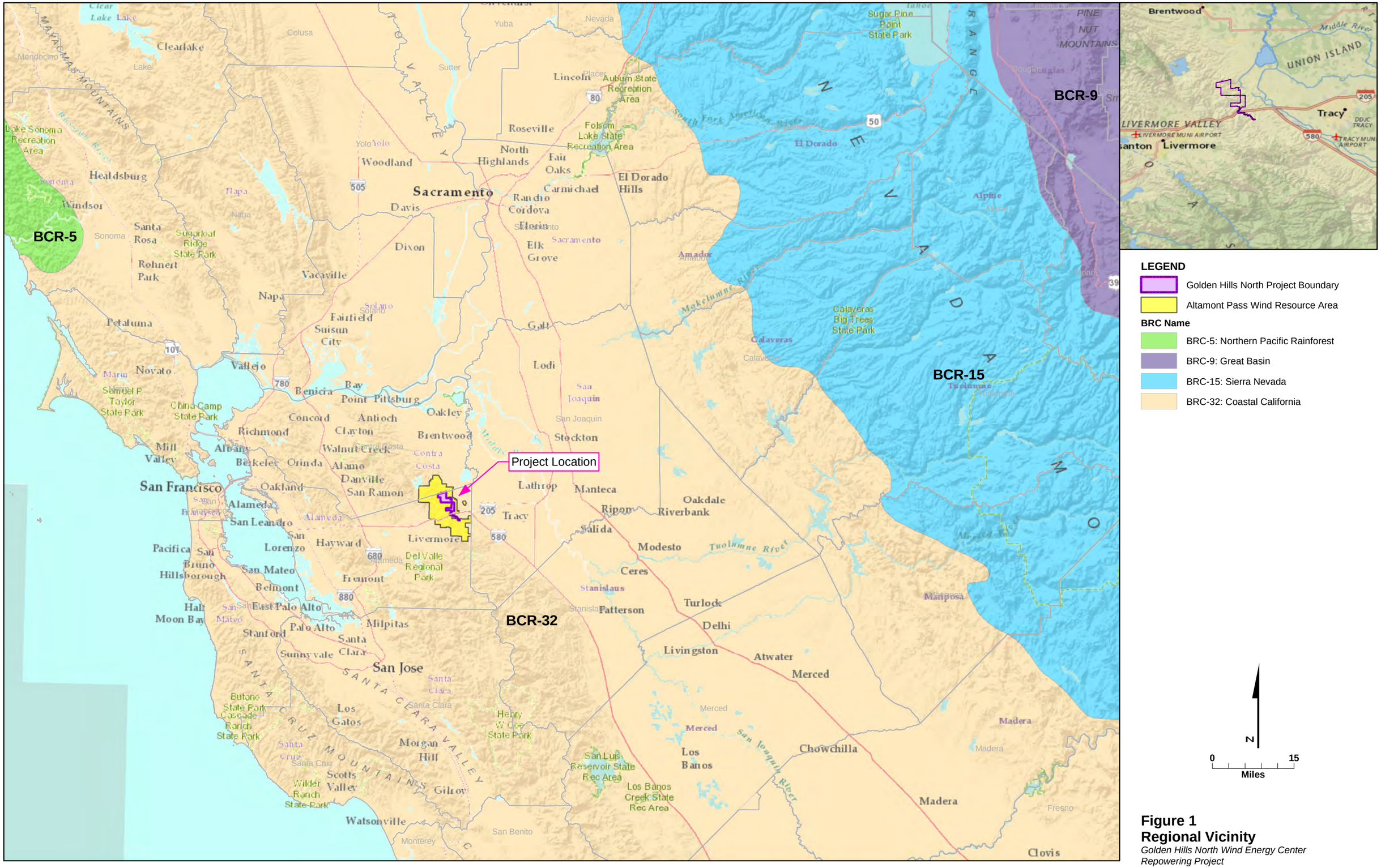

Figure 1
Regional Vicinity
Golden Hills North Wind Energy Center
Repowering Project

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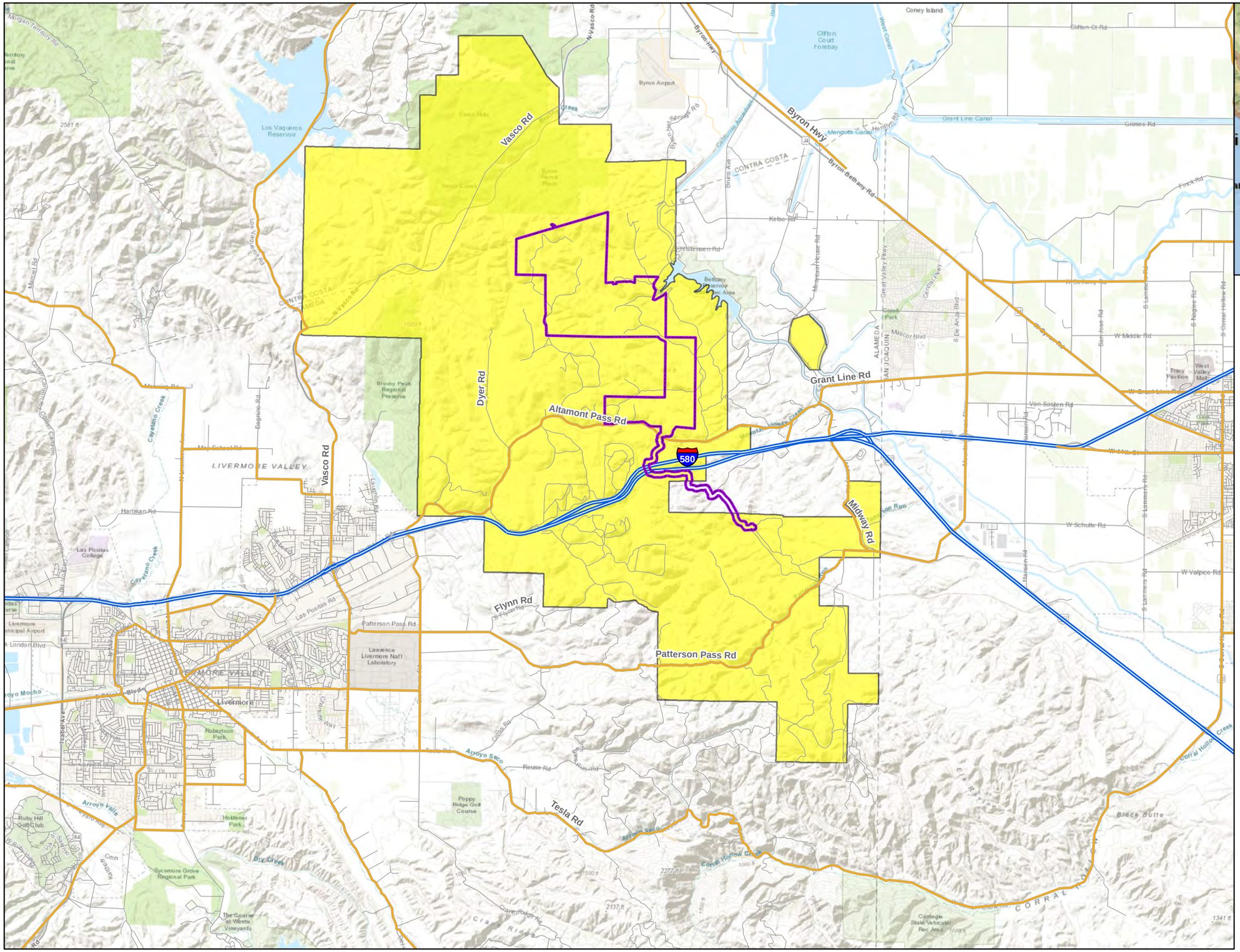

LEGEND

- Golden Hills North Project Boundary
- Altamont Pass Wind Resource Area

N

0 8,000

Feet

Figure 2
Project Location
Golden Hills North Wind Energy Center Repowering Project

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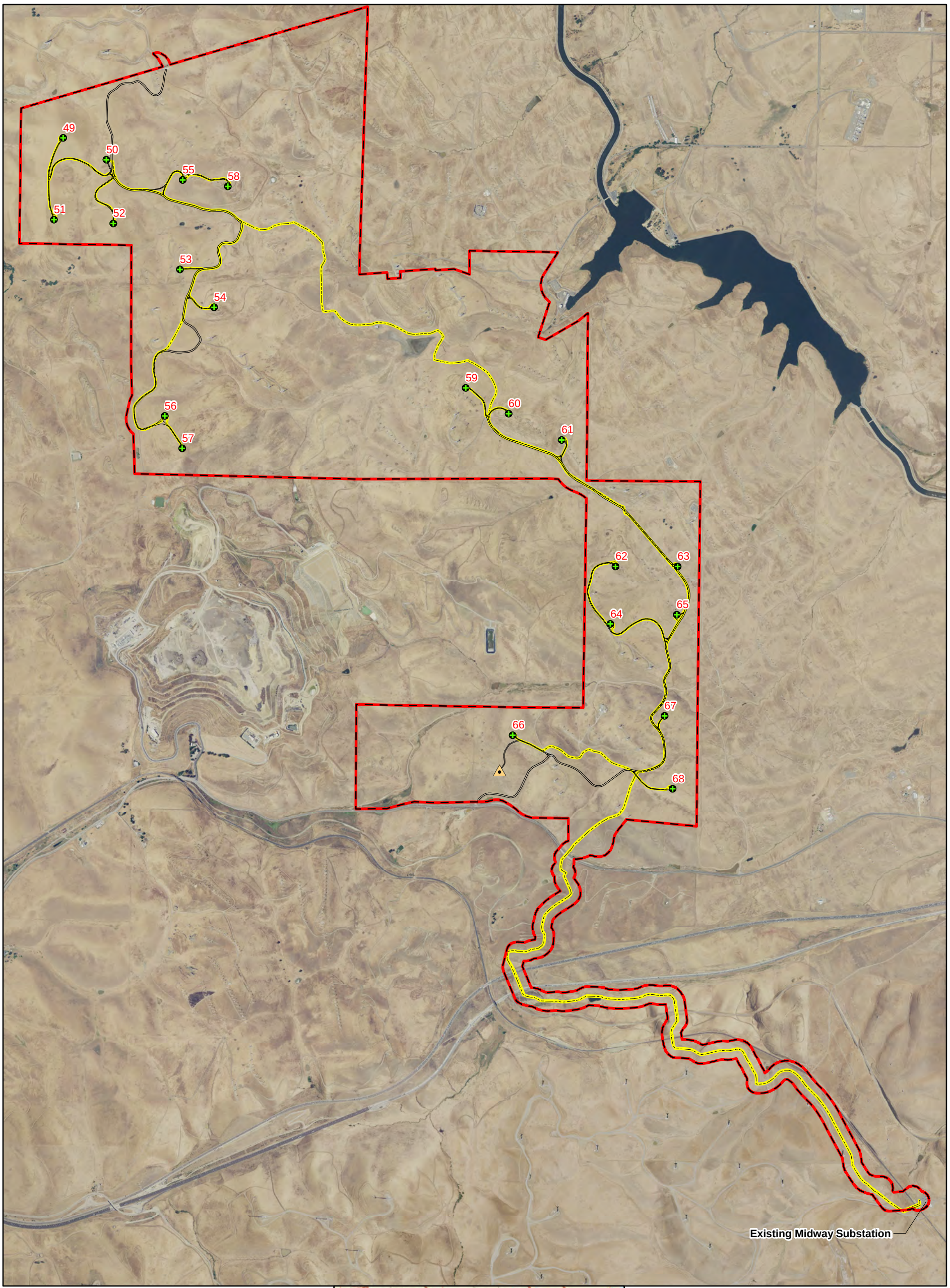
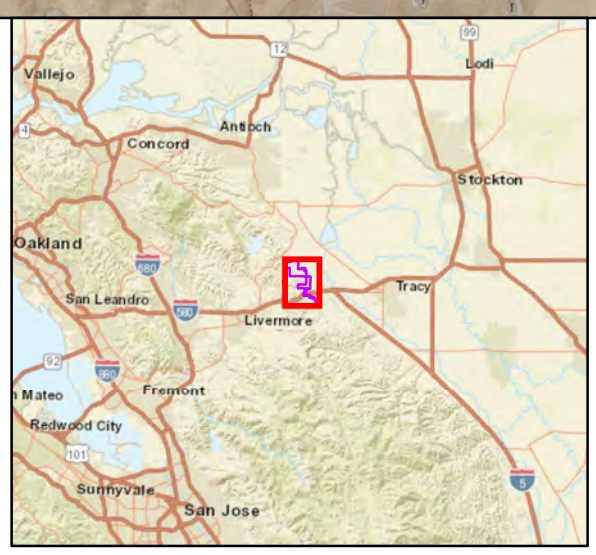


Legend

- Project Boundary
- Turbine
- Met Tower
- Edge of Road and Pad
- Collection Line



N

0 2,250 4,500

Feet

Figure 3
Site Layout
Golden Hills North Wind Energy Center Repowering Project

Regulatory Setting

2.1 California Environmental Quality Act

The California Environmental Quality Act (CEQA) declares that the State shall prevent the elimination of fish or wildlife species due to man's activities and ensure that wildlife populations do not drop below self-perpetuating levels (§ 21001(c)). Furthermore, mandatory findings of significant impact include substantial reduction in habitat of wildlife species, or if impacts cause a species population to drop below self-sustaining levels (§15065[a][1]). Alameda County adopted findings required by CEQA that fatality impacts as a result of the repowering project would be considered unavoidable, potentially substantial and significant among certain specified avian species. As such, the PEIR identified mitigation measures that would reduce or avoid the greatest severity of these effects than those acknowledged to result from the wind turbines that were previously permitted in the APWRA. Recent studies based on the nesting population of golden eagles in the region have suggested that the current level of wind-induced fatalities is sustainable; so the estimated mortality rate at the Project would not cause a decline in the local golden eagle population (Wiens, 2015)[1].

2.2 State Renewable Energy Directives and Goals

The California Renewable Portfolio Standard (RPS) legislation, enacted in 2002 (Senate Bill 1078) and accelerated in 2005, required retail sellers of electricity to obtain 20 percent of their supply of electricity from renewable energy sources, such as wind, by 2010. The governor of California set a statewide goal of achieving a 33 percent renewable energy share by 2020, and expanded that target to 50 percent by 2030 in 2015. Power generated by the proposed Project will be delivered to the California energy market. By using the wind sites best suited to generate power, such as the APWRA, the proposed Project will meet the California RPS requirements more cost effectively than sites with less wind output. Additionally, the proposed Project will contribute to the overall reduction of greenhouse gas emissions that would otherwise be released into the atmosphere from sources of nonrenewable power.

2.3 East Alameda County Conservation Strategy

Alameda County has developed a conservation strategy with the purpose of preserving endangered species by developing strategies that address long term habitat protection. The East Alameda County Conservation Strategy (EACCS) lays out a system of mitigation that supports conservation and/or recovery of sensitive species. The strategy also aims to assist with and streamline the state environmental permitting process by providing guidance on avoidance, minimization, and mitigation for project compliance with CEQA and other applicable laws.

The APWRA lies within the area covered by the EACCS, and the PEIR and EACCS are closely aligned with one another. Where applicable, the goals and objectives in the EACCS were used to develop mitigation measures to minimize potential impacts to biological resources resulting from repowering projects in the APWRA. The mitigation measures are outlined in the 2014 PEIR and included here as Appendix A.

2.4 Settlement Agreement (December 2010)

On December 3, 2010, NextEra entered into an Agreement to Repower Turbines at the Altamont Pass Wind Resource Area (Settlement Agreement) with the California Attorney General's Office, Audubon Society, and

[1] Wiens estimates that there are 280 nesting pairs of golden eagles in the Diablo Range, and previous studies (cited by Wiens 2015) indicate that about 165 pairs of nesting eagles could sustain 50 turbine blade-strike fatalities annually. The rate of annual fatalities from 1998-2002 is estimated to be 65 golden eagles (Smallwood and Thelander 2008), and that number has fallen as repowering has taken place.

CARE. Under this Settlement Agreement, NextEra will implement repowering of 2,400 turbines in up to three phases, each of which will represent approximately 80 megawatts (MW). Phase 1 was the Vasco Winds Project, approved by Contra Costa County and in the Vasco Winds Repowering Project EIR. Construction of Phase 1 is complete. Phases 2 and 3, known as the Golden Hills and Golden Hills North Projects, are in Alameda County. Phase 2 was the Golden Hills Project, approved by Alameda County and in the Golden Hills Repowering Project EIR. Construction of Phase 2 was completed in December 2015 and Phase 3 is expected to be completed in December 2017. The Golden Hills North Project is located within the programmatic level analysis area within the PEIR boundary, which was certified in the 2014 by Alameda County. The Settlement Agreement is included as Appendix B of this APP.

2.4.1 Terms and Conditions of the Settlement Agreement

The core tenants of the 2010 Settlement Agreement center on repowering the obsolete turbines, siting new turbines consistent with the 2011 Smallwood and Neher report titled *Siting Repowered Turbines to Minimize Raptor Collisions at Vasco Wind (*2011), implementing long-term monitoring and management measures, and payment of a mitigation fee. These terms and conditions were incorporated into the Vasco Winds EIR and associated mitigation measures, the Contra Costa County Land Use Permit, the Alameda County PEIR, and the Golden Hills and Golden Hills North EIRs and associated mitigation measures.

2.4.1.1 Repowering

NextEra will have satisfied its obligation under the 2010 Settlement Agreement, as well as the earlier 2007 Settlement Agreement between Audubon, CARE, AES, EnXco, and NextEra and the 2005 CUP, to reduce raptor mortality by 50 percent provided that it replaces approximately 2,400 WTGs (including all of the existing turbines on the Vasco Wind Project, Golden Hills Project, and Golden Hills North project sites). NextEra shut down all its old generation wind turbines by November 1, 2015 and removed all such turbines within the APRWA by 2016 (unless NextEra acquires non-repowered turbines from current owners or operators in the APWRA after the effective date of the Settlement Agreement). Regardless, NextEra must shutdown such subsequently acquired turbines no later than one year after the commercial operation date for Phase 3 or the date of their acquisition, whichever is later.

2.4.1.2 Siting of New Turbines

All turbine siting was developed using the recommendations of the 2011 Smallwood and Neher report as a starting point as well as improved modeling and siting efforts specific to the Golden Hills North Project site. The methodology used by Smallwood and Neher includes using a digital elevation model (DEM) and raptor use and behavior data to avoid areas most used by raptors (Smallwood and Neher, 2011). Smallwood's Project-specific (Golden Hills North Project) siting report is located in Appendix C.

2.4.1.3 Monitoring and Management

Three years of post-construction monitoring are required by the PEIR and under the Settlement Agreement. Additionally, after 10 years of operating, another 2 years of monitoring shall occur. The PEIR and Settlement Agreement also establish an enforceable monitoring program subject to review by a Technical Advisory Committee (TAC). NextEra will use the post-construction monitoring data from Phases 1 and 2 and reports and studies from other repowering projects to improve the siting evaluations for the Phase 3 (the Project). NextEra will fund 3 years of post-construction monitoring for each phase, unless additional monitoring is conducted in accordance with specific conditions of the PEIR and Settlement Agreement, plus a potential subsequent 2-year monitoring period.

2.4.1.4 Mitigation Fee

NextEra is obligated to pay $10,500 per MW of installed capacity for each phase of repowering to a fund, such as the one administered by the East Bay Regional Park District (EBRPD), for scientific research and conservation efforts that benefit birds and bats and their habitat. For the Project, the amount in total for

research and conservation land procurement was $483,000, for a total of $2,206,260 for all 3 phases of repowering.

2.5 Golden Hills North Project CEQA Review

The Project, located within the Alameda County portion of APWRA, was reviewed at a project level by Alameda County and a PEIR was certified in November 2014 that supported approval of a CUP to enable the construction of the Project. The review included the requirement that a project-specific APP would be prepared, and which would "specify measures and protocols consistent with the program-level mitigation measures that address avian mortality."

This project-specific APP is required to include the following components:

- Information and methods used to site turbines to minimize risk (see Appendix C)
- Documentation that appropriate turbine designs are being used
- Documentation that avian-safe practices are being implemented on project infrastructure
- Methods used to discourage prey for raptors
- A detailed description of the post-construction avian fatality monitoring methods to be used (consistent with the minimum requirements outlined in Mitigation Measure BIO-11g)
- Methods used to compensate for the loss of raptors (consistent with the requirements of Mitigation Measure BIO-11h)

Further, the project-specific draft APP needs to be submitted to Alameda County and is subject to review and obtaining recommendation for approval by the TAC. The TAC will review for consistency and the inclusion of appropriate mitigation measures that are provided by the PEIR. A final APP needs to be completed within six months of commercial operation. All mitigation measures pertaining to birds are included in the PEIR, and in Appendix A of this APP.

SECTION 3

Altamont Pass Wind Development

Since the early 1980s, wind energy facilities have been operating in the Altamont Pass. The APWRA is recognized nationally and is designated by the State of California and Alameda County as a Wind Resource Area because it maintains winds at a level that supports economically viable wind energy projects. According to the California Energy Commission ([CEC], 2011), more than 95 percent of all wind generating capacity and output is located in the Altamont Pass, Tehachapi, and San Gorgonio, making the ongoing production of wind energy in the Altamont Pass a critical part of California's diverse energy portfolio.

The Altamont Pass is located in the Diablo Range of the California Coast Range. Meteorological conditions are particularly favorable for creating sustained high winds, making commercial wind energy feasible. Wind development in the Altamont Pass began in the early 1980s, prompted by good wind energy resources and favorable federal and state legislation in the wake of the high energy prices of the 1970s. By 1986, California had installed more than 1.2 gigawatts of wind power, representing nearly 90 percent of global installations at that time (DOE, 2008).

The actual number of turbines built in the Altamont Pass is in the range of 4,200 to 5,400, depending on the source document and time period. Early turbine models consisted of a turbine mounted on a lattice tower. A good example of this model is the Kenetech 56-100 turbines equipped on 18-meter lattice towers, with rotor diameters of 18 meters, down-wind blades spinning at approximately 60 revolutions per minute (rpm), with tips within 9 meters of the ground (Erickson et al., 2002). These smaller turbines were densely placed in clusters, leaving little to no space for birds to maneuver between them.

Over a period of time, a high incidence of bird mortality was observed in the APWRA, primarily from collisions with operating old-generation turbines. As noted by Hoover (2002), raptors were the type of bird most commonly killed within the APWRA, including an estimated 36 to 50 golden eagles and hundreds of other raptors estimated to have been killed annually between monitoring years 2005-2013 (ICF, 2016). During the period cited, old generation turbines dominated the APWRA. In response to this trend, a myriad of avian mortality studies began to determine the causal relationships between wind turbines and bird mortality. Most data indicate that raptor mortality is more a consequence of turbine placement, rather than turbine type, particularly in relation to the topography and turbine spacing (Hoover, 2002). Sections of the APWRA have been repowered in an attempt to minimize the impact to avian species.

3.1 Attributes of Repowering Existing Wind Energy Facilities

Smallwood and Thelander (2004) found that repowering may be the most effective approach to reducing turbine-related avian mortality in the APWRA because it appears that fewer, taller, and larger-output turbines offer lower risk than many, smaller, lower-output turbines. Additionally, preliminary results of studies of repowered sites in the APWRA indicate that repowering with newer-generation turbines has resulted in a reduction in the estimated total number of avian fatalities and the overall mortality rate per MW of capacity for all species groups and for all individual species (ICF, 2010). The Diablo Winds and the Buena Vista repowering projects demonstrate a substantial reduction in avian mortality as a result of repowering existing wind projects. Table 1 and Table 2 below provide mortality rates within and outside the repowering projects on a per MW basis and total per year, respectively. In addition, although the nameplate capacity of the repowered turbines is the same or similar as that of the turbines being replaced, the amount of energy actually produced by the new-generation turbines is much greater. Therefore, the total number of fatalities per MW-hour generated is even less for repowered project sites.

3.1.1 Diablo Winds

In the Diablo Winds repowering project, 169 FloWind, vertical-axis turbines were replaced with 31 660-kilowatt (kW) Vestas V47 turbines in 2005 (WEST, 2008). Although the Vestas turbines were larger than the FloWind turbines and structurally very different (vertical-axis turbines versus horizontal turbines on tubular towers), they are smaller than the standard modern turbines rated at 1 MW or more. The Diablo Winds repowering project was evaluated for avian mortality by Western Ecosystems Technology, Inc. ([WEST], 2008), Smallwood and Karas (2009), and ICF (2016). The results of fatality monitoring are provided in Table 1 and Table 2.

3.1.2 Buena Vista Wind

The Buena Vista project site was repowered in 2005 and became operational in December 2006. One hundred seventy-nine older-generation 150- and 160-kW turbines were replaced with 38 new Mitsubishi 1-MW turbines. Post-construction monitoring at Buena Vista used a census of the turbines, a 2-week search interval, and monitoring of carcass removal and searcher efficiency rates. The Buena Vista repowering project was evaluated for avian mortality by Insignia Environmental (2012); the results of fatality monitoring are provided in Table 1. It is worth noting that developing estimates from the monitoring program for Buena Vista proved to be difficult due to the lack of (and quality of) data available (searcher efficiency and scavenging estimates) for adjusting raw fatality numbers.

3.1.3 Vasco Winds

The Vasco Winds site was repowered in 2011 by Vasco Winds, LLC, a subsidiary of NextEra. In 1985, the area originally consisted of 800 KCS56 100-kW turbines and produced 80 MW of electric power. In 1992, 20 KVS33 400-kW turbines were added. Over time, the number of turbines in the area declined due to attrition, mitigation efforts, and removal projects (e.g., construction of the current Vasco Road through the original project area). In 2011, the 438 remaining wind turbines were removed and replaced by 34 Siemens 2.3 MW wind turbines. The 78.2 MW repowered project commenced operations in February 2012.

3.1.4 Golden Hills

The Golden Hills site was repowered in 2015 by Golden Hills Wind, LLC, a subsidiary of NextEra. The number of active turbine sites for this project had diminished as well over time due to attrition and mitigation. The project removed 775 existing wind turbine locations in order to install 48 1.79-MW GE turbines. The Golden Hills project commenced operations in December 2015.

Table 1. Adjusted Mortality Rates within and Outside Repowering Projects (fatalities/MW/year)
Golden Hills North Wind Energy Facility Repowering Project

	Ventus 2016	**HT Harvey 2018**	**WEST 2008**	**ICF 2016***		**Insignia 2012**	**Smallwood and Karas 2009**	
Species/Group	**Vasco Repowered[1]**	**Golden Hills Repowered[2]**	**Diablo[3]**	**APWRA**	**Diablo**	**Buena Vista**	**Non-Diablo**	**Diablo**
Golden eagle	0.046	0.13	0.04	0.09	0.02	0.08	0.12	0.02
Red-tailed hawk	0.21	0.91	0.22	0.40	0.28	0.41	0.70	0.25
American kestrel	0.28	0.06	0.04	0.56	0.07	0.58	0.78	0.66
Burrowing owl	0.057	0.05	0.36	0.67	0.58	0.70	1.87	1.43
Total raptors	**0.64**	**1.30**	**0.72**	**2.01**	**--[a]**	**1.77**	**3.74**	**1.79**

Notes:
Comparison between projects should not be made indiscriminately due to survey methodology inconsistencies.
* includes both non-repowered and repowered turbines and data from monitoring years 2005-2013
1 - average of Year 1, Year 2, and Year 3 monitoring results
2 – Year 1 monitoring results
3 – does not include incidental finds
a – not reported

Table 2. Estimate of Adjusted Mortality Rates within and Outside Repowering Projects (total death/year)
Golden Hills North Wind Energy Facility Repowering Project

	Ventus 2016	**HT Harvey 2018**	**WEST 2008**	**ICF 2016***		**Insignia 2012**	**Smallwood and Karas 2009**	
Species/Group	**Vasco Repowered[1]**	**Golden Hills Repowered[2]**	**Diablo[3]**	**APWRA**	**Diablo**	**Buena Vista[3]**	**AWPRA-wide (pre Diablo)**	**APWRA-wide (post Diablo)**
Golden eagle	3	11	0.7	43	--[a]	4.4	55	65
Red-tailed hawk	16	78	4	169	--[a]	7.2	177	392
American kestrel	22	5	0.7	244	--[a]	4.2	731	440
Burrowing owl	4	4	7	266	--[a]	0.00	858	1,112
Total raptors	**50**	**112**	**15**	**161**	--[a]	**17**	**1,880**	**2,232**

Notes:
Comparison between projects should not be made indiscriminately due to survey methodology inconsistencies.
* includes both non-repowered and repowered turbines for years 2005-2013
1 - average of Year 1, Year 2, and Year 3 monitoring results
2 – Year 1 monitoring results
3 – does not include incidental finds
3 – adjusted mortality rate "1a[21]" for focal species including incidentals
a – not reported

SECTION 4

Altamont Pass Avian Baseline Studies

Numerous studies addressing avian mortality have been conducted within the APWRA, including areas that encompass the Project site. Early research in the APWRA focused on identifying the extent of avian mortality. As studies progressed, research began addressing causal relationships for avian mortality. The National Renewable Energy Laboratory (NREL) initiated research, and other agencies have since funded multiple studies, to address the causes of mortality of various bird species from wind turbines (Smallwood and Thelander, 2005). Since 1998, these studies have quantified avian mortality, use and behavior within the APWRA (Erickson and Smallwood, 2004).

This section provides a description of the habitat and species within the APWRA and a summary of the long-term, multispecies-fatality studies conducted in the APWRA, including an overview of the various study methods. It also documents that these studies provide a substantial set of data that comprise a baseline against which to understand avian behavior in the Project site relative to existing and future wind energy generation, while also demonstrating the variety in the studies and study designs.

4.1 Description of Habitat and Species within the APWRA

Although the APWRA is substantially altered by the human activities, it does provide nesting and foraging habitat for a wide variety of Migratory Bird Treaty Act (MBTA)-protected avian species, including raptors and the golden eagle, protected under the Bald and Golden Eagle Protection Act (BGEPA). Grasslands and ruderal habitats can support a variety of small mammals and provide important foraging and nesting habitat for raptors and other bird species. Birds commonly found foraging in grasslands in this region include loggerhead shrike (*Lanius ludovicianus*), golden eagle (*Aquila chrysaetos*), northern harrier (*Circus cyaneus*), white-tailed kite (*Elanus leucurus*), and California horned lark (*Eremophila alpestris actia*). Ground-nesting birds in these vegetation types include western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), and the western burrowing owl (*Athene cunicularia*), a species that nests and roosts in small mammal burrows and other burrow-type settings associated with human disturbance. Common mammals include black-tailed jackrabbit (*Lepus californicus*), cottontail rabbit (*Lepus sylvaticus*), California ground squirrel (*Spermophilus beecheyi*), and Botta's pocket gopher (*Thomomys bottae*). Rock outcrops in the vicinity can provide nesting habitat for raptors including golden eagle and prairie falcon (*Falco mexicanus*), and other birds including rock wren (*Salpinctes obsoletus*). Additionally, these rock outcrops also provide cover and nesting habitat for small mammals including cottontail rabbit and California ground squirrel, and reptiles including western fence lizard (*Sceloporus occidentalis*) and Pacific rattlesnake (*Crotalus oreganus*). Mammals and reptiles attracted to rock outcrops provide foraging opportunities for raptors.

4.2 APWRA Avian Survey Methodology and Baseline

The baseline for assessing impacts to avian species at the Project site is derived from numerous studies and research that focuses on various wind energy projects throughout the APWRA over time. Developing a baseline using the collective avian mortality studies conducted in the APWRA is an appropriate, albeit challenging, task (geographically and historically) for establishing the basis against which to assess the Project-specific impacts.

Within the APWRA, multiple wind energy projects exist that differ in their location and in the types and sizes of turbines in operation. These different groups theoretically present different levels of risk to birds based on the variability in bird use patterns across the APWRA and variability in the collision risk between different types and sizes of turbines. The sampling effort, however, is not evenly distributed across turbine types or project areas in the APWRA, at times do not use similar methods, nor do they occur during the same time

periods (years apart with rarely any overlap). This results in variations in the sample size and the relevance of the site-specific estimates by group across the APWRA.

Figure 2 shows the boundaries of the APWRA relative to the boundaries of the Project site.

The survey methodologies for the fatality studies conducted in the APWRA each relied on searches that were conducted for avian carcasses to estimate deaths from collision with operating wind turbines. Because only a portion of the birds killed are found during searches, the total number of carcasses found is adjusted to produce an estimate of the total number of birds killed.

Despite some similarities in search methodology (e.g. search intervals), the studies used different sampling schemes, survey methods (e.g. humans vs. dogs), and analytical techniques that result in variations in interpretations of the number of avian deaths attributable to wind turbines. Variability of avian mortality study parameters (for example, search interval, searcher efficiency, carcass removal rate, estimates of mortality) is not uncommon, and greater detail on these variations is presented in Appendix C (*History, Assessment, and Implications of Avian Studies for the Vasco Winds LLC Repowering Project*, ICF, June 2010), which provides more information on various survey methodologies, but does not address the challenges of analytical comparisons between human surveys and dog surveys. Because these multiple studies, as summarized below, collectively reflect the known peer-reviewed and established baseline data set for the APWRA, of which the Project is a part, this APP relies on this collective baseline for assessing impacts to avian species for the project. Preconstruction APWRA-wide baseline fatality estimates as cited in the PEIR are provided in Table 3.

Table 3. Estimated Annual Avian Fatalities for Non-repowered PEIR Program Area
Golden Hills North Wind Energy Facility Repowering Project

Species	Average Annual Fatalities
Golden eagle	26.6
Red-tailed hawk	144.5
American kestrel	194.2
Burrowing owl	255.1
Total raptors	**799.9**

Note: fatality rates reflect annual fatalities (95% confidence interval)
Source: APWRA Repowering Program PEIR

4.3 Summary of Completed Studies

There have been more than two dozen studies since 1980 that in whole or in part address wind energy impacts to birds in the APWRA. The Scientific Review Committee for the APWRA maintains an extensive online research library.[2] Table 4 includes a subset of studies that are not necessarily specific to the Altamont Pass but contain relevant information to avian use and wind energy.

[2] Website: http://www.altamontsrc.org/alt_rl.php.

Table 4. Altamont Pass Avian Related Studies 1991 through 2008
Golden Hills North Wind Energy Facility Repowering Project

Study Name	Prepared By	Author	Date of Study	Summary
Assessment of Avian Use and Mortality Related to Wind Turbine Operations, Altamont Pass, Alameda and Contra Costa Counties, California, September 1988 Through August 1989 Final report	U.S. Windpower, Inc.	Judd Howell and Joseph DiDonato	November 1991	Bird mortality study of 359 turbines over a 12-month period
Raptor Acuity and Wind Turbine Blade Conspicuity	Raptor Research Center, Boise State University	Hugh McIsaac	May 2001	Summarizes the results of several studies that were undertaken in an effort to increase the conspicuity of wind turbine blades and reduce raptor fatalities in APWRA
Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States	National Wind Coordinating Committee	Erickson et al.	August 2001	Compares avian mortality associated with wind power to other sources of avian collision mortality
The Response of Red-Tailed Hawks and Golden Eagles to Topographical Features, Weather, and Abundance of a Dominant Prey Species at the Altamont Pass Wind Resource Area, California April 1999—December 2000	NREL	S. Hoover	June 2002	Determine which characteristics of the landscape influence hawk and eagle habitat selection within the APWRA
Searcher Bias and Scavenging Rates in Bird/Wind Energy Studies	NREL	M. Morrison	June 2002	Summarize results of searcher efficiency and scavenging, thus providing a guide for workers designing or interpreting bird/wind energy studies.
Synthesis and Comparison of Baseline Avian Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments	Bonneville Power Administration	W. Erickson et al	December 2002	Assist various stakeholders in the interpretation and use of the large amount of baseline and operational monitoring data that have been collected at proposed and existing U.S. wind plants and provide an information source in evaluating new projects
20% Wind Energy by 2030	DOE	DOE	July 2008	Considers associated challenges, estimates the impacts, and discusses specific needs and outcomes in the areas of technology, manufacturing and employment, transmission and grid integration, markets, siting strategies, and potential environmental effects associated with a 20% Wind Scenario

Table 4. Altamont Pass Avian Related Studies 1991 through 2008
Golden Hills North Wind Energy Facility Repowering Project

Study Name	Prepared By	Author	Date of Study	Summary

Source: Website: http://www.altamontsrc.org/alt_rl.php.

Some of the key studies related to avian mortality are described in greater detail below, with respective study parameters included in Table 5 below.

4.3.1.1 Orloff and Flannery

The CEC initiated one of the first assessments of avian mortality due to collisions with operating wind turbines in 1989 (Orloff and Flannery, 1992). It was a 2-year study (1989–1991) where mortalities were evaluated at 1,169 wind turbines and their appurtenant facilities (meteorological towers, electrical lines, and guy wires). Searches were intermittently conducted weekly or semi-weekly depending on the season. Scavenger removal and searcher efficiency trials were conducted as part of the study to estimate the adjustment factors needed to estimate total fatalities. Avian use studies also were conducted to characterize the abundance and behavior of the various species that used the area.

Orloff and Flannery's data suggested that raptor mortality was greater at end-row turbines than at in-row turbines, and greater at turbines near canyons than at those farther from canyons. The data also suggested that some species and species groups (such as raptors and waterfowl) were more vulnerable to collision with turbines than others; for example, despite their relatively greater abundance, turkey vultures and common ravens suffered lower mortality rates than did red-tailed hawks, American kestrels, and golden eagles. The inter-annual variance in the point estimate suggested that APWRA turbine-related raptor fatalities were naturally variable through time, difficult to estimate with high precision and accuracy, or both. The study did not attempt to determine the cause of inter-annual variance in the estimates.

4.3.1.2 Smallwood and Thelander

Smallwood and Thelander produced a series of reports based on studies conducted in the APWRA from March 1998 to May 2003. These surveys included searches for fatalities at 1,526 wind turbines, which were searched approximately every 53 days. A second set of fatality surveys was conducted during the last 6 months of the study from September 2002 to May 2003. In these surveys, 2,548 wind turbines were searched two (and occasionally three) times at approximately 90-day intervals. The California Institute for Energy and Environment commissioned a peer review of the Smallwood and Thelander (2004) findings that concluded the study design resulted in limitations in the application of the findings to regulatory decision-making (California Institute for Energy and Environment, 2006).

In 2004 and 2008, Smallwood and Thelander (2004, 2008) presented adjusted mortality estimates. Despite the variations in the Smallwood and Thelander studies (2004, 2008), the analysis documented that operating turbines in the APWRA kill large numbers of birds.

4.3.1.3 ICF International

The Alameda County Avian Monitoring Team, led by WEST during 2005, by the Predatory Bird Research Group at U.C. Santa Cruz from 2006 to 2008, and by ICF International (ICF) (formerly ICF Jones & Stokes) since 2008, has been conducting fatality searches since December 2005, but the number of monitored turbines has decreased dramatically over time. The APWRA was subdivided into northern and southern halves and stratified by blocks. Blocks of turbines containing small turbines (by far the most common turbine size in the Altamont) were then selected at random, while all very small and medium-sized turbines were monitored. Turbines were searched approximately every 30–40 days, with the search interval steadily decreasing over time as the efficiency of the program increased.

The searcher efficiency adjustment factors were derived from Smallwood (2007), and estimates of the carcass removal adjustment factors were taken from a variety of sources. The value for large birds was derived by following fresh carcasses of large birds found by the search team through time. The value for small birds was derived similarly from a study of small bird carcasses found during a study of the effects of using a 2-day search interval. The resulting adjustment factors were greater than those reported from other studies, which suggest higher detection probabilities and produced lower estimates of total mortality. Consequently, some of the fatality estimates were lower in the ICF report than in the previous work by Smallwood and Thelander (2004).

Several analyses were conducted in an attempt to make comparisons between estimated mortality from the baseline study (using the data from Smallwood and Thelander [2004]) and estimated mortality from the ICF fatality study (ICF, 2016). Attempts to make the datasets comparable involved using different subsets of turbines and searches from the baseline and ICF studies to standardize variables such as search interval and the number of searches conducted at a particular turbine, and other factors that are known to have a potentially substantial effect on resulting estimates of mortality. Overall estimates of annual mortality varied widely among years, depending on the datasets used and the analysis method. Numerous assumptions were made in order to generate the following estimates, and for many reasons the actual fatality rate could be very different than the estimates provided in ICF's report (2016). Adjusted mortality estimates ranged from 278 to 1,101 raptor fatalities/year and from 1,838 to 2,982 bird fatalities/year.

The major conclusion was that annual mortality rates for most species and species groups (raptors, non-raptors, large raptors, small raptors) varied significantly across years, confounding attempts to assess the effectiveness of management measures. Management measures implemented during the ICF study period included shutting down turbines for various lengths of time during the winter months (seasonal shutdown) and the removal of turbines rated as hazardous by the Scientific Review Committee (hazardous turbine removal).

4.3.1.4 Smallwood and Karas (2009)

Smallwood and Karas presented a parallel analysis of the data presented in ICF (2009), but examining only 2 years rather than 3 because the third year of data was not yet available when they conducted their analysis. Adjustment factors used in Smallwood and Karas (2009) were derived from Smallwood (2007). Estimates of average annual mortality rates were substantially higher than those reported by ICF (2009) primarily due to the use of different adjustment factors and calculation methods; inclusion of Wildlife Reporting Response System records (fatality records recorded by power company personnel and not found as part of the standardized sampling scheme); the inclusion of only 2 years of data, of which one was a year of record high mortality (ICF, 2009); and some differences in the specific turbines, search information, and fatality records that were included. However, conclusions by Smallwood and Karas (2009) were the same as those found by ICF (2009), regarding: changes in fatality rates between the pre-ICF and ICF fatality study periods; the lack of evidence for the effectiveness of management measures to reduce turbine-related avian mortality; and, notable differences between fatality rates associated with older and newer generation turbines, including the lower calculated mortality rates at the repowered Diablo Winds Project.

4.3.1.5 Smallwood (2010)

Smallwood also prepared a report on avian mortality rates for the proposed Tres Vaqueros Wind Project (*Baseline Avian and Bat Fatality Rates at the Tres Vaqueros Wind Project, Contra Costa County, California, Report to the East Bay Regional Park District* [2010]). This report extrapolated data from existing fatality searches from 2005 to 2009 (from data associated with APWRA-wide monitoring) and from the two operating wind repower projects, Diablo Winds and Buena Vista. Using these data from the area of the proposed Tres Vaqueros Project, other regional monitoring data, and from operating projects, Smallwood developed four separate sets of baseline fatality rate estimates and selected one of those based on a series of assumptions about representative fatality rates from previously operating turbines models and sizes. Smallwood made assumptions and incorporated data from operating projects and from APWRA-wide

monitoring to reduce the potential for establishing an inappropriately low baseline. Smallwood notes that ”Using the fatality monitoring data from Tres Vaqueros alone could prove misleading as the foundation for baseline fatality rates because the baseline conditions were changing rapidly.”

4.3.1.6 Smallwood and Neher (2011)

Smallwood and Neher (2011) analyzed the optimal turbine layout for the Vasco Winds Project. This study evaluated a DEM and raptor use and behavior data to develop geographical and topographical map-based predictive models that show where on the project site raptors more often fly and perform other specific behaviors such that locating turbines in these areas would create greater risks to raptors. To reduce avian mortality, Vasco Winds LLC has applied and supplemented certain measures for site-specific conditions, as documented in Smallwood and Neher, 2010. The report documents site-specific modeling of golden eagle flights, red-tailed hawk and American kestrel hovering and kiting, and burrowing owl nest burrow locations. These models were used to site wind turbines in a way that would minimize encounter frequencies between raptors and operating turbines. Vasco Winds implemented the Smallwood and Neher recommendations in developing the project layout, and the report documents that the project’s final turbine layouts are consistent with the report’s recommendations and with how the report authors intended the predictive models of raptor-use behavior to be used.

Table 5. Summary of Mortality Data

Golden Hills North Wind Energy Facility Repowering Project

Attribute	Orloff and Flannery 1992	Smallwood and Thelander 2004	Smallwood and Thelander 2005	Smallwood and Thelander 2008	Smallwood and Karas 2009*	Ventus 2016	ICF 2016	HT Harvey 2018
Start Date	1989	3/1998	3/1998	3/1998	10/2005	5/2012	2005	9/2016
End date	1991	9/2002 11/2002–5/2003	9/2001	9/2002 11/2002–5/2003	10/2007	5/2015	2013	9/2017
Total years	2 years /6 seasons	~5 years	~3.5 years	~5 years	2 years	3 years	8 years	1 year
Total number of turbines searched	1,169	1,526/2,548	1,526	1,526/2,548	~2,650	34	Mean of 2,297/year (2005-2009; mean of 1,323/year (2010-2012)	48
Total carcasses found	182	1,162	652	1,157	4,087	- (Year 1 unknown) 66 (Year 2, includes bats) 57 (Year 3, includes bats)	5,530 (excluding bats)	332 (birds) 229 (bats)
Total raptors/year (adjusted)	Year 1 – 429 Year 2 – 186	1,300	835	1,127	2,232	50 (average of Years 1-3)	595 – 1,084/year	112
Total birds/year (adjusted)	not presented	4,721	4,272 (excl. bats)	2,710	9,297	210 (average of Years 1-3)	2,593 – 6,107/year	549
Mean search interval	3.5 or 7 days	53 days for set 1 90 days for set 2	53 days	Not explicitly stated	Average of 38 days	7 days and 28 days	Average of 37 days	7 days and 28 days
Search distance	100–200 ft	50 m	50 m	50 m	50–75 m	105 m	50–75 m	105 m
Included old birds in sample?	No, birds limited to those that died within 1 week	Birds >90 days excluded	Birds >90 days excluded	Birds >90 days excluded	Yes	<90 days	Yes	Birds greater than relevant survey interval (7 days or 30 days) excluded
Carcass removal	Carcass removal	Used modified	Used values	Used values	Used values	Carcass	Tracked native	Integrated

adjustment factor	trials conducted as part of study	values from Erickson et al. 2003	from Erickson et al. 2003	derived from meta-analysis in Smallwood 2007	from Smallwood 2007	persistence trials conducted as part of Year 2 study	carcasses found during fatality surveys	searcher efficiency and carcass persistence trials conducted as part of Year 1 study
Searcher efficiency adjustment factor	Conducted searcher efficiency trials	Used values derived from Orloff and Flannery 1992, Erickson et al. 2003, and Johnson et al. 2002	Used values from Orloff and Flannery 1992	Used values from Smallwood 2007	Used values from Smallwood 2007	Searcher efficiency trials conducted as part of Year 2 study	Used values from Smallwood 2007	Integrated searcher efficiency and carcass persistence trials conducted as part of Year 1 study

*Values presented are from 2005–2007 of the ICF fatality study period only.
Source: ICF, 2010a

SECTION 5

Golden Hills North Project Description

The Project site is in Alameda County, directly north of Highway 580. The retired old generation facility will be decommissioned, which involves the removal of up to 324 older-generation WTGs and related infrastructure from the site. With the repowered facility, comprised of 20 2.3-MW GE WTGs, for a total of 46-MW, the 4,400-acre Project area continues to transmit energy from the site to the regional power grid and maximizes renewable energy production by replacing the aging infrastructure with newer, more efficient turbines.

Annual grassland is the dominant land cover type in the project area, with cattle grazing in the Project area and on adjacent lands. Due to the prolonged presence of cattle on the site, many of the native habitats that formerly dominated these hills, including chaparral, oak woodlands, alkali seeps and meadows, and valley needlegrass grassland, are no longer evident. The surrounding environment is similar in that it is dominated by rolling hills of grazed annual grasslands interspersed by aquatic features in the low-lying valleys with wind turbines atop most of the ridgelines.

5.1 Decommission Existing Wind Energy Facilities

The existing wind farm site comprised of obsolete turbine pads and roads will be reclaimed. Old concrete foundations, transformers and associated electrical equipment, will be removed from the site in accordance with landowner agreements. The existing underground collection system will remain in place and will not be excavated.

Disturbed areas associated with decommissioning will be restored by using salvaged topsoil and reseeding with appropriate native grassland seed mix. Temporary erosion control measures will be implemented to maintain topsoil and re-vegetation.

5.2 Install New Turbines and Related Infrastructure

A total of 20 2.3-MW GE turbines were constructed onsite during repowering of the existing facility. Each turbine includes three main physical components assembled and erected during construction: the tower, the nacelle, and the rotor. Other turbine components included a foundation; controller; transformer; braking system; vibration, temperature and fire detection systems; safety lighting; and lightning protection. To the extent possible, existing roads were used for construction and operations. The existing roadway system primarily consists of gravel access roads. Existing roads will be maintained to facilitate operation and maintenance activities.

5.3 Power Collection

The new power collection system consists of medium-voltage, high-density, insulated underground cables that connect the turbines to the substation. Underground collection cables were buried in parallel trenches located adjacent to the roadbed of the interior access roads. Trenching equipment was used to excavate trenches in or near the access roadbed to allow installation of the insulated underground cables that connect each turbine to the substation.

To the extent possible, existing roads were used during project construction and will continue to be used during operations. The existing roadway system primarily consisted of gravel access roads. Turbine transportation requires equipment transport and crane specifications that dictate road width and turning radii. To allow safe passage of the large transport equipment used in construction, all-weather

gravel roads were built with adequate drainage and compaction to accommodate equipment transport vehicles.

SECTION 6

NextEra Standard Business Practices

This section describes the operating procedures used by NextEra to avoid or minimize impacts to avian species in the APWRA.

6.1 Micro-siting to Reduce Avian Risk

All APWRA-related repowering conducted by NextEra includes removal of older turbines and replacement with larger and more efficient turbines. The location of each turbine is determined by the results of predictive modeling as well as a site-specific micro-siting analysis designed to reduce hazards to avian species.

The turbine array for the Project has been developed using predictive models to locate turbines in areas with the lowest (practical) potential for avian impacts to occur. The models developed by Smallwood and Neher (2010) integrate the body of literature derived from prior avian studies and more advanced data and analysis techniques to develop predictive models of bird flights and flight behavior that relate to collision hazards. The models include utilization data; DEM; slope attributes; techniques to identify saddles, notches, and benches; and associations between bird utilization and slope attributes. The models essentially result in a delineation of areas with predicted high activity where wind turbine siting should be avoided. Upon review of the models provided by Smallwood, NextEra moved turbines as far from risk areas as practicable, prior to the first review by Smallwood. At each modification to the array, Smallwood reviewed and made recommendations on risk and location changes, and when possible, turbines were moved to reflect those recommendations. Limitations to the siting or movement of turbines may have included, but were not limited to, setbacks from public roads, setbacks from residences, setbacks from power lines, setbacks from communication structures, minimum distances between turbines, constructability (geology, steepness, and remoteness, etc.), and so on. See Appendix C for the Project's site-specific siting report by Smallwood.

State and federal guidelines provide some common strategies for micro- and meso-siting of turbines in the Project area, and the Smallwood and Neher (2010) study incorporated these strategies including: collection of preliminary information to evaluate risk and the regulatory framework, avoidance actions as a priority in the siting process, and the importance of turbine configuration in turbine siting.

6.2 Wildlife Response and Reporting System

NextEra implements an existing Wildlife Response and Reporting System (WRRS) managed out of Livermore, California, by NextEra's onsite biologist. The WRRS includes worker training and education including PowerPoint presentations to field maintenance and operations staff at regularly scheduled intervals. NextEra is aware that permits are required for removing carcasses and carrion, and this requirement was included in the existing worker safety training program. NextEra retains a qualified biologist and a USFWS Special Purpose Utility permit and participates in regular communication with the appropriate agency staff. Wildlife and safety training is also given to monitoring contractors and others who access the site. The training presentations given to field staff are focused on a consistent message of reporting field observations to the qualified biologist.

SECTION 7

Avian Protection Measures

This section presents the specific measures and practices to avoid or minimize risks to bird species. These measures were certified in the PEIR (2014), referenced in the Golden Hills North Wind Energy Facility Repowering Project CUP (2015), and are consistent with the 2010 Settlement Agreement.

When impacts are identified in an EIR, CEQA requires a mitigation reporting or monitoring program to be prepared and implemented for the project. The PEIR and the Golden Hills North Wind Energy Facility Repowering Project Mitigation Monitoring and Reporting Program (MMRP) outlines various mitigation measures for biological resources including those to avoid or minimize potential adverse impacts to avian species. The full text of the mitigation measures referred to in this section is provided in Appendix A.

This APP has been prepared in accordance with Mitigation Measure BIO-11a, "Prepare a project-specific avian protection plan," which will include the following components:

- Information and methods used to site turbines to minimize risk.
- Documentation that appropriate turbine designs are being used.
- Documentation that avian-safe practices are being implemented on project infrastructure.
- Methods used to discourage prey for raptors.
- A detailed description of the post-construction avian fatality monitoring methods to be used (consistent with the minimum requirements outlined in Mitigation Measure BIO-11g).
- Methods used to compensate for the loss of raptors (consistent with the requirements of Mitigation Measure BIO-11h).

Additional measures include:

- To compensate for ongoing fatalities of the bird and bat species, NextEra will pay a mitigation fee of $10,500 per MW of installed capacity for each phase of repowering (including subsequently acquired turbines). The fees for each phase shall be paid to a fund administered by the EBRPD, for conservation efforts for the benefit of those bird and bat species and their habitat in the greater area encompassed by and surrounding the APWRA.
- Historically, conservation easements established by NextEra for construction related impacts have been located as close to the repowering projects as possible, including within the APWRA. The conservation easements established by NextEra for Vasco Winds have had the wind rights retired as an additional benefit.

This APP was submitted to Alameda County and will be reviewed by the TAC for consistency and inclusion of appropriate mitigation measures.

7.1 Avian-sensitive Turbine Siting and Design

Mitigation measures from the MMRP related to siting and design of wind turbines to reduce impacts to avian species are summarized below, followed by additional detail on how NextEra will comply with the measures.

Mitigation Measure BIO-11b: Site turbines to minimize potential mortality of birds *and* **Mitigation Measure BIO-11c: Use turbine designs that reduce avian impacts**

Careful siting and repowering have been the primary methods for reducing mortality of birds in the APWRA. DEM and raptor use and behavior data were used to develop geographical and topographical map-based predictive models that showed where on the project site raptors more often fly and perform other specific behaviors, such that locating turbines in these areas could create greater risks to raptors. To reduce avian mortality, site-specific modeling of golden eagle flights, red-tailed hawk and American kestrel hovering and kiting, and burrowing owl nest burrow locations were incorporated as well to site wind turbines in a way that would minimize encounter frequencies between raptors and turbines. See Appendix C for full siting report.

A turbine design was selected that reduces the collision risk for birds. Turbine design limits or eliminates perching and nesting opportunities, which has been shown to reduce avian fatalities. Lighting on turbines is the minimum required by Federal Aviation Administration (FAA) regulations.

Mitigation Measure BIO-11d: Incorporate avian-safe practices into design of turbine-related infrastructure

To reduce the risk of electrocution and collision, mitigation measures were applied when designing and siting turbines and ancillary components including meteorological stations, power lines, and lighting. The use of guy wires on permanent meteorological towers is avoided. Meteorological towers are lit only as required by the FAA. Power lines will be buried to the extent possible. Guidelines from the Avian Power Line Interaction Committee will be followed to prevent electrocutions. Lighting will be focused downward where possible to minimize skyward illumination.

Mitigation Measure BIO-11e: Retrofit existing infrastructure to minimize risk to raptors

Existing power lines in the Project area that are associated with electrocution of an eagle or other raptor will be retrofitted to make them raptor safe.

NextEra will ensure that any infrastructure or ancillary components present at the Project site are avian safe to the extent possible through retrofitting or other actions.

7.2 Avian Risk Reduction Measures

The PEIR (2014) MMRP provide additional mitigation measures to be implemented at the project site to minimize impacts to birds and their habitats. These mitigation measures are outlined below and provided in full in Appendix A. The project will comply with the MMRPs referenced, as applicable during preconstruction and construction. Unless otherwise noted, the nesting season is typically February 1 to August 31, and the non-breeding season is typically September 1 to January 31.

Mitigation Measure BIO-8a: Implement measures to avoid and minimize potential impacts on special-status and non-special-status nesting birds

Where suitable habitat is present, the following measures will be implemented for raptors (within 1 mile of suitable habitat), golden eagles (within 2 miles of suitable habitat), and tree/shrub- and ground-nesting birds (within 50 feet of suitable habitat):

- Suitable nesting habitat (shrubs and trees) will be removed during the non-breeding season (typically September 1 to January 31).
- Construction activities near suitable or occupied nesting habitat will be avoided to the extent feasible during the nesting season.
- Preconstruction nest surveys by a qualified biologist will take place if construction activities are scheduled during the nesting season.
- If an active nest is identified near a proposed work area when construction is scheduled to occur, coordination with USFWS and/or CDFW will occur to establish an appropriate no-activity buffer around the nest.

Mitigation Measure BIO-8b: Implement measures to avoid and minimize potential impacts on western burrowing owl

Where suitable habitat for western burrowing owl is in or within 500 feet of proposed work areas, the following measures will be implemented:

- During the nesting season, construction activities near active burrows will be avoided to the extent feasible.
- Preconstruction surveys for burrowing owl will occur no less than 14 days prior to, and within 24 hours of initiating ground-disturbing activities.
- If an active burrow is identified during the breeding season near a proposed work area, an appropriate no-activity buffer will be established with coordination from CDFW. An appropriate no-activity buffer will also be established for burrows occupied outside of the breeding season. If a no-activity buffer cannot be established, additional measures will be put in place as specified by a qualified biologist and CDFW.
- An approved burrowing owl exclusion plan may be used to exclude owl from burrows in the active project area during the non-breeding season.
- Ongoing surveillance of the project site will occur during project activities.

Mitigation Measure BIO-9: Compensate for the permanent loss of occupied habitat for western burrowing owl

Construction activities may result in the removal of suitable burrowing owl habitat. Therefore, the habitat loss will be mitigated as appropriate through a plan developed in coordination with CDFW and approved by the County. Separately from this APP, NextEra will provide for any required habitat compensation for impacts to western burrowing owl as a result of construction of the Project, e.g., recordation of a combined species conservation easement.

Mitigation Measure BIO-11f: Discourage prey for raptors

To discourage small mammals from nesting or burrowing near turbines, boulders and rock piles will be placed 500 meters (1,640 feet) or more away from turbines, and gravel will be placed around the foundation of each turbine. NextEra will not utilize rodenticide on the Project site to avoid the risk of raptors scavenging in the area.

Mitigation Measure BIO-11h: Compensate for the loss of raptors and other avian species, including golden eagles, by contributing to conservation efforts

The PEIR (2014) outlines conservation efforts for the area that includes the Project site. The strategy identifies a set of mitigation standards including avoidance and minimization measures and a compensation program to offset impacts expected from projects in the study area. These measures fall under Mitigation Measures BIO-11h requiring conservations efforts for avian species.

In addition to the purchase of approximately 290 acres of conservation lands as relates to Mitigation Measure BIO-9, and other non-avian sections of the PEIR, additional funds in the amount of $10,500 per MW installed are paid out by the project for conservation land purchases and scientific research on the effects of wind turbines on birds and bats at the APWRA. The values paid out by the project are stipulated in the Settlement Agreement as well as the PEIR. Important raptor habitat for hunting and nesting will be managed and maintained in perpetuity. Continued support of research focused on impacted species will provide a better understanding of local populations that are directly impacted by wind energy projects. Examples of research made possible through the ongoing mitigation funding generated from NextEra's repowering projects in the APWRA are:

- Diablo Range eagle nesting surveys (by USGS); provided a dramatically improved population estimate for the region (Wiens 2015). Ongoing work promises to elucidate additional relationships between ages of eagles and successful nesting, as well as ideal habitat and nest choice indicators.
- Eagle capture, telemetry and GIS tracking (by EBRPD); aided in siting models and general knowledge of local population's behavior and use of the landscape.
- Nesting burrowing owl surveys in the Altamont (by Smallwood); provided general information on the species and nesting behavior locally, as well as aided in developing improved siting models for turbines.
- Nocturnal observations of burrowing owls (by Smallwood); improved knowledge of species behavior and improved siting models for turbines.
- Analyze previously collected data and nesting locations to develop siting models for golden eagles (by Smallwood); specifically improved siting models by using many years of historical behavior observations and known nesting locations.
- Directed golden eagle behavior surveys (by Smallwood); increased data on local area use by golden eagles to aid in improving siting models for turbines.

For the research component to the mitigation funds, NextEra has funded two research projects with multiple components or goals (see Appendix D), as follows.

Research of Wind Turbine Impacts on Wildlife in the APWRA

- Assess effectiveness of wind turbine siting in repowering to minimize collision hazards to golden eagles, red-tailed hawks, American kestrels, and burrowing owls
    - Satellite telemetry of golden eagles in and around the APWRA
    - Compare flight behaviors of golden eagles and other raptors and burrow locations of burrowing owls in opportune before-after, control-impact experimental design
    - Assess burrowing owl population as repowering expands in the APWRA
    - Nocturnal behavior observations in the APWRA to quantify passage rates and behaviors of owls and bats encountering newly installed turbines
    - Analyze flight and nest location data to develop collision hazard models
- Establish studies of flight patterns as alternative to pre-construction avian use rate surveys
- Inform collision risk models with empirically derived passage rates and avoidance rates

Recent Trends in Site Occupancy, Breeding Success, and Abundance of Golden Eagles in the Vicinity of the APWRA, California

- Continue surveys of occupancy, reproduction and density of golden eagles under existing sampling framework of 2014-2015 study period
- Use additional years of survey data to estimate recent trends in proportion of area occupied and breeding success of territorial pairs of golden eagles in the Diablo Range study area
- Estimate intensity of use of APWRA by breeding and non-breeding golden eagles relative to the similar landscape conditions in the broader Diablo Range study area
- Explore the potential to expand surveys of golden eagles in the vicinity of APWRA to provide better coverage of areas associated with repower efforts or other management activities

7.3 Avian Post-construction Monitoring

NextEra will implement a post-construction avian monitoring program consistent with and in accordance with the provisions of the 2010 Settlement Agreement, the PEIR (**Mitigation Measure BIO-11g, Implement post-construction avian fatality monitoring for all repowering projects**) and the MMRP, as amended and approved by the TAC. The County, TAC, and Settling Parties approved several modifications to the monitoring provisions stipulated by the Settlement Agreement, PEIR, and MMRP, including:

- **Removal of bat acoustic monitoring (although not technically part of the Avian Protection Plan) –** TAC recommended shifting effort from bat acoustic surveys to more frequent avian fatality monitoring searches and the continued use of dogs in the monitoring program. Products of bat acoustic monitoring programs are unlikely to provide new information beyond what is already known about species absence/presence and that the fall period provides intermittent pulses of bats migrating through the area.
- **Avian use and behavior surveys** – TAC recommended shifting effort from general avian use surveys to raptor, and more specifically eagle, centered use and behavior surveys. Settling parties, too, agreed upon this approach.
- **Post-Construction Avian Fatality Monitoring –** Post construction avian fatality monitoring for the Project will commence as soon as feasible following TAC approval of the Project's monitoring program methodology, and requisite contract development. Monitoring is expected to begin in September 2018.
- **Change from minimum turbines searched every two weeks –** TAC recommended a change from searching a subset of turbines every two weeks to searching a subset of turbines (half, or 10 turbines) every 7 days. This decreases the search interval and is consistent with the search intervals (7 day and 28 day) from other monitoring programs in the APWRA.

Consistent with these approved modifications and Mitigation Measure BIO-11g, the following provides more detail on the monitoring program methodology.

Fatality monitoring will be conducted at the Project area for a minimum of 3 years beginning as close to the commercial operation date for the project as possible, following monitoring program approval by the TAC. If results of the initial 3-year monitoring period indicate that baseline fatality rates are exceeded, monitoring will be extended until the average annual fatality rate has dropped below baseline fatality rates for 2 years, and to assess the effectiveness of adaptive management measures (see Section 7.4 of this plan). An additional 2 years of monitoring will commence on the 10th anniversary of the commercial operation date. The monitoring program will be managed by an approved consultant ("Monitor") and monitoring activities will be conducted by qualified biologists. The TAC will review the post-construction monitoring program, and will consult on an adaptive management plan if additional protective measures are required.

The post-construction avian monitoring program will use red-tailed hawks, golden eagles, American kestrels and burrowing owls ("Focal Raptor Species") as benchmarks for evaluating the effectiveness of the overall project repowering in reducing turbine-related mortality and informing and updating future siting analyses, although the fatality rates for other species will be presented.

Fatality monitoring will occur at 10 turbines (50%) every 28 days and 10 turbines (50%) every seven days through the duration of the post-construction monitoring period. Integrated detection trials will be conducted concurrently with monitoring to determine appropriate detection probabilities to generate estimates from raw counts of fatalities found in the field. Post-construction monitoring will include year-round raptor surveys, collecting field data on activity and behavior. Four observation stations will be

elected and visited weekly for 30-minute surveys. The surveyor will conduct observations of a 360-degree viewshed with a maximum survey radius of 800m and at maximum height of 50m above the maximum rotor tip. The data collection will be prioritized as 1) Use by golden eagles, 2) Behavior of golden eagles, 3) Use by other raptors, including turkey vultures, and 4) Behavior of other raptors.

NextEra will prepare annual monitoring reports and submit them to Alameda County within 3 months of completing each year of post-construction monitoring and shall prepare and submit a final 3-year monitoring report within 6 months of completing 3 years of post-construction monitoring and a final 2-year monitoring report within 6 months of completing 2 years of post-construction monitoring. All monitoring reports will report adjusted and unadjusted annual fatalities for the Focal Raptor Species and all other bird species on a per-turbine and per-MW basis. Monitoring reports also will summarize the results for the preceding 1 or 2 years, as applicable.

During the post-construction monitoring periods, monthly digital summary data from the monitoring program, as well as incidental reports of dead birds and/or bats discovered on the Project, will be reported to Alameda County (along with the Federal and State agencies, as is NextEra's existing process). Raw data will be provided in electronic format to Alameda County once per year, and - at a minimum - all data required to replicate the analyses conducted in the annual report will be included in the data set. If paper data sheets are generated from field monitoring, those data sheets will be provided to the County upon request.

7.4 Adaptive Management Program

Research is ongoing (e.g., research sponsored by Golden Hills and Golden Hills North mitigation funds) to study and correlate the interaction of birds with wind-energy generation and the fatalities that can result. The amount of information continues to increase and methods to mitigate negative impacts to birds are constantly evolving and improving. Accordingly, incorporating an adaptive management strategy to adjust operation and avian management to the results of onsite monitoring, new technology, and new behavioral information is necessary in attempting to minimize impacts to the greatest extent feasible.

Mitigation Measure BIO-11i: Implement an avian adaptive management program requires an adaptive management program (AMP) to be implemented if baseline fatality estimates are exceeded during operation of wind energy facility in the APWRA. The goal of the AMP is to ensure the best available science and emerging technologies are used to assess and manage impacts to avian species. Site-specific data and current research will be used to form effective impact-reduction strategies. The adaptive measures of the program will aim to minimize impacts to the greatest extent possible while maximizing energy production.

Preconstruction APWRA-wide baseline fatality estimates as cited in the PEIR are provided in Table 3 above (see Section 4.2). If post-construction monitoring results indicate a fatality rate that exceeds the preconstruction baseline fatality estimates for any focal species or species group, then the adaptive management measures (see Section 7.4.1 below) provided by the PEIR will be implemented, in consultation with the TAC The best information available will be used to determine which measures to implement from the list pre-determined by Alameda County. The TAC will review the avian impacts and advise NextEra and the County on which measures that they recommend for implementation. The program requires approval by Alameda County, and will be implemented within 2 months of its approval.

The AMP will be used to adjust mitigation measures and, potentially, operations based on the results of monitoring, research data, and new technology to ensure that the best available science is used to minimize impacts to avian species, and reduce fatalities to below baseline numbers. The program will entail implementing an adaptive measure or measures and monitoring the outcome and results of the

measures for success or failure. Additional measures will be added as necessary and followed by monitoring until the approved success criteria are achieved.

7.4.1 Adaptive Management Measures

As detailed in the PEIR and MMRP, the following adaptive management measures (ADMM) will be considered in the order shown below, but all, none, or some combination of these measures with or without additional measures not defined below may be recommended for implementation by the TAC.

ADMM-1: Visual Modifications

Visual modifications may include painting a pattern on a portion of turbine blades or painting one blade black to reduce motion smear (the blurring of turbine blades due to rapid rotation that makes the blades less visible to birds).

ADMM-2: Anti-Perching Measures

Anti-perching devices may be considered for installation on select artificial structures (excluding utility poles) within 1 mile of the project area.

ADMM-3: Prey Reduction

A prey-reduction program may be considered around hazardous turbines to include direct removal of prey species and/or making the area less desirable to prey species through vegetation management or other efforts.

ADMM-4: Implementation of Experimental Technologies

Experimental technologies may be tried and tested for their efficacy in reducing fatalities.

ADMM-5: Turbine Curtailment

Turbines that have been shown to have significantly higher numbers of avian fatalities may have operations curtailed.

ADMM-6: Cut-in Speed Study

Cut-in speeds may be altered and monitored to determine if increases would significantly reduce avian fatalities.

ADMM-7: Real-Time Turbine Curtailment

Turbine curtailment may occur based on observations from an onsite biologist, radar, video, or other monitoring technology that detects the presence of raptors or other avian species within the operational project area.

SECTION 8

References

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Appendix A
Mitigation Measures Defined in the PEIR (2014)

Exhibit B
Golden Hills North Wind Repowering Project
Mitigation Monitoring and Reporting Program

Purpose of and Need for Monitoring

In compliance with CEQA, an EIR has been prepared for the proposed project. The Environmental Checklist prepared for the proposed project identified potentially significant impacts in the resource areas listed below, as well as mitigation measures to reduce these impacts to a less-than-significant level where possible.

Significant impacts pertaining to the following resource areas would be reduced to a less-than-significant level by mitigation measures identified in the EIR.

- Aesthetics impacts
- Expose sensitive receptors to substantial pollutant concentrations during construction
- Impacts on non-avian (birds and bats) biological resources
- Cultural resources impacts
- Geology, soils, mineral resources, and paleontological resources impacts
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases
- Hazards
- Water quality impacts
- Construction traffic impacts

Impacts that cannot be reduced to less-than-significant levels, even with implementation of mitigation measures identified in the PEIR, are listed below.

- Air quality impacts associated with construction.
- Impacts on avian species, including raptors, and bats.

CEQA requires that a lead agency adopt a Mitigation Monitoring and Reporting Program (MMRP) for the measures the agency has proposed to avoid or mitigate significant environmental effects (CEQA Guidelines Section 15097). The purpose of the MMRP is to ensure that the applicable PEIR mitigation measures identified in the APWRA Implementation Checklist are implemented and to identify who is responsible for their implementation.

Table MMRP-1, which follows this introductory section, identifies the PEIR mitigation measures required for the proposed Golden Hills North Wind Project, the parties responsible for implementing and monitoring the measures, the timing of each measure, and a summary of the actions necessary to implement and monitor each measure.

Mitigation Monitoring and Reporting Program

The MMRP has been prepared for the proposed project in accordance with Public Resources Code 21081.6, which specifies that when a public agency makes findings required by paragraph (1) of subdivision (a) of Section 21081, it "shall adopt a reporting or monitoring program for the changes made to the project or conditions of project approval, adopted in order to mitigate or avoid significant effects on the environment." Public Resources Code 21081.6 further specifies that the MMRP will "ensure compliance during project implementation."

This MMRP is intended to ensure the effective implementation of mitigation measures that are within the County's authority to implement, including monitoring where identified, throughout all phases of development and operation of the proposed program.

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Aesthetics				
Mitigation Measure AES-1: Limit construction to daylight hours Major construction activities will not be undertaken between sunset and sunrise or on weekends. Construction activity is specifically prohibited from using high-wattage lighting sources to illuminate work sites after sunset and before sunrise, with the exception of nighttime deliveries under the approved transportation control plan or other construction activities that require nighttime work for safety considerations.	During construction	County—adopt a Condition of Approval; Operator—ensure construction hours are maintained	County	Monitor compliance with Conditions of Approval
Mitigation Measure AES-2a: Require site development review New turbines along ridgelines or hilltops that have not previously been developed with commercial-scale wind turbines will not be allowed unless a separate Site Development Review is completed that determines that the visual effects will be substantially avoided by distance from public viewpoints (e.g., more than 2,000 feet), intervening terrain, screening landscaping, or compensatory improvements to equivalent and nearby (radius of 1 mile) scenic features, as approved by the Planning Director.	Prior to approval of site plans for new turbines along ridgelines that have not previously been developed with wind turbines	County—Require, review, and approve Site Development Review prior to approving new turbines along ridgelines that have not previously been developed with wind turbine strings	County	Ensure that Site Development Review process occurs
Mitigation Measure AES-2b: Maintain site free of debris and restore abandoned roadways Project sites will be cleaned of all derelict equipment, wind turbine components not required for the project, and litter and debris from old turbines and past turbine operations. Such litter and debris may include derelict turbines, obsolete anemometers, unused electrical poles, and broken turbine blades. In addition, abandoned roads that are no longer in use on such parcels will be restored and hydroseeded to reclaim the sites and remove their visual traces from the viewscape, except in cases where the resource agencies (USFWS and CDFW) recommend that the features be left in place for resource protection. All parcels with new turbines will be maintained in such a manner through the life of project operations and until the parcels are reclaimed in accordance with the approved reclamation plan.	During construction and operation	County—adopt a Condition of Approval; Operator—ensure that site conditions are maintained as required	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Mitigation Measure AES-2c: Screen surplus parts and materials Surplus parts and materials that are kept onsite will be maintained in a neat and orderly fashion and screened from view. This can be accomplished by using a weatherproof camouflage material that can be draped over surplus parts and materials stockpiles. Draping materials will be changed out to accommodate for seasonal variations so that surplus materials are camouflaged in an effective manner when grasses are both green and brown.	During construction and operation	County—adopt a Condition of Approval; Operator—ensure that site conditions are maintained as required	County	Monitor compliance with Conditions of Approval
Mitigation Measure AES-5: Analyze shadow flicker distance and mitigate effects or incorporate changes into project design to address shadow flicker Where shadow flicker could result from the installation of wind turbines proposed near residences (i.e., within 500 meters [1,640 feet] in a generally east or west direction to account for all seasons), the project applicant will prepare a graphic model and study to evaluate shadow flicker impacts on nearby residences. No shadow flicker in excess of 30 minutes in a given day or 30 hours in a given year will be permitted. If it is determined that existing setback requirements as established by the County are not sufficient to prevent shadow flicker impacts on residences, Alameda County will require an increase in the required setback distances to ensure that residences are not affected. If any residence is nonetheless affected by shadow flicker within the 30-minute/30-hour thresholds, the applicant will implement measures to minimize the effect, such as relocating the turbine; providing opaque window coverings, window awnings, landscape buffers, or a combination of these features to reduce flicker to acceptable limits for the affected receptor; or shutting down the turbine during the period shadow flicker would occur. Such measures will be undertaken in consultation with the owner of the affected residence. If the shadow flicker study indicates that any given turbine would result in shadow flicker exceeding the 30-minute/30-hour thresholds and the property owner is not amenable to window coverings, window awnings, or landscaping and the turbine cannot be shut down during the period of shadow flicker, then the turbine will be relocated to reduce the effect to acceptable limits.	During project design	County—adopt a Condition of Approval; Operator—ensure that thresholds are maintained as required	County	Monitor compliance with Conditions of Approval
Air Quality				
Mitigation Measure AQ-2a: Reduce construction-related air pollutant emissions by implementing applicable BAAQMD Basic Construction Mitigation Measures The project proponents will require all contractors to comply with the following	During construction	County—adopt a Condition of Approval; Operator—ensure	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
requirements for all areas with active construction activities. • All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) will be watered as needed to maintain dust control onsite—approximately two times per day. • All haul trucks transporting soil, sand, or other loose material offsite will be covered. • All visible mud or dirt track-out onto adjacent public roads will be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited. • All vehicle speeds on unpaved roads will be limited to 15 mph. • All roadways, driveways, and sidewalks to be paved will be completed as soon as possible. Building pads will be laid as soon as possible after grading unless seeding or soil binders are used. • Idling times will be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage will be provided for construction workers at all access points. • All construction equipment will be maintained and properly tuned in accordance with manufacturer's specifications. All equipment will be checked by a certified visible emissions evaluator. • Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person will respond and take corrective action within 48 hours. The air district's phone number will also be visible to ensure compliance with applicable regulations.		compliance		
Mitigation Measure AQ-2b: Reduce construction-related air pollutant emissions by implementing measures based on BAAQMD's Additional Construction Mitigation Measures The project proponents will require all contractors to comply with the following requirements for all areas with active construction activities. • During construction activities, all exposed surfaces will be watered at a frequency adequate to meet and maintain fugitive dust control requirements of all relevant air quality management entities.	During construction	County—adopt a Condition of Approval; Operator—ensure compliance	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
• All excavation, grading, and/or demolition activities will be suspended when average wind speeds exceed 20 mph, as measured at the Livermore Municipal Airport. • Wind breaks (e.g., trees, fences) will be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50% air porosity. • Vegetative ground cover (e.g., fast-germinating native grass seed) will be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established. • If feasible and practicable, the simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time will be limited. • Construction vehicles and machinery, including their tires, will be cleaned prior to leaving the construction area to remove vegetation and soil. Cleaning stations will be established at the perimeter of the construction area. • Site accesses to a distance of 100 feet from the paved road will be treated with a 6 to 12 inch compacted layer of wood chips, mulch, or gravel. • Sandbags or other erosion control measures will be installed to prevent silt runoff to public roadways from sites with a slope greater than 1%. • The idling time of diesel powered construction equipment will be minimized to 2 minutes. • The project will develop a plan demonstrating that the offroad equipment (more than 50 horsepower) to be used in the construction project (i.e., owned, leased, and subcontractor vehicles) would achieve a project wide fleet-average 20% NO_X reduction and 45% PM reduction compared to the most recent ARB fleet average. Acceptable options for reducing emissions include the use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters, and/or other options as such become available. • Use low VOC (i.e., ROG) coatings beyond the local requirements (i.e., Regulation 8, Rule 3: Architectural Coatings). • All construction equipment, diesel trucks, and generators will be equipped with BACT for emission reductions of NO_X and PM.				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
• All contractors will use equipment that meets ARB's most recent certification standard for offroad heavy duty diesel engines. Implementation of Mitigation Measures AQ-2a and AQ-2b would ensure that impacts related to fugitive dust emissions in the SFBAAB would be less than significant. However, implementation of these measures would not reduce total ROG or NO_X emissions to a less-than-significant level (Table 3.3-11). This impact of total ROG and NO_X emissions would be significant and unavoidable. Mitigation Measures AQ-2a and AQ-2b would not reduce the onroad emissions in the SJVAB shown in Table 3.3-7, but these emissions would not exceed SJVAPCD's significance thresholds and are, therefore, less than significant.				
Biological Resources				
Mitigation Measure BIO-1a: Conduct surveys to determine the presence or absence of special-status plant species Project proponents will conduct surveys for the special-status plant species within and adjacent to all project sites. All surveys will be conducted by qualified biologists in accordance with the appropriate protocols. Special-status plant surveys will be conducted in accordance with *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (California Department of Fish and Game 2009) during the season that special-status plant species would be evident and identifiable—i.e., during their blooming season. No more than 3 years prior to ground-disturbing repowering activities and during the appropriate identification periods for special-status plants (Table 3.4-4), a qualified biologist (as determined by Alameda County) will conduct field surveys within decommissioning work areas, proposed construction areas, and the immediately adjacent areas to determine the presence of habitat for special-status plant species. The project proponent will submit a report documenting the survey results to Alameda County for review and approval prior to conducting any repowering activities. The report will include the location and description of all proposed work areas, the location and description of all suitable habitat for special-status plant species, and the location and description of other sensitive habitats (e.g., vernal pools, wetlands, riparian areas). Additionally, the report will outline where additional species and/or habitat-specific mitigation measures are required. This report will provide the basis for any applicable permit applications where incidental take of listed species may occur.	Prior to site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Mitigation Measure BIO-1b: Implement best management practices to avoid and minimize impacts on special-status species Project proponents will ensure that the following BMPs, in accordance with practices established in the EACCS, will be incorporated into individual project design and construction documents. • Employees and contractors performing decommissioning and reclamation activities will receive environmental sensitivity training. Training will include review of environmental laws, mitigation measures, permit conditions, and other requirements that must be followed by all personnel to reduce or avoid effects on special-status species during construction activities. • Environmental tailboard trainings will take place on an as-needed basis in the field. These trainings will include a brief review of the biology of the covered species and guidelines that must be followed by all personnel to reduce or avoid negative effects on these species during decommissioning and reclamation activities. Directors, managers, superintendents, and the crew leaders will be responsible for ensuring that crewmembers comply with the guidelines. • Vehicles and equipment will be parked on pavement, existing roads, and previously disturbed areas to the extent practicable. • Offroad vehicle travel will be avoided. • Material will be stockpiled only in areas that do not support special-status species or sensitive habitats. • Grading will be restricted to the minimum area necessary. • Prior to ground-disturbing activities in sensitive habitats, project construction boundaries and access areas will be flagged and temporarily fenced during construction to reduce the potential for vehicles and equipment to stray into adjacent habitats. • Vehicles or equipment will not be refueled within 100 feet of a wetland, stream, or other waterway unless a bermed and lined refueling area (i.e., a created berm made of sandbags or other removable material) is constructed. • Erosion control measures will be implemented to reduce sedimentation in nearby aquatic habitat when activities are the source of potential erosion.	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Plastic monofilament netting (erosion control matting) or similar material containing netting will not be used at the project. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds. • Significant earth moving-activities will not be conducted in riparian areas within 24 hours of predicted storms or after major storms (defined as 1-inch of rain or more). The following will not be allowed at or near work sites for project activities: trash dumping, firearms, open fires (such as barbecues) not required by the activity, hunting, and pets (except for safety in remote locations).				
Mitigation Measure BIO-1c: Avoid and minimize impacts on special-status plant species by establishing activity exclusion zones Where surveys determine that a special-status plant species is present in or adjacent to a project area, direct and indirect impacts of the project on the species will be avoided through the establishment of activity exclusion zones, within which no ground-disturbing activities will take place, including construction of new facilities, construction staging, or other temporary work areas. Activity exclusion zones for special-status plant species will be established around each occupied habitat site, the boundaries of which will be clearly marked with standard orange plastic construction exclusion fencing or its equivalent. The establishment of activity exclusion zones will not be required if no construction-related disturbances will occur within 250 feet of the occupied habitat. The size of activity exclusion zones may be reduced through consultation with a qualified biologist and with concurrence from CDFW based on site-specific conditions.	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-1d: Compensate for impacts on special-status plant species All project proponents will avoid or minimize temporary and permanent impacts on special-status plants that occur on project sites and will compensate for impacts on special-status plant species. Although all impacts on large-flowered fiddleneck, diamond-petaled California poppy, and caper-fruited tropidocarpum will be avoided, impacts on other special-status plant species will be avoided to the extent feasible, and any unavoidable impacts will be addressed through compensatory mitigation. Where avoidance of impacts on a special-status plant species is infeasible, loss of individuals or occupied habitat of a special-status plant species occurrence will be compensated for through the acquisition, protection, and subsequent management	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
in perpetuity of other existing occurrences at a 2:1 ratio (occurrences impacted: occurrences preserved). The project proponent will provide detailed information to the County and CDFW on the location of the preserved occurrences, quality of the preserved habitat, feasibility of protecting and managing the areas in-perpetuity, responsibility parties, and other pertinent information. If suitable occurrences of a special-status plant species are not available for preservation, then the project will be redesigned to remove features that would result in impacts on that species.				
Mitigation Measure BIO-1e: Retain a biological monitor during ground-disturbing activities in environmentally sensitive areas All project proponents will retain a qualified biologist (as determined by Alameda County) to conduct periodic monitoring of decommissioning, repowering, and reclamation activities that occur adjacent to sensitive biological resources (e.g., special-status species, sensitive vegetation communities, wetlands). Monitoring will occur during initial ground disturbance where sensitive biological resources are present and weekly thereafter or as determined by the County in coordination with a qualified biologist. The biologist will assist the crew, as needed, to comply with all project implementation restrictions and guidelines. In addition, the biologist will be responsible for ensuring that the project proponent or its contractors maintain exclusion areas adjacent to sensitive biological resources, and for documenting compliance with all biological resources– related mitigation measures.	During all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-2: Prevent introduction, spread, and establishment of invasive plant species To avoid and minimize the introduction and spread of invasive nonnative plant species, all project proponents will implement the following BMPs. • Construction vehicles and machinery will be cleaned prior to entering the construction area to remove vegetation and soil. Cleaning stations will be established at the perimeter of the construction area or at a nearby offsite location (no more than 1 mile from the project construction entry point). • Vehicles will be washed only at approved areas. No washing of vehicles will occur at job sites. • To discourage the introduction and establishment of invasive plant species, seed mixtures and straw used within natural vegetation will be either rice straw or weed-free straw, as allowed by state and federal regulation of stormwater runoff.	During all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
In addition, the project proponents will prepare and implement erosion and sediment control plans to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities (Mitigation Measures BIO-1b and WQ-1). Prior to initiating any construction activities that will result in temporary impacts on natural communities, a restoration and monitoring plan will be developed for temporarily affected habitats in each project area (Mitigation Measure BIO-5c). Restoration and monitoring plans will be submitted to the County and CDFW for approval. These plans will include methods for restoring soil conditions and revegetating disturbed areas, seed mixes, monitoring and maintenance schedules, adaptive management strategies, reporting requirements, and success criteria. Following completion of project construction, the project proponents will implement the revegetation plans to restore areas disturbed by project activities to a condition of equal or greater habitat function than occurred prior to the disturbance.				
Mitigation Measure BIO-3a: Conduct preconstruction surveys for habitat for special-status wildlife species No more than 3 years prior to ground-disturbing repowering activities, a qualified biologist (as determined by Alameda County) will conduct field surveys within decommissioning, repowering, and restoration work areas and their immediate surroundings to determine the presence of habitat for special-status wildlife species. The project proponent will submit a report documenting the survey results to Alameda County for review prior to conducting any repowering activities. The report will include the location and description of all proposed work areas, the location and description of all suitable habitat for special-status wildlife species, and the location and description of other sensitive habitats (e.g., vernal pools, wetlands, riparian areas). Additionally, the report will outline where additional species- and/or habitat-specific mitigation measures are required. This report may provide the basis for any applicable permit applications where incidental take may occur.	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-3b: Implement measures to avoid, minimize, and mitigate impacts on vernal pool branchiopods and curved-footed hygrotus diving beetle Where suitable habitat for listed vernal pool branchiopods and curved-footed hygrotus diving beetle are identified within 250 feet (or another distance as determined by a qualified biologist based on topography and other site conditions) of proposed work areas, the following measures will be implemented to ensure	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
that the repowering projects do not have adverse impacts on listed vernal pool branchiopods or curved-footed hygrotus diving beetle. These measures are based on measures from the EACCS, with some modifications and additions. Additional conservation measures or conditions of approval may be required in applicable project permits (e.g., ESA incidental take permit). • Avoid all direct impacts on sandstone rock outcrop vernal pools. • Ground disturbance will be avoided from the first day of the first significant rain (1 inch or more) until June 1, or until pools remain dry for 72 hours and no significant rain is forecast on the day of such ground disturbance. • If vernal pools, clay flats, alkaline pools, ephemeral stock tanks (or ponds), sandstone pools, or roadside ditches are present within 250 feet of the work area (or another appropriate distance as determined by a qualified biologist on the basis of topography and other site conditions), the biologist will stake and flag an exclusion zone prior to construction activities. The width of the exclusion zone will be based on site conditions and will be the maximum practicable distance that ensures protection of the feature from direct and indirect effects of the project. Exclusion zones will be established around features whether they are wet or dry at the time. The exclusion zone will be fenced with orange construction zone and erosion control fencing (to be installed by construction crew). • No herbicide will be applied within 100 feet of exclusion zones, except when applied to cut stumps or frilled stems or injected into stems. No broadcast applications will be allowed. • Avoid modifying or changing the hydrology of aquatic habitats. • Minimize the work area for stream crossings and conduct work during the dry season (June 1 through the first significant rain of the fall/winter). • Install utility collection lines across perennial creeks by boring under the creek. Where impacts cannot be avoided or minimized, compensatory mitigation will be undertaken in accordance with mitigation ratios and requirements developed under the EACCS (Appendix C). In the event that an incidental take permit is required, compensatory mitigation will be undertaken in accordance with the terms of the permit in consultation with USFWS.				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Mitigation Measure BIO-4a: Implement measures to avoid or protect habitat for valley elderberry longhorn beetle If it is determined through preconstruction surveys conducted pursuant to Mitigation Measure BIO-3a that elderberry shrubs are present within proposed work areas or within 100 feet of these areas, the following measures will be implemented to ensure that the proposed project does not have a significant impact on valley elderberry longhorn beetle. • Avoid removal of elderberry shrubs. • Elderberry shrubs/clusters within 100 feet of the construction area that will not be removed will be protected during construction. A qualified biologist (i.e., with elderberry/VELB experience) will mark the elderberry shrubs and clusters that will be protected during construction. Orange construction barrier fencing will be placed at the edge of the buffer areas. The buffer area distances will be proposed by the biologist and approved by USFWS. No construction activities will be permitted within the buffer zone other than those activities necessary to erect the fencing. Signs will be posted every 50 feet (15.2 meters) along the perimeter of the buffer area fencing. The signs will contain the following information: *This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment.* • Buffer area fences around elderberry shrubs will be inspected weekly by a qualified biological monitor during ground-disturbing activities and monthly after ground-disturbing activities until project construction is complete or until the fences are removed, as approved by the biological monitor and the resident engineer. The biological monitor will be responsible for ensuring that the contractor maintains the buffer area fences around elderberry shrubs throughout construction. Biological inspection reports will be provided to the project proponent and USFWS.	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-4b: Compensate for direct and indirect effects on valley elderberry longhorn beetle If elderberry shrubs cannot be avoided and protected as outlined in Mitigation Measure 4a, the project proponent will obtain an incidental take permit from USFWS and compensate for the loss of any elderberry shrubs. Surveys of	Prior to disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
elderberry shrubs to be transplanted will be conducted by a qualified biologist prior to transplantation. Surveys will be conducted in accordance with the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (U.S. Fish and Wildlife Service 1999). Survey results and an analysis of the number of elderberry seedlings/cuttings and associated native plants based on the survey results will be submitted to USFWS in a biological assessment or an HCP. After receipt of an incidental take permit and before construction begins, the project proponent will compensate for direct effects on elderberry shrubs by transplanting shrubs that cannot be avoided to a USFWS-approved conservation area. Elderberry seedlings or cuttings and associated native species will also be planted in the conservation area. Each elderberry stem measuring 1 inch or more in diameter at ground level that is adversely affected (i.e., transplanted or destroyed) will be replaced, in the conservation area, with elderberry seedlings or cuttings at a ratio ranging from 1:1 to 8:1 (new plantings to affected stems). The numbers of elderberry seedlings/cuttings and associated riparian native trees/shrubs to be planted as replacement habitat are determined by stem size class of affected elderberry shrubs, presence or absence of exit holes, and whether the shrub lies in a riparian or nonriparian area. Stock of either seedlings or cuttings would be obtained from local sources. At the discretion of USFWS, shrubs that are unlikely to survive transplantation because of poor condition or location, or a plant that would be extremely difficult to move because of access problems, may be exempted from transplantation. In cases where transplantation is not possible, minimization ratios would be increased to offset the additional habitat loss. The relocation of the elderberry shrubs will be conducted according to USFWS-approved procedures outlined in the Conservation Guidelines (U.S. Fish and Wildlife Service 1999). Elderberry shrubs within the project construction area that cannot be avoided will be transplanted during the plant's dormant phase (November through the first 2 weeks of February). A qualified biological monitor will remain onsite while the shrubs are being transplanted. Evidence of valley elderberry longhorn beetle occurrence in the conservation area, the condition of the elderberry shrubs in the conservation area, and the general condition of the conservation area itself will be monitored over a period of 10 consecutive years or for 7 years over a 15-year period from the date of transplanting. The project proponent will be responsible for funding and providing monitoring reports to USFWS in each of the years in which a monitoring report is				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
required. As specified in the Conservation Guidelines, the report will include information on timing and rate of irrigation, growth rates, and survival rates and mortality.				
Mitigation Measure BIO-5a: Implement best management practices to avoid and minimize effects on special-status amphibians All project proponents will ensure that BMPs and other appropriate measures, in accordance with measures developed for the EACCS, be incorporated into the appropriate design and construction documents. *Implementation of some of these measures will require that the project proponent obtain incidental take permits from USFWS (California red-legged frog and California tiger salamander) and from CDFW (California tiger salamander only) before construction begins.* Additional conservation measures or conditions of approval may be required in applicable project permits (e.g., ESA or CESA incidental take authorization). The applicant will comply with the State of California State Water Resources Control Board NPDES construction general requirements for stormwater. • Ground-disturbing activities will be limited to dry weather between April 15 and October 31. No ground-disturbing work will occur during wet weather. Wet weather is defined as when there has been 0.25 inch of rain in a 24-hour period. Ground disturbing activities halted due to wet weather may resume when precipitation ceases and the National Weather Service 72-hour weather forecast indicates a 30% or less chance of precipitation. No ground-disturbing work will occur during a dry-out period of 48 hours after the above referenced wet weather. • Where applicable, barrier fencing will be installed around the worksite to prevent amphibians from entering the work area. Barrier fencing will be removed within 72 hours of completion of work. • Before construction begins, a qualified biologist will locate appropriate relocation areas and prepare a relocation plan for special-status amphibians that may need to be moved during construction. The proponent will submit this plan to USFWS and CDFW for approval a minimum of 2 weeks prior to the start of construction. • A qualified biologist will conduct preconstruction surveys immediately prior to ground-disturbing activities (including equipment staging, vegetation removal, grading). The biologist will survey the work area and all suitable habitats within 300 feet of the work area. If individuals	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
(including adults, juveniles, larvae, or eggs) are found, work will not begin until USFWS and/or CDFW is contacted to determine if moving these life-stages is appropriate. If relocation is deemed necessary, it will be conducted in accordance with the relocation plan. Incidental take permits are required for relocation of California tiger salamander (USFWS and CDFW) and California red-legged frog (USFWS). Relocation of western spadefoot and foothill yellow-legged frog requires a letter from CDFW authorizing this activity. • No monofilament plastic will be used for erosion control. • All project activity will terminate 30 minutes before sunset and will not resume until 30 minutes after sunrise during the migration/active season from November 1 to June 15. Sunrise and sunset times are established by the U.S. Naval Observatory Astronomical Applications Department for the geographic area where the project is located. • Vehicles will not exceed a speed limit of 15 mph on unpaved roads within natural land cover types, or during offroad travel. • Trenches or holes more than 6 inches deep will be provided with one or more escape ramps constructed of earth fill or wooden planks and will be inspected by a qualified biologist prior to being filled. Any such features that are left open overnight will be searched each day prior to construction activities to ensure no covered species are trapped. Work will not continue until trapped animals have moved out of open trenches. • Work crews or the onsite biological monitor will inspect open trenches, pits, and under construction equipment and material left onsite in the morning and evening to look for amphibians that may have become trapped or are seeking refuge. • If special-status amphibians are found in the work area during construction and cannot or do not move offsite on their own, a qualified biologist who is USFWS and/or CDFW-approved under a biological opinion and/or incidental take permit for the specific project, will trap and move special-status amphibians in accordance with the relocation plan. Relocation of western spadefoot and foothill yellow-legged frog requires a letter permit from CDFW authorizing this activity.				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Mitigation Measure BIO-5b: Compensate for loss of habitat for special-status amphibians Where impacts on aquatic and upland habitat for special-status amphibians cannot be avoided or minimized, compensatory mitigation will be undertaken in accordance with mitigation ratios and requirements developed under the EACCS (Appendix C). In the event that take authorization is required, compensatory mitigation will be undertaken in accordance with the terms of the authorization in consultation with USFWS and/or CDFW.	Prior to disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-5c: Restore disturbed annual grasslands Within 30 days prior to any ground disturbance, a qualified biologist will prepare a Grassland Restoration Plan in coordination with CDFW and subject to CDFW approval, to ensure that temporarily disturbed annual grasslands and areas planned for the removal of permanent roads and turbine pad areas are restored to preproject conditions. The Grassland Restoration Plan will include but not be limited to the following measures. • Gravel will be removed from areas proposed for grassland restoration. • To the maximum extent feasible, topsoil will be salvaged from within onsite work areas prior to construction. Imported fill soils will be limited to weed-free topsoil similar in texture, chemical composition, and pH to soils found at the restoration site. • Where appropriate, restoration areas will be seeded (hydroseeding is acceptable) to ensure erosion control. Seed mixes will be tailored to closely match that of reference site(s) within the program area and should include native or naturalized, noninvasive species sourced within the project area or from the nearest available location. • Reclaimed roads will be restored in such a way as to permanently prevent vehicular travel. The plan will include a requirement to monitor restoration areas annually (between March and October) for up to 3 years following the year of restoration. The restoration will be considered successful when the percent cover for restored areas is 70% absolute cover of the planted/seeded species compared to the percent absolute cover of nearby reference sites. No more than 5% relative cover of the vegetation in the restoration areas will consist of invasive plant species rated as "high" in Cal-IPC's California Invasive Plant Inventory Database (http://www.cal-ipc.org). Remedial measures prescribed in the plan will include supplemental	Prior to disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
seeding, weed control, and other actions as determined necessary to achieve the long-term success criteria. Monitoring may be extended if necessary to achieve the success criteria or if drought conditions preclude restoration success. Other performance standards may also be required as they relate to special-status species habitat; these will be identified in coordination with CDFW and included in the plan. The project proponent will provide evidence that CDFW has reviewed and approved the Grassland Restoration Plan. Additionally, the project proponent will provide annual monitoring reports to the County by January 31 of each year, summarizing the monitoring results and any remedial measures implemented (if any are necessary) during the previous year.				
Mitigation Measure BIO-6: Conduct preconstruction surveys for western pond turtle and monitor construction activities if turtles are observed If it is determined through preconstruction surveys conducted pursuant to Mitigation Measure BIO-3a that suitable aquatic or upland habitat for western pond turtle is present within proposed work areas, the following measures, consistent with measures developed for the EACCS, will be implemented to ensure that the proposed project does not have a significant impact on western pond turtle. • One week before and within 24 hours of beginning work in suitable aquatic habitat, a qualified biologist (one who is familiar with different species of turtles) will conduct surveys for western pond turtle. The surveys should be timed to coincide with the time of day and year when turtles are most likely to be active (during the cooler part of the day between 8 a.m. and 12 p.m. during spring and summer). Prior to conducting the surveys, the biologist should locate the microhabitats for turtle basking (logs, rocks, brush thickets) and determine a location to quietly observe turtles. Each survey should include a 30-minute wait time after arriving onsite to allow startled turtles to return to open basking areas. The survey should consist of a minimum 15-minute observation period for each area where turtles could be observed. • If western pond turtles are observed during either survey, a biological monitor will be present during construction activities in the aquatic habitat where the turtle was observed. The biological monitor also will be mindful of suitable nesting and overwintering areas in proximity to suitable aquatic habitat and will periodically inspect these areas for nests and turtles.	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
• If one or more western pond turtles are found in the work area during construction and cannot or do not move offsite on their own, a qualified biologist will remove and relocate the turtle to appropriate aquatic habitat outside and away from the construction area. Relocation of western pond turtle requires a letter from CDFW authorizing this activity.				
Mitigation Measure BIO-7a: Implement best management practices to avoid and minimize effects on special-status reptiles Where suitable habitat for Blainville's horned lizard, Alameda whipsnake, or San Joaquin coachwhip is identified in proposed work areas, all project proponents will ensure that BMPs and other appropriate measures, in accordance with measures developed for the EACCS, be incorporated into the appropriate design and construction documents. *Implementation of some of these measures will require that the project proponent obtain incidental take permits from USFWS and CDFW (Alameda whipsnake) before construction begins.* Additional conservation measures or conditions of approval may be required in applicable project permits (i.e., ESA incidental take permit). • A qualified biologist will conduct preconstruction surveys immediately prior to ground-disturbing activities (e.g., equipment staging, vegetation removal, grading) associated with the program. If any Blainville's horned lizards, Alameda whipsnakes, or San Joaquin coachwhips are found, work will not begin until they are moved out of the work area to a USFWS- and/or CDFW-approved relocation site. Incidental take permits from USFWS and CDFW are required for relocation of Alameda whipsnake. Relocation of Blainville's horned lizard and San Joaquin coachwhip requires a letter from CDFW authorizing this activity. • No monofilament plastic will be used for erosion control. • Where applicable, barrier fencing will be used to exclude Blainville's horned lizard, Alameda whipsnake, and San Joaquin coachwhip. Barrier fencing will be removed within 72 hours of completion of work. • Work crews or an onsite biological monitor will inspect open trenches and pits and under construction equipment and materials left onsite for special-status reptiles each morning and evening during construction. • Ground disturbance in suitable habitat will be minimized. • Vegetation within the proposed work area will be removed prior to grading. Prior to clearing and grubbing operations, a qualified biologist	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
will clearly mark vegetation within the work area that will be avoided. Vegetation outside the work area will not be removed. Where possible hand tools (e.g., trimmer, chain saw) will be used to trim or remove vegetation. All vegetation removal will be monitored by the qualified biologist to minimize impacts on special-status reptiles. • If special-status reptiles are found in the work area during construction and cannot or do not move offsite on their own, a qualified biologist who is USFWS- and/or CDFW-approved under an incidental take permit for the specific project will trap and move the animal(s) to a USFWS and/or CDFW-approved relocation area. Incidental take permits from USFWS and CDFW are required for relocation of Alameda whipsnake. Relocation of Blainville's horned lizard and San Joaquin coachwhip requires a letter from CDFW authorizing this activity.				
Mitigation Measure BIO-7b: Compensate for loss of habitat for special-status reptiles Where impacts on habitat for special-status reptiles cannot be avoided or minimized, compensatory mitigation will be undertaken in accordance with mitigation ratios and requirements developed under the EACCS (Appendix C). In the event that incidental take permits are required for Alameda whipsnake, compensatory mitigation will be undertaken in accordance with the terms of permits in consultation with USFWS and CDFW.	Prior to disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-8a: Implement measures to avoid and minimize potential impacts on special-status and non–special-status nesting birds Where suitable habitat is present for raptors within 1 mile (within 2 miles for golden eagles) and for tree/shrub- and ground-nesting migratory birds (non-raptors) within 50 feet of proposed work areas, the following measures will be implemented to ensure that the proposed project does not have a significant impact on nesting special-status and non–special-status birds. • Remove suitable nesting habitat (shrubs and trees) during the non-breeding season (typically September 1–January 31) for nesting birds. • To the extent feasible, avoid construction activities in or near suitable or occupied nesting habitat during the breeding season of birds (generally February 1–August 31). • If construction activities (including vegetation removal, clearing, and grading) will occur during the nesting season for migratory birds, a qualified biologist will conduct preconstruction nesting bird surveys	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
within 7 days prior to construction activities. The construction area and a 1-mile buffer will be surveyed for tree-nesting raptors (except for golden eagles), and a 50-foot buffer will be surveyed for all other bird species. • Surveys to locate eagle nests within 2 miles of construction will be conducted during the breeding season prior to construction. A 1-mile no-disturbance buffer will be implemented for construction activities to protect nesting eagles from disturbance. Through coordination with USFWS, the no-disturbance buffer may be reduced to 0.5 mile if construction activities are not within line-of-sight of the nest. • If an active nest (other than golden eagle) is identified near a proposed work area and work cannot be conducted outside the nesting season (February 1–August 31), a no-activity zone will be established around the nest by a qualified biologist in coordination with USFWS and/or CDFW. Fencing and/or flagging will be used to delineate the no-activity zone. To minimize the potential to affect the reproductive success of the nesting pair, the extent of the no-activity zone will be based on the distance of the activity to the nest, the type and extent of the proposed activity, the duration and timing of the activity, the sensitivity and habituation of the species, and the dissimilarity of the proposed activity to background activities. The no-activity zone will be large enough to avoid nest abandonment and will be between 50 feet and 1 mile from the nest, or as otherwise required by USFWS and/or CDFW.				
Mitigation Measure BIO-8b: Implement measures to avoid and minimize potential impacts on western burrowing owl Where suitable habitat for western burrowing owl is in or within 500 feet of proposed work areas, the following measures will be implemented to avoid or minimize potential adverse impacts on burrowing owls. • To the maximum extent feasible (e.g., where the construction footprint can be modified), construction activities within 500 feet of active burrowing owl burrows will be avoided during the nesting season (February 1–August 31). • A qualified biologist will conduct preconstruction take avoidance surveys for burrowing owl no less than 14 days prior to and within 24 hours of initiating ground-disturbing activities. The survey area will encompass the work area and a 500-foot buffer around this area.	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
• If an active burrow is identified near a proposed work area and work cannot be conducted outside the nesting season (February 1–August 31), a no-activity zone will be established by a qualified biologist in coordination with CDFW. The no-activity zone will be large enough to avoid nest abandonment and will extend a minimum of 250 feet around the burrow. • If burrowing owls are present at the site during the non-breeding season (September 1–January 31), a qualified biologist will establish a no-activity zone that extends a minimum of 150 feet around the burrow. • If the designated no-activity zone for either breeding or non-breeding burrowing owls cannot be established, a wildlife biologist experienced in burrowing owl behavior will evaluate site-specific conditions and, in coordination with CDFW, recommend a smaller buffer (if possible) and/or other measure that still minimizes disturbance of the owls (while allowing reproductive success during the breeding season). The site-specific buffer (and/or other measure) will consider the type and extent of the proposed activity occurring near the occupied burrow, the duration and timing of the activity, the sensitivity and habituation of the owls, and the dissimilarity of the proposed activity to background activities. • If burrowing owls are present in the direct disturbance area and cannot be avoided during the non-breeding season (generally September 1 through January 31), burrowing owls may be excluded from burrows through the installation of one-way doors at burrow entrances. A burrowing owl exclusion plan, prepared by the project proponent, must be approved by CDFW prior to exclusion of owls. One-way doors (e.g., modified dryer vents or other CDFW-approved method) will be left in place for a minimum of 1 week and monitored daily to ensure that the owl(s) have left the burrow(s). Excavation of the burrow will be conducted using hand tools. During excavation of the burrow, a section of flexible plastic pipe (at least 3 inches in diameter) will be inserted into the burrow tunnel to maintain an escape route for any animals that may be inside the burrow. Owls will be excluded from their burrows as a last resort and only if other avoidance and minimization measures cannot be implemented. • Avoid destruction of unoccupied burrows outside the work area and place visible markers near burrows to ensure that they are not collapsed. • Conduct ongoing surveillance of the project site for burrowing owls during project activities. If additional owls are observed using burrows within				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
500 feet of construction, the onsite biological monitor will determine, in coordination with CDFW, if the owl(s) are or would be affected by construction activities and if additional exclusion zones are required.				
Mitigation Measure BIO-9: Compensate for the permanent loss of occupied habitat for western burrowing owl If construction activities would result in the removal of occupied burrowing owl habitat (determined during preconstruction surveys described in Mitigation Measure BIO-8a), this habitat loss will be mitigated by permanently protecting mitigation land through a conservation easement or by implementing alternative mitigation determined through consultation with CDFW as described in its *Staff Report on Burrowing Owl Mitigation* (California Department of Fish and Game 2012:11–13). The project proponent will work with CDFW to develop the compensation plan, which will be subject to County review and approval.	Prior to disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-10a: Implement measures to avoid and minimize potential impacts on San Joaquin kit fox and American badger Where suitable habitat is present for San Joaquin fit fox and American badger in and adjacent to proposed work areas, the following measures, consistent with measures developed in the EACCS, will be implemented to ensure that proposed projects do not have a significant impact on San Joaquin kit fox or American badger. *Implementation of some of these measures will require that the project proponent obtain incidental take permits from USFWS and CDFW (San Joaquin kit fox) before construction begins.* Additional conservation measures or conditions of approval may be required in applicable project permits. • To the maximum extent feasible, suitable dens for San Joaquin kit fox and American badger will be avoided. • All project proponents will retain qualified approved biologists (as determined by USFWS) to conduct a preconstruction survey for potential San Joaquin kit fox dens (U.S. Fish and Wildlife Service 2011). Resumes of biologists will be submitted to USFWS for review and approval prior to the start of the survey. • Preconstruction surveys for American badgers will be conducted in conjunction with San Joaquin kit fox preconstruction surveys. • As described in U.S. Fish and Wildlife Service 2011, the preconstruction survey will be conducted no less than 14 days and no more than 30 days before the beginning of ground disturbance, or any activity likely to affect	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
San Joaquin kit fox. The biologists will conduct den searches by systematically walking transects through the project area and a buffer area to be determined in coordination with USFWS and CDFW. Transect distance should be based on the height of vegetation such that 100% visual coverage of the project area is achieved. If a potential or known den is found during the survey, the biologist will measure the size of the den, evaluate the shape of the den entrances, and note tracks, scat, prey remains, and recent excavations at the den site. The biologists will also determine the status of the dens and map the features. Dens will be classified in one of the following four den status categories defined by USFWS (U.S. Fish and Wildlife Service 2011). o Potential den: Any subterranean hole within the species' range that has entrances of appropriate dimensions and for which available evidence is sufficient to conclude that it is being used or has been used by a kit fox. Potential dens include (1) any suitable subterranean hole; or (2) any den or burrow of another species (e.g., coyote, badger, red fox, ground squirrel) that otherwise has appropriate characteristics for kit fox use; or an artificial structure that otherwise has appropriate characteristics for kit fox use. o Known den: Any existing natural den or artificial structure that is used or has been used at any time in the past by a San Joaquin kit fox. Evidence of use may include historical records; past or current radiotelemetry or spotlighting data; kit fox sign such as tracks, scat, and/or prey remains; or other reasonable proof that a given den is being or has been used by a kit fox (USFWS discourages use of the terms *active* and *inactive* when referring to any kit fox den because a great percentage of occupied dens show no evidence of use, and because kit foxes change dens often, with the result that the status of a given den may change frequently and abruptly). o Known natal or pupping den: Any den that is used, or has been used at any time in the past, by kit foxes to whelp and/or rear their pups. Natal/pupping dens may be larger with more numerous entrances than dens occupied exclusively by adults. These dens typically have more kit fox tracks, scat, and prey remains in the vicinity of the den, and may have a broader apron of matted dirt or vegetation at one or more entrances. A natal den, defined as a den in which kit fox pups are				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
actually whelped but not necessarily reared, is a more restrictive version of the pupping den. In practice, however, it is difficult to distinguish between the two; therefore, for purposes of this definition either term applies. o Known atypical den: Any artificial structure that has been or is being occupied by a San Joaquin kit fox. Atypical dens may include pipes, culverts, and diggings beneath concrete slabs and buildings. Written results of the survey including the locations of any potential or known San Joaquin kit fox dens will be submitted to USFWS within 5 days following completion of the survey and prior to the start of ground disturbance or construction activities. • After preconstruction den searches and before the commencement of repowering activities, exclusion zones will be established as measured in a radius outward from the entrance or cluster of entrances of each den. Repowering activities will be prohibited or greatly restricted within these exclusion zones. Only essential vehicular operation on existing roads and foot traffic will be permitted. All other repowering activities, vehicle operation, material and equipment storage, and other surface-disturbing activities will be prohibited in the exclusion zones. Barrier fencing will be removed within 72 hours of completion of work. Exclusion zones will be established using the following parameters. o Potential and atypical dens: A total of four or five flagged stakes will be placed 50 feet from the den entrance to identify the den location. o Known den: Orange construction barrier fencing will be installed between the work area and the known den site at a minimum distance of 100 feet from the den. The fencing will be maintained until construction-related disturbances have ceased. At that time, all fencing will be removed to avoid attracting subsequent attention to the den. o Natal/pupping den: USFWS will be contacted immediately if a natal or pupping den is discovered in or within 200 feet of the work area. • Any occupied or potentially occupied badger den will be avoided by establishing an exclusion zone consistent with a San Joaquin kit fox potential burrow (i.e., four or five flagged stakes will be placed 50 feet from the den entrance).				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions

• In cases where avoidance is not a reasonable alternative, limited destruction of potential San Joaquin kit fox dens may be allowed as follows.
  o Natal/pupping dens: Natal or pupping dens that are occupied will not be destroyed until the adults and pups have vacated the dens and then only after consultation with USFWS. Removal of natal/pupping dens requires incidental take authorization from USFWS and CDFW.
  o Known dens: Known dens within the footprint of the activity must be monitored for 3 days with tracking medium or an infrared camera to determine current use. If no kit fox activity is observed during this period, the den should be destroyed immediately to preclude subsequent use. If kit fox activity is observed during this period, the den will be monitored for at least 5 consecutive days from the time of observation to allow any resident animal to move to another den during its normal activity. Use of the den can be discouraged by partially plugging its entrance(s) with soil in such a manner that any resident animal can escape easily. Only when the den is determined to be unoccupied will the den be excavated under the direction of a biologist. If the fox is still present after 5 or more consecutive days of monitoring, the den may be excavated when, in the judgment of the biologist, it is temporarily vacant, such as during the fox's normal foraging activities. Removal of known dens requires incidental take authorization from USFWS and CDFW.
  o Potential dens: If incidental take permits have been received (from USFWS and CDFW), potential dens can be removed (preferably by hand excavation) by biologist or under the supervision of a biologist without monitoring, unless other restrictions were issued with the incidental take permits. If no take authorizations have been issued, the potential dens will be monitored as if they are known dens. If any den was considered a potential den but was later determined during monitoring or destruction to be currently or previously used by kit foxes (e.g., kit fox sign is found inside), then all construction activities will cease and USFWS and CDFW will be notified immediately.
• Nighttime work will be minimized to the extent possible. The vehicular speed limit will be reduced to 10 miles per hour during nighttime work.
• Pipes, culverts, and similar materials greater than 4 inches in diameter will be stored so as to prevent wildlife species from using these as temporary				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
refuges, and these materials will be inspected each morning for the presence of animals prior to being moved. • A representative appointed by the project proponent will be the contact for any employee or contractor who might inadvertently kill or injure a kit fox or who finds a dead, injured, or entrapped kit fox. The representative will be identified during environmental sensitivity training (Mitigation Measure BIO-1b) and his/her name and phone number will be provided to USFWS and CDFW. Upon such incident or finding, the representative will immediately contact USFWS and CDFW. • The Sacramento USFWS office and CDFW will be notified in writing within 3 working days of the accidental death or injury of a San Joaquin kit fox during project-related activities. Notification must include the date, time, and location of the incident, and any other pertinent information.				
Mitigation Measure BIO-10b: Compensate for loss of suitable habitat for San Joaquin kit fox and American badger Where permanent impacts on habitat for San Joaquin kit fox and American badger cannot be avoided or minimized, compensatory mitigation will be undertaken in accordance with mitigation ratios and requirements developed under the EACCS (Appendix C). In the event that incidental take permits are required for San Joaquin kit fox, compensatory mitigation will be undertaken in accordance with the terms of permits in consultation with USFWS and CDFW.	Prior to disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-11a: Prepare a project-specific avian protection plan All project proponents will prepare a project-specific APP to specify measures and protocols consistent with the program-level mitigation measures that address avian mortality. The project-specific APPs will include, at a minimum, the following components. • Information and methods used to site turbines to minimize risk. • Documentation that appropriate turbine designs are being used. • Documentation that avian-safe practices are being implemented on project infrastructure. • Methods used to discourage prey for raptors. • A detailed description of the postconstruction avian fatality monitoring methods to be used (consistent with the minimum requirements outlined in Mitigation Measure BIO-11g).	Prior to site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
• Methods used to compensate for the loss of raptors (consistent with the requirements of Mitigation Measure BIO-11h). Each project applicant will prepare and submit a draft project-specific APP to the County. The draft APP will be reviewed by the TAC for consistency and the inclusion of appropriate mitigation measures that are consistent with the PEIR and recommended for approval by the County. Each project applicant must have an approved Final APP prior to commercial operation.				
Mitigation Measure BIO-11b: Site turbines to minimize potential mortality of birds Siting of turbines—using analyses of landscape features and location-specific bird use and behavior data to identify locations with reduced collision risk—may result in reduced fatalities (Smallwood et al. 2009). All project proponents will conduct a siting process and prepare a siting analysis to select turbine locations to minimize potential impacts on bird and bat species. Proponents will utilize existing data as well as collect new site-specific data as part of the siting analysis. Project proponents will utilize currently available guidelines such as the Alameda County SRC guidelines for siting wind turbines (Alameda County SRC 2010) and/or other currently available research or guidelines to conduct siting analysis. Additionally, project proponents will use the results of previous siting efforts to inform the analysis and siting methods as appropriate such that the science of siting continues to be advanced. All project proponents will collect field data that identify or confirm the behavior, utilization, and distribution patterns of affected avian and bat species prior to the installation of turbines. Project proponents will collect and utilize available existing information, including but not necessarily limited to: siting reports and monitoring data from previously installed projects; published use and abundance studies and reports; and topographic features known to increase collision risk (trees, riparian areas, water bodies, and wetlands). Project proponents will also collect and utilize additional field data as necessary to inform the siting analysis for golden eagle. As required in Mitigation Measure BIO-8a, surveys will be conducted to locate golden eagle nests within 2 miles of proposed project areas. Siting of turbines within 2 miles of an active or alternative golden eagle nest or active golden eagle territory will be based on a site-specific analysis of risk based on the estimated eagle territories, conducted in consultation with USFWS.	Prior to site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Project proponents will utilize methods (i.e., computer models) to identify dangerous locations for birds and bats based on site-specific risk factors informed by the information discussed above. The project proponents will compile the results of the siting analyses for each turbine and document these in the project-level APP, along with the specific location of each turbine.				
Mitigation Measure BIO-11c: Use turbine designs that reduce avian impacts Use of turbines with certain characteristics is believed to reduce the collision risk for avian species. Project proponents will implement the design-related measures listed below. • Turbine designs will be selected that have been shown or that are suspected to reduce avian fatalities, based on the height, color, configuration, or other features of the turbines. • Turbine design will limit or eliminate perching opportunities. Designs will include a tubular tower with internal ladders; external catwalks, railings, or ladders will be prohibited. • Turbine design will limit or eliminate nesting or roosting opportunities. Openings on turbines will be covered to prevent cavity-nesting species from nesting in the turbines. • Lighting will be installed on the fewest number of turbines allowed by FAA regulations, and all pilot warning lights will fire synchronously. Turbine lighting will employ only red or dual red-and-white strobe, strobe-like, or flashing lights (U.S. Fish and Wildlife Service 2012). All lighting on turbines will be operated at the minimum allowable intensity, flashing frequency, and quantity allowed by FAA (Gehring et al. 2009; U.S. Fish and Wildlife Service 2012). Duration between flashes will be the longest allowable by the FAA.	Prior to site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-11d: Incorporate avian-safe practices into design of turbine-related infrastructure All project proponents will apply the following measures when designing and siting turbine-related infrastructure. These measures will reduce the risk of bird electrocution and collision. • Permanent meteorological stations will avoid use of guy wires. If it is not possible to avoid using guy wires, the wires will be at least 4/0 gauge to ensure visibility and will be fitted with bird deterrent devices.	Prior to site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
• All permanent meteorological towers will be unlit unless lighting is required by FAA. If lighting is required, it will be operated at the minimum allowable intensity, flashing frequency, and quantity allowed by FAA. • To the extent possible, all powerlines will be placed underground. However, lines may be placed aboveground immediately prior to entering the substation. All aboveground lines will be fitted with bird flight diverters or visibility enhancement devices (e.g., spiral damping devices). When lines cannot be placed underground, appropriate avian protection designs must be employed. As a minimum requirement, the collection system will conform with the most current edition of the Avian Power Line Interaction Committee guidelines to prevent electrocutions. • Lighting will be focused downward and minimized to limit skyward illumination. Sodium vapor lamps and spotlights will not be used at any facility (e.g., laydown areas, substations) except when emergency maintenance is needed. Lighting at collection facilities, including substations, will be minimized using downcast lighting and motion-detection devices. The use of high-intensity lighting; steady-burning or bright lights such as sodium vapor, quartz, or halogen; or other bright spotlights will be minimized. Where lighting is required it will be designed for the minimum intensity required for safe operation of the facility. Green or blue lighting will be used in place of red or white lighting.				
Mitigation Measure BIO-11e: Retrofit existing infrastructure to minimize risk to raptors Any existing power lines in a specific project area that are owned by the wind project operator and that are associated with electrocution of an eagle or other raptor will be retrofitted within 30 days to make them raptor-safe according to Avian Power Line Interaction Committee guidelines. All other existing structures to remain in a project area during repowering will be retrofitted, as feasible, according to specifications of Mitigation Measure BIO-11c prior to repowered turbine operation.	During operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-11f: Discourage prey for raptors All project proponents will apply the following measures when designing and siting turbine-related infrastructure. These measures are intended to minimize opportunities for fossorial mammals to become established and thereby create a prey base that could become an attractant for raptors.	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
• Rodenticide will not be utilized on the project site to avoid the risk of raptors scavenging the remains of poisoned animals. • Boulders (rocks more than 12 inches in diameter) excavated during project construction may be placed in aboveground piles in the project area so long as they are more than 500 meters (1,640 feet) from any turbine. Existing rock piles created during construction of first- and second-generation turbines will also be moved at least 500 meters (1,640 feet) from turbines. • Gravel will be placed around each tower foundation to discourage small mammals from burrowing near turbines.				
Mitigation Measure BIO-11g: Implement postconstruction avian fatality monitoring for all repowering projects A postconstruction monitoring program will be conducted at each repowering project for a minimum of 3 years beginning on the commercial operation date (COD) of the project. Monitoring may continue beyond 3 years if construction is completed in phases. Moreover, if the results of the first 3 years indicate that baseline fatality rates (i.e., nonrepowered fatality rates) are exceeded, monitoring will be extended until the average annual fatality rate has dropped below baseline fatality rates for 2 years, and to assess the effectiveness of adaptive management measures specified in Mitigation Measure BIO-11i. An additional 2 years of monitoring will be implemented at year 10 (i.e., the tenth anniversary of the COD). Project proponents will provide access to qualified third parties authorized by the County to conduct any additional monitoring after the initial 3-year monitoring period has expired and before and after the additional 2-year monitoring period, provided that such additional monitoring utilizes scientifically valid monitoring protocols. A technical advisory committee (TAC) will be formed to oversee the monitoring program and to advise the County on adaptive management measures that may be necessary if fatality rates substantially exceed those predicted for the project (as described below in Mitigation Measure BIO-11i). The TAC will have a standing meeting, which will be open to the public, every 6 months to review monitoring reports produced by operators in the program area. In these meetings, the TAC will discuss any issues raised by the monitoring reports and recommend to the County next steps to address issues, including scheduling additional meetings, if necessary.	During operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
The TAC will comprise representatives from the County (including one or more technical consultants, such as a biostatistician, an avian biologist, and a bat biologist), and wildlife agencies (CDFW, USFWS). Additional TAC members may also be considered (e.g., a representative from Audubon, a landowner in the program area, a representative of the operators) at the discretion of the County. The TAC will be a voluntary and advisory group that will provide guidance to the County Planning Department. To maintain transparency with the public, all TAC meetings will be open to the public, and notice of meetings will be given to interested parties.				
The TAC will have three primary advisory roles: (1) to review and advise on project planning documents (i.e., project-specific APPs) to ensure that project-specific mitigation measures and compensatory mitigation measures described in this PEIR are appropriately and consistently applied, (2) to review and advise on monitoring documents (protocols and reporting) for consistency with the mitigation measures, and (3) to review and advise on implementation of the adaptive management plans.				
Should fatality monitoring reveal that impacts exceed the baseline thresholds established in this PEIR, the TAC will advise the County on requiring implementation of adaptive management measures as described in Mitigation Measure BIO-11i. The County will have the decision-making authority, as it is the organization issuing the CUPs. However, the TAC will collaboratively inform the decisions of the County.				
Operators are required to provide for avian use surveys to be conducted within the project area boundaries for a minimum of 30 minutes duration. Surveyors will be qualified and trained and subject to approval by the County.				
Carcass surveys will be conducted at every turbine for projects with 20 or fewer turbines. For projects with more than 20 turbines, such surveys will be required at a minimum of 20 turbines, and a sample of the remaining turbines may be selected for carcass searches. The operator will be required to demonstrate that the sampling scheme and sample size are statistically rigorous and defensible. Where substantial variation in terrain, land cover type, management, or other factors may contribute to significant variation in fatality rates, the sampling scheme will be stratified to account for such variation. The survey protocol for sets and subsets of turbines, as well as proposed sampling schemes that do not entail a search of all turbines, must be approved by the County in consultation with the TAC prior to the start of surveys.				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
The search interval will not exceed 14 days for the minimum of 20 turbines to be surveyed; however, the search interval for the additional turbines (i.e., those exceeding the 20-turbine minimum) that are to be included in the sampling scheme may be extended up to 28 days or longer if recommended by the TAC. The estimation of detection probability is a rapidly advancing field. Carcass placement trials, broadly defined, will be conducted to estimate detection probability during each year of monitoring. Sample sizes will be large enough to potentially detect significant variation by season, carcass size, and habitat type. Operators will be required to submit copies of all raw data forms to the County annually, will supply raw data in a readily accessible digital format to be specified by the County, and will prepare raw data for inclusion as appendices in the annual reports. The intent is to allow the County to conduct independent analyses and meta-analyses of data across the APWRA, and to supply these data to the regulatory agencies if requested. Annual reports submitted to the County will provide a synthesis of all information collected to date. Each report will provide an introduction; descriptions of the study area, methods, and results; a discussion of the results; and any suitable recommendations. Reports will provide raw counts of fatalities, adjusted fatality rates, and estimates of project-wide fatalities on both a per MW and per turbine basis.				
Mitigation Measure BIO-11h: Compensate for the loss of raptors and other avian species, including golden eagles, by contributing to conservation efforts **Discussion:** Several options to compensate for impacts on raptors are currently available. Some are targeted to benefit certain species, but they may also have benefits for other raptor and non-raptor species. For example, USFWS's ECP Guidelines currently outline a compensatory mitigation strategy for golden eagles using the retrofit of high-risk power poles (poles known or suspected to electrocute and kill eagles). The goal of this strategy is to eliminate hazards for golden eagles. However, because the poles are also dangerous for other large raptors (e.g., red-tailed hawk, Swainson's hawk), retrofitting them can benefit such species as well as eagles. Similarly, although the retrofitting of electrical poles may have benefits for large raptors, such an approach may provide minimal benefits for smaller raptors such as American kestrel and burrowing owl. Consequently, additional measures would	Prior to startup and during operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
be required components of an overall mitigation package to compensate for impacts on raptors in general. The Secretary of the Interior issued Order 3330 on October 31, 2013, outlining a new approach to mitigation policies and practices of the Department of the Interior. This approach recognizes that certain strategies aimed at some species (e.g., raptors) can provide substantial benefit to others (e.g., non-raptors) and to the ecological landscape as a whole. The landscape-scale approach to mitigation and conservation efforts is now central to the Department's mitigation strategy. Although the Order was intended for use by federal agencies and as such is not directly applicable to the County, it is evident that such an approach would likely have the greatest mitigation benefits, especially when considering ongoing and long-term impacts from wind energy projects. With these considerations in mind, the County has outlined several options that are currently available to compensate for impacts on raptors and other avian species. The options discussed below are currently considered acceptable approaches to compensation for impacts on raptors and other species. Although not every option is appropriate for all species, it is hoped that as time proceeds, a more comprehensive landscape-level approach to mitigation will be adopted to benefit a broader suite of species than might benefit from more species-specific measures. The County recognizes that the science of raptor conservation and the understanding of wind-wildlife impacts are continuing to evolve and that the suite of available compensation options may consequently change over the life of the proposed projects. **Conservation Measures** To promote the conservation of raptors and other avian species, project proponents will compensate for raptor fatalities estimated within their project areas. Mitigation will be provided in 10-year increments, with the first increment based on the estimates (raptors/MW/year) provided in this PEIR for the Vasco Winds Project (Table 3.4-10) or the project-specific EIR for future projects. The Vasco Winds fatality rates were selected because the Vasco turbines are the most similar to those likely to be proposed for future repowering projects and consequently represent the best available fatality estimates. Each project proponent will conduct postconstruction fatality monitoring for at least 3 years beginning at project startup (date of commercial operation) and again for 2 years at year 10, as required under Mitigation Measure BIO-11g, to estimate the average number of raptors taken each year by each individual project. The project				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
proponent will compensate for this number of raptors in subsequent 10-year increments for the life of the project (i.e., three 10-year increments) as outlined below. Mitigation Measure BIO-11g also requires additional fatality monitoring at year 10 of the project. The results of the first 3 years of monitoring and/or the monitoring at year 10 may lead to revisions of the estimated average number of raptors taken, and mitigation provided may be adjusted accordingly on a one-time basis within each of the first two 10-year increments, based on the results of the monitoring required by Mitigation Measure BIO-11g, in consultation with the TAC. Prior to the start of operations, project proponents will submit for County approval an avian conservation strategy, as part of the project-specific APP outlined in Mitigation Measure BIO-11a, outlining the estimated number of raptor fatalities based on the number and type of turbines being constructed, and the type or types of compensation options to be implemented. Project proponents will use the avian conservation strategy to craft an appropriate strategy using a balanced mix of the options presented below, as well as considering new options suggested by the growing body of knowledge during the course of the project lifespan, as supported by a Resource Equivalency Analysis (REA) (see example in Appendix C) or similar type of compensation assessment acceptable to the County that demonstrates the efficacy of proposed mitigation for impacts on raptors. The County Planning Director, in consultation with the TAC, will consider, based on the REA, whether the proposed avian-conservation strategy is adequate, including consideration of whether each avian conservation strategy incorporates a landscape-scale approach such that the conservation efforts achieve the greatest possible benefits. Compensation measures as detailed in an approved avian conservation strategy must be implemented within 1 year of the date of commercial operations. Avian conservation strategies will be reviewed and may be revised by the County every 10 years, and on a one-time basis in each of the two 10-year increments based on the monitoring required by Mitigation Measure BIO-11g. • **Retrofitting high-risk electrical infrastructure.** USFWS's ECP Guidelines outline a compensatory mitigation strategy using the retrofit of high-risk power poles (poles known or suspected to electrocute and kill eagles). USFWS has developed an REA (U.S. Fish and Wildlife Service 2013a) as a tool to estimate the compensatory mitigation (number of retrofits) required for the take of eagles. The REA takes into account the current understanding of eagle life history factors, the effectiveness of retrofitting				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
poles, the expected annual take, and the timing of implementation of the pole retrofits. The project proponents may need to contract with a utility or a third-party mitigation account (such as the National Fish and Wildlife Foundation) to retrofit the number of poles needed as demonstrated by a project-specific REA. If contracting directly, the project proponent will consult with utility companies to ensure that high-risk poles have been identified for retrofitting. Proponents will agree in writing to pay the utility owner/operator to retrofit the required number of power poles and maintain the retrofits for 10 years and will provide the County with documentation of the retrofit agreement. The first retrofits will be based on the estimated number of eagle fatalities as described above in this measure or as developed in the project-specific EIR for future projects. Subsequent numbers of retrofits required for additional 10-year durations will be based on the results of project-specific fatality monitoring as outlined in Mitigation Measure BIO-11g. If fewer eagle fatalities are identified through the monitoring, the number of future required retrofits may be reduced through a project-specific REA. Although retrofitting poles has not been identified as appropriate mitigation for other large raptors, they would likely benefit from such efforts, as they (particularly red-tailed and Swainson's hawks) constitute the largest non-eagle group to suffer electrocution on power lines (Avian Power Line Interaction Committee 2006).				
• **Measures outlined in an approved Eagle Conservation Plan and Bird and Bat Conservation Strategy.** Project proponents may elect to apply for programmatic eagle take permits from USFWS. The programmatic eagle take permit process currently involves preparation of an ECP and a Bird and Bat Conservation Strategy (BBCS). The ECP specifies avoidance and minimization measures, advanced conservation practices, and compensatory mitigation for eagles—conditions that meet USFWS's criteria for issuance of a permit. The BBCS outlines measures being implemented by the applicant to avoid and minimize impacts on migratory birds, including raptors. If programmatic eagle take permits are obtained by project proponents, those permit terms, including the measures outlined in the approved ECP and BBCS, may constitute an appropriate conservation measure for estimated take of golden eagles and other raptors, provided such terms are deemed by the County to be comparable to or more protective of raptors than the other options listed herein.				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
• **Contribute to raptor conservation efforts.** Project proponents will contribute funds, in the amount of $580/raptor, in 10-year increments to local and/or regional conservation efforts designed to protect, recover, and manage lands for raptors, or to conduct research involving methods to reduce raptor fatalities or increase raptor productivity. The $580 amount is based on the average cost to rehabilitate one raptor at the California Raptor Center, affiliated with the UC Davis School of Veterinary Medicine, which receives more than 200 injured or ill raptors annually (Stedman pers. comm.). Ten-year installments are more advantageous than more frequent installments for planning and budgeting purposes. The funds will be contributed to an entity or entities engaged in these activities, such as the East Bay Regional Park District and the Livermore Area Regional Park District. Conservation efforts may include constructing and installing nest boxes and perches, conducting an awareness campaign to reduce the use of rodenticide, and conducting research to benefit raptors. The specific conservation effort to be pursued will be submitted to the County for approval as part of the avian conservation strategy review process. The donation receipt will be provided to the County as evidence of payment. The first contributions for any given project will be based on the estimated number of raptor fatalities as described above in this measure or as developed in the project-specific EIR for future projects. Funds for subsequent 10-year installments will be provided on the basis of the average annual raptor fatality rates determined through postconstruction monitoring efforts, allowing for a one-time adjustment within each 10-year increment after the results of the monitoring efforts are available. If fewer raptor fatalities are determined through the monitoring effort, the second installment amount may be reduced to account for the difference between the first estimated numbers and the monitoring results.				
• **Contribute to regional conservation of raptor habitat.** Project proponents may address regional conservation of raptor habitat by funding the acquisition of conservation easements within the APWRA or on lands in the same eco-region outside the APWRA, subject to County approval, for the purpose of long-term regional conservation of raptor habitat. Lands proposed for conservation must be well-managed grazing lands similar to those on which the projects have been developed. Project				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
proponents will fund the regional conservation and improvement of lands (through habitat enhancement, lead abatement activities, elimination of rodenticides, and/or other measures) using a number of acres equivalent to the conservation benefit of the raptor recovery and conservation efforts described above, or as determined through a project-specific REA (see example REA in Appendix C). The conservation lands must be provided for compensation of a minimum of 10 years of raptor fatalities, as 10-year increments will minimize the transaction costs associated with the identification and conservation of lands, thereby increasing overall cost effectiveness. The conservation easements will be held by an organization whose mission is to purchase and/or otherwise conserve lands, such as The Trust for Public Lands, The Nature Conservancy, California Rangeland Trust, or the East Bay Regional Parks District. The project proponents will obtain approval from the County regarding the amount of conserved lands, any enhancements proposed to increase raptor habitat value, and the entity holding the lands and/or conservation easement. • **Other Conservation Measures Identified in the Future.** As noted above, additional conservation measures for raptors may become available in the future. Conservation measures for raptors are currently being developed by USFWS and nongovernmental organizations (e.g., American Wind Wildlife Institute)—for example, activities serving to reduce such fatalities elsewhere, and enhancing foraging and nesting habitat. Additional options for conservation could include purchasing credits at an approved mitigation bank, credits for the retirement of windfarms that are particularly dangerous to birds or bats, the curtailment of prey elimination programs, and hunter-education programs that remove sources of lead from the environment. Under this option, the project proponent may make alternative proposals to the County for conservation measures—based on an REA or similar compensation assessment—that the County may accept as mitigation if they are deemed by the County to be comparable to or more protective of raptor species than the other options described herein.				
Mitigation Measure BIO-11i: Implement an avian adaptive management program If fatality monitoring described in Mitigation Measure BIO-11g results in an estimate that exceeds the preconstruction baseline fatality estimates (i.e., estimates	During operation	County—adopt a Condition of Approval; Operator—	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
at the nonrepowered turbines as described in this PEIR) for any focal species or species group (i.e., individual focal species, all focal species, all raptors, all non-raptors, all birds combined), project proponents will prepare a project-specific adaptive management plan within 2 months following the availability of the fatality monitoring results. These plans will be used to adjust operation and mitigation to the results of monitoring, new technology, and new research to ensure that the best available science is used to minimize impacts to below baseline. Project-specific adaptive management plans will be reviewed by the TAC, revised by project proponents as necessary, and approved by the County. The TAC will take current research and the most effective impact reduction strategies into account when reviewing adaptive management plans and suggesting measures to reduce impacts. The project-specific adaptive management plans will be implemented within 2 months of approval by the County. The plans will include a stepped approach whereby an adaptive measure or measures are implemented, the results are monitored for success or failure for a year, and additional adaptive measures are added as necessary, followed by another year of monitoring, until the success criteria are achieved (i.e., estimated fatalities are below the baseline). Project proponents should use the best measures available when the plan is prepared in consideration of the specific adaptive management needs. For example, if only one threshold is exceeded, such as golden eagle fatalities, the plan and measures used will target that species. As set forth in other agreements in the APWRA, project proponents may also focus adaptive management measures on individual or multiple turbines if those turbines are shown to cause a significantly disproportionate number of fatalities. In general, the following types of measures will be considered by the TAC, in the order they are presented below; however, the TAC may recommend any of these or other measures that are shown to be successful in reducing the impact. **ADMM-1: Visual Modifications.** The project proponent could paint a pattern on a proportion of the turbine blades. The proportion and the pattern of the blades to be painted will be determined by the County in consultation with the TAC. USFWS recommends testing measures to reduce *motion smear*—the blurring of turbine blades due to rapid rotation that renders them less visible and hence more perilous to birds in flight. Suggested techniques include painting blades with staggered stripes or painting one blade black. The project proponent will conduct fatality studies on a controlled number of painted and unpainted turbines. The project proponent will coordinate with the TAC to determine the location of the painted		implement		

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
turbines, but the intent is to implement this measure in areas that appear to be contributing most to the high number of fatalities detected.				
ADMM-2: Anti-Perching Measures. The County will consult with the TAC regarding the use of anti-perching measures to discourage bird use of the area. The TAC will use the most recent research and information available to determine, on a case-by–case basis, if anti-perching measures will be an effective strategy to reduce impacts. If determined to be feasible, anti-perching devices will be installed on artificial structures, excluding utility poles, within 1 mile of project facilities (with landowner permission) to discourage bird use of the area.				
ADMM-3: Prey Reduction. The project proponent will implement a prey reduction program around the most hazardous turbines. Examples of prey reduction measures may include changes in grazing practices to make the area less desirable for prey species, active reduction through direct removal of prey species, or other measures provided they are consistent with management goals for threatened and endangered species.				
ADMM-4: Implementation of Experimental Technologies. Project proponents can deploy experimental technologies at their facilities to test their efficacy in reducing turbine-related fatalities. Examples may include, but are not limited to, visual deterrents, noise deterrents, and active radar systems.				
ADMM-5: Turbine Curtailment. If postconstruction monitoring indicates patterns of turbine-caused fatalities—such as seasonal spikes in fatalities, topographic or other environmental features associated with high numbers of fatalities, or other factors that can potentially be manipulated and that suggest that curtailment of a specific turbine's operation would result in reducing future avian fatalities—the project operator can curtail operations of the offending turbine or turbines. Curtailment restrictions would be developed in coordination with the TAC and based on currently available fatality data, use data, and research.				
ADMM-6: Cut-in Speed Study. Changes in cut-in speed could be conducted to see if changing cut-in speeds from 3 meters per second to 5 meters per second (for example) would significantly reduce avian fatalities. The proponent will coordinate with the TAC in determining the feasibility of the measure for the particular species affected as well as the amount of the change in the cut-in speed.				
ADMM-7: Real-Time Turbine Curtailment. The project proponent can employ a real-time turbine curtailment program designed in consultation with the TAC. The intent would be to deploy a biologist to monitor onsite conditions and issue a curtailment order when raptors are near operating turbines. Alternatively, radar,				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
video, or other monitoring measures could be deployed in place of a biological monitor if there is evidence to indicate that such a system would be as effective and more efficient than use of a human monitor.				
Mitigation Measure BIO-12a: Conduct bat roost surveys Prior to development of any repowering project, a qualified bat biologist will conduct a roost habitat assessment to identify potential colonial roost sites of special-status and common bat species within 750 feet of the construction area. If suitable roost sites are to be removed or otherwise affected by the proposed project, the bat biologist will conduct targeted roost surveys of all identified sites that would be affected. Because bat activity is highly variable (both spatially and temporally) across the landscape and may move unpredictably among several roosts, several separate survey visits may be required. Surveys will be repeated at different times of year if deemed necessary by the bat biologist to determine the presence of seasonally active roosts (hibernacula, migratory stopovers, maternity roosts).Appropriate field methods will be employed to determine the species, type, and vulnerability of the roost to construction disturbance. Methods will follow best practices for roost surveys such that species are not disturbed and adequate temporal and spatial coverage is provided to increase likelihood of detection. Roost surveys may consist of both daylight surveys for signs of bat use and evening/night visit(s) to conduct emergence surveys or evaluate the status of night roosts. Survey timing should be adequate to account for individual bats or species that might not emerge until well after dark. Methods and approaches for determining roost occupancy status should include a combination of the following components as the biologist deems necessary for the particular roost site. • Passive and/or active acoustic monitoring to assist with species identification. • Guano traps to determine activity status. • Night-vision equipment. • Passive infrared camera traps. At the completion of the roost surveys, a report will be prepared documenting areas surveyed, methods, results, and mapping of high-quality habitat or confirmed roost locations.	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Mitigation Measure BIO-12b: Avoid removing or disturbing bat roosts • Active bat roosts will not be disturbed, and will be provided a minimum buffer of 500 feet where preexisting disturbance is moderate or 750 feet where preexisting disturbance is minimal. Confirmation of buffer distances and determination of the need for a biological monitor for active maternity roosts or hibernacula will be obtained in consultation with CDFW. At a minimum, when an active maternity roost or hibernaculum is present within 750 feet of a construction site, a qualified biologist will conduct an initial assessment of the roost response to construction activities and will recommend buffer expansion if there are signs of disturbance from the roost. • Structures (natural or artificial) showing evidence of significant bat use within the past year will be left in place as habitat wherever feasible. Should such a structure need to be removed or disturbed, CDFW will be consulted to determine appropriate buffers, timing and methods, and compensatory mitigation for the loss of the roost. • All project proponents will provide environmental awareness training to construction personnel, establish buffers, and initiate consultation with CDFW if needed. • Artificial night lighting within 500 feet of any roost will be shielded and angled such that bats may enter and exit the roost without artificial illumination and the roost does not receive artificial exposure to visual predators. • Tree and vegetation removal will be conducted outside the maternity season (April 1–September 15) to avoid disturbance of maternity groups of foliage-roosting bats. • If a maternity roost or hibernaculum is present within 500 feet of the construction site where preexisting disturbance is moderate or within 750 feet where preexisting disturbance is minimal, a qualified biological monitor will be onsite during groundbreaking activities.	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-14a: Site and select turbines to minimize potential mortality of bats All project proponents will use the best information available to site turbines and to select from turbine models in such a manner as to reduce bat collision risk. The siting and selection process will take into account bat use of the area and landscape	Prior to site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
features known to increase collision risk (trees, edge habitats, riparian areas, water bodies, and wetlands). Measures include but are not limited to siting turbines the greatest distance feasible up to 500 meters (1,640) feet from still or flowing bodies of water, riparian habitat, known roosts, and tree stands (California Bat Working Group 2006:6). To generate site-specific "best information" to inform turbine siting and operation decisions, a bat habitat assessment and roost survey will be conducted in the project area to identify and map habitat of potential significance to bats, such as potential roost sites (trees and shrubs, significant rock formations, artificial structures) and water sources. Turbine siting decisions will incorporate relevant bat use survey data and bat fatality records published by other projects in the APWRA. Roost surveys will be carried out according to the methods described in Mitigation Measure-BIO-12a.				
Mitigation Measure BIO-14b: Implement postconstruction bat fatality monitoring program for all repowering projects A scientifically defensible, postconstruction bat fatality monitoring program will be implemented to estimate actual bat fatalities and determine if additional mitigation is required. Bat-specific modifications to the 3-year postconstruction monitoring program described in Mitigation Measure BIO-11g, developed in accordance with CEC 2007 and with appropriate recommendations from California Bat Working Group guidelines (2006), will be implemented. In addition to the requirements outlined in Mitigation Measure BIO-11g, the following two bat-specific requirements will be added. • Include on the TAC at least one biologist with significant expertise in bat research and wind energy impacts on bats. • Conduct bat acoustic surveys concurrently with fatality monitoring in the project area to estimate nightly, seasonal, or annual variations in relative activity and species use patterns, and to contribute to the body of knowledge on seasonal bat movements and relationships between bat activity, environmental variables, and turbine fatality. Should emerging research support the approach, these data may be used to generate site-specific predictive models to increase the precision and effectiveness of mitigation measures (e.g., the season-specific, multivariate models described by Weller and Baldwin 2011:11). Acoustic bat surveys will be designed and data analysis conducted by qualified biologists with	During operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
significant experience in acoustic bat survey techniques. Methods will be informed by the latest available guidelines (California Energy Commission guidelines, 2007); California Bat Working Group guidelines, 2006), except where best available science supports technological or methodological updates. High-quality, sensitive acoustic equipment will be used to produce data of sufficient quality to generate species identifications. Survey design and methods will be scientifically defensible and will include, at a minimum, the following elements. o Acoustic detectors will be installed at multiple stations to adequately sample range of habitats in the project area for both resident and migratory bats. The number and locations for acoustic monitoring will be developed in consultation with the TAC. The number of detector arrays installed per project site should incorporate emerging research on the density of detectors required to adequately meet sampling goals and inform mitigation approaches (Weller and Baldwin 2011:10). o Acoustic detector arrays will sample multiple airspace heights including as close to the repowered rotor swept area as possible Vertical structures used for mounting may be preexisting or may be installed for the project (e.g., temporary or permanent meteorological towers). o Surveys will be conducted such that data are collected continuously for a minimum of 90 days between mid-August and mid-November to cover the activity transition from maternity to migration season and determine if there is elevated activity during migration. Survey season may be adjusted to more accurately reflect the full extent of the local migration season and/or season(s) of greatest local bat fatality risk, if scientifically sound data support doing so. o Anticipated adaptive management goals, such as determining justifiable timeframes to reduce required periods of cut-in speed adjustments, will be reviewed with the TAC and incorporated in designing the acoustic monitoring and data analysis program. Modifications to the fatality search protocol will be implemented to obtain better information on the number and timing of bat fatalities (e.g., Johnston et al. 2013:85). Modifications will include decreases in the transect width and search interval for a period of time coinciding with high levels of bat mortality, i.e., the fall				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
migration season (roughly August to early November, or as appropriate in the view of the TAC). The nature of bat-specific transect distance and search intervals will be determined in consultation with the TAC and will be guided by scientifically sound and pertinent data on rates of bat carcass detection at wind energy facilities (e.g., Johnston et al. 2013:54–55) and site-specific data from APWRA repowering project fatality monitoring programs as these data become available. Other methods to achieve the goals of the bat fatality monitoring program while avoiding prohibitive costs may be considered subject to approval by the TAC, if these methods have been peer reviewed and evidence indicates the methods are effective. For example, if project proponents wish to have the option of altering search methodology to a newly developed method, such as searching only roads and pads (Good et al. 2011:73), a statistically robust field study to index the results of the methodology against standard search methods will be conducted concurrently to ensure site-specific, long-term validity of the new methods. Finally, detection probability trials will utilize bat carcasses to develop bat-specific detection probabilities. Care should be taken to avoid introducing novel disease reservoirs; such avoidance will entail using onsite fatalities or using carcasses obtained from within a reasonably anticipated flight distance for that species.				
Mitigation Measure BIO-14c: Prepare and publish annual monitoring reports on the findings of bat use of the project area and fatality monitoring results Annual reports of bat use results and fatality monitoring will be produced within 3 months of the end of the last day of fatality monitoring. Special-status bat species records will be reported to CNDDB.	Within 3 months of the end of the last day of fatality monitoring	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-14d: Develop and implement a bat adaptive management plan In concert with Mitigation Measure BIO-14b, all project proponents will develop adaptive management plans to ensure appropriate, feasible, and current incorporation of emerging information. The goals of the adaptive management plans are to ensure that the best available science and emerging technologies are used to assess impacts on bats, and that impacts are minimized to the greatest extent possible while maximizing energy production. The project-specific adaptive management plans will be used to adjust operation and mitigation to incorporate the results of project area monitoring and new technology and research results when sufficient evidence exists to support these	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
new approaches. These plans will be reviewed by the TAC and approved by the County. All adaptive management measures will be implemented within a reasonable timeframe, sufficient to allow the measures to take effect in the first fall migration season following the year of monitoring in which the adaptive management threshold was crossed. ADMMs may be modified by the County in consultation with the TAC to take into account current research, site-specific data, and the most effective impact reduction strategies. ADMMs will include a scientifically defensible, controlled research component and minimum post-implementation monitoring time to evaluate the effectiveness and validity of the measures. The minimum monitoring time will consist of three sequential fall seasons of the bat-specific mortality monitoring program covering the 3–4 months of the year in which the highest bat mortality has been observed: likely August–November. The start and end dates of the 3–4 months of bat-specific mortality monitoring period will be based on existing fatality data and in consultation with the TAC. Determining a fatality threshold to trigger adaptive management is not straightforward, as insufficient information exists on the status and vitality of the populations of migratory bat species subject to mortality in the APWRA. The low estimate of anticipated bat fatality rates is from the Vasco Winds project in the APWRA. Applying this rate programmatically would result in an estimate of 21,000 bats killed over the 30-year life of the program. The high estimate is from the Montezuma Hills Wind Resource Area. Applying this rate programmatically would result in an estimate of 49,050 bats killed over the 30-year life of the program. Bats are slow to reproduce, and turbines may be more likely to kill adult bats than juveniles, suggesting that a conservative approach is warranted. Accordingly, an initial adaptive management threshold will be established using the low fatality estimates, or 1.679 fatalities/MW/year, to ensure that the most conservative trigger for implementation of adaptive management measures is adopted. If postconstruction fatality monitoring results in a point estimate for the bat fatality rate that exceeds the 1.679 fatalities/MW/year threshold by a statistically significant amount, then, in consultation with the TAC, ADMM-7 and ADMM-8 (described below) for bats will be implemented. It is important to note that neither the high nor the low estimate speaks to the ability of bat populations to withstand the associated levels of take. The initial fatality rate threshold triggering adaptive management may be modified by the TAC if appropriate and if such adaptation is supported by the best available science.				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
The TAC may direct implementation of adaptive management measures for other appropriate reasons, such as an unexpectedly and markedly high fatality rate observed for any bat species, or special-status species being killed in unexpectedly high numbers. ADMMs for bats may be implemented using a stepped approach until necessary fatality reductions are reached, and monitoring methods must be revised as needed to ensure accurate measurement of the effectiveness of the ADMMs. Additional ADMMs for bats should be developed as new technologies or science supports doing so. **ADMM-7: Seasonal Turbine Cut-in Speed Increase.** Cut-in speed increases offer the most promising and immediately available approach to reducing bat fatalities at fourth-generation wind turbines. Reductions in fatalities (53–87%) were observed when increasing modern turbine cut-in speed to 5.0–6.5 m/s (Arnett et al. 2009:3; Good et al. 2012:iii). While implementing this measure immediately upon a project's commencement would likely reduce bat fatalities, that assumption is not yet supported by conclusive data. Moreover, without establishing baseline fatality at repowered projects, there would be no way to determine the effectiveness of the approach or whether the costs of increased cut-in speeds (and consequent power generation reductions) were providing fatality reductions. Cut-in speed increases will be implemented as outlined below, with effectiveness assessed annually. • The project proponent will increase cut-in speed to 5.0 m/s from sunset to sunrise during peak migration season (generally August–October). If this is ineffective, the project proponent will increase turbine cut-in speed by annual increments of 0.5 m/s until target fatality reductions are achieved. • The project proponent may refine site-specific migration start dates on the basis of pre- and postconstruction acoustic surveys and ongoing review of dates of fatality occurrences for migratory bats in the APWRA. • The project proponent may request a shorter season of required cut-in speed increases with substantial evidence that similar levels of mortality reduction could be achieved. Should resource agencies and the TAC find there is sufficient support for a shorter period (as low as 8 weeks), evidence in support of this shorter period will be documented for the public record and the shorter period may be implemented.				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
• The project proponent may request shorter nightly periods of cut-in speed increases with substantial evidence from defensible onsite, long-term postconstruction acoustic surveys indicating predictable nightly timeframes when target species appear not to be active. Target species are here defined as migratory bats or any other species appearing repeatedly in the fatality records. • The project proponent may request exceptions to cut-in speed increases for particular weather events or wind patterns if substantial evidence is available from onsite acoustic or other monitoring to support such exceptions (i.e., all available literature and onsite surveys indicate that bat activity ceases during specific weather events or other predictable conditions). • In the absence of defensible site-specific data, mandatory cut-in speed increases will commence on August 1 and continue through October 31, and will be in effect from sunset to sunrise. **ADMM-8: Emerging Technology as Mitigation.** The project proponent may request, with consultation and approval from agencies, replacement or augmentation of cut-in speed increases with developing technology or another mitigation approach that has been proven to achieve similar bat fatality reductions. The project proponent may also request the second tier of adaptive management to be the adoption of a promising but not fully proven technology or mitigation method. These requests are subject to review and approval by the TAC and must include a controlled research component designed by a qualified principal investigator so that the effectiveness of the method may be accurately assessed. Some examples of such emerging technologies and research areas that could be incorporated in adaptive management plans are listed below. • The use of acoustic deterrents (Arnett et al. 2013:1). • The use of altitude-specific radar, night vision and/or other technology allowing bat use monitoring and assessment of at-risk bat behavior (Johnston et al. 2013: 90-91) if research in these areas advances sufficiently to allow effective application of these technologies. • Application of emerging peer-reviewed studies on bat biology (such as studies documenting migratory corridors or bat behavior in relation to turbines) that support specific mitigation methods.				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Mitigation Measure BIO-14e: Compensate for expenses incurred by rehabilitating injured bats The cost of reasonable, licensed rehabilitation efforts for any injured bats taken to wildlife care facilities from the program area will be assumed in full by project proponents.	During operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-15: Compensate for the loss of alkali meadow habitat If alkali meadow habitat is filled or disturbed as part of a repowering project, the project proponent will compensate for the loss of this habitat to ensure no net loss of habitat functions and values. Compensation ratios will be based on site-specific information and determined through coordination with state and federal agencies (CDFW, USFWS, USACE). Unless specified otherwise by a resource agency, the compensation will be at a minimum 1:1 ratio (1 acre restored or created for every 1 acre filled) and may be a combination of onsite restoration/creation, offsite restoration, and mitigation credits. A restoration and monitoring plan will be developed and implemented. The plan will describe how alkali meadow habitat will be created and monitored.	Prior to disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-16: Compensate for the loss of riparian habitat If riparian habitat is filled or removed as part of a project, the project proponent will compensate for the loss of riparian habitat to ensure no net loss of habitat functions and values. Compensation ratios will be based on site-specific information and determined through coordination with state and federal agencies (CDFW, USFWS, USACE). The compensation will be at a minimum 1:1 ratio (1 acre restored or created for every 1 acre filled) and may be a combination of onsite restoration/creation, offsite restoration, and mitigation credits. A restoration and monitoring plan will be developed and implemented. The plan will describe how riparian habitat will be created and monitored.	Prior to disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure BIO-18: Compensate for the loss of wetlands If wetlands are filled or disturbed as part of a project, the project proponent will compensate for the loss to ensure no net loss of habitat functions and values. Compensation ratios will be based on site-specific information and determined through coordination with state and federal agencies (CDFW, USFWS, USACE). The compensation will be at a minimum 1:1 ratio (1 acre restored or created for every 1 acre filled) and may be a combination of onsite restoration/creation, offsite restoration, and mitigation credits. A restoration and monitoring plan will be developed and implemented. The plan will describe how wetlands will be created and monitored.	Prior to disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Cultural Resources				
Mitigation Measure CUL-2a: Conduct a preconstruction cultural field survey and cultural resources inventory and evaluation Alameda County will require applicants to retain qualified personnel to conduct an archaeological field survey of the program area to determine whether significant resources exist within the program area. The inventory and evaluation will include the documentation and result of these efforts, the evaluation of any cultural resources identified during the survey, and cultural resources monitoring, if the survey identifies that it is necessary.	Prior to site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure CUL-2b: Develop a treatment plan for any identified significant cultural resources If any significant resources are identified through the preconstruction survey, a treatment plan that could include site avoidance, capping, or data recovery will be developed and implemented.	Prior to site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure CUL-2c: Conduct worker awareness training for archaeological resources prior to construction Prior to the initiation of any site preparation and/or the start of construction, the project applicant will ensure that all construction workers receive training overseen by a qualified professional archaeologist who is experienced in teaching nonspecialists, to ensure that forepersons and field supervisors can recognize archaeological resources (e.g., areas of shellfish remains, chipped stone or groundstone, historic debris, building foundations, human bone) in the event that any are discovered during construction.	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure CUL-2d: Stop work if cultural resources are encountered during ground-disturbing activities The project applicant will ensure that construction specifications include a stop-work order if prehistoric or historic-era cultural resources are unearthed during ground-disturbing activities. If such resources are encountered, the project applicant will immediately halt all activity within 100 feet of the find until a qualified archaeologist can assess the significance of the find. Prehistoric materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or tool-making debris; culturally darkened soil ("midden") containing heat-affected rocks and artifacts; stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered-stone tools, such as hammerstones and pitted stones. Historic-period materials might include stone, concrete, or adobe	During construction and other site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse. If the find is determined to be potentially significant, the archaeologist, in consultation with the Native American representative (if appropriate), will develop a treatment plan that could include site avoidance, capping, or data recovery.				
Mitigation Measure CUL-3: Stop work if human remains are encountered during ground-disturbing activities The project applicant will ensure the construction specifications include a stop-work order if human remains are discovered during construction or demolition. There will be no further excavation or disturbance of the site within a 100-foot radius of the location of such discovery, or any nearby area reasonably suspected to overlie adjacent remains. The Alameda County Coroner will be notified and will make a determination as to whether the remains are Native American. If the Coroner determines that the remains are not subject to his authority, he will notify the Native American Heritage Commission, who will attempt to identify descendants of the deceased Native American. If no satisfactory agreement can be reached as to the disposition of the remains pursuant to this state law, then the landowner will re-inter the human remains and items associated with Native American burials on the property in a location not subject to further subsurface disturbance. A final report will be submitted to Alameda County. This report will contain a description of the mitigation program and its results, including a description of the monitoring and testing resources analysis methodology and conclusions and a description of the disposition/curation of the resources.	During site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Geology, Soils, Mineral Resources, and Paleontological Resources				
Mitigation Measure GEO-1: Conduct site-specific geotechnical investigation and implement design recommendations in subsequent geotechnical report Prior to construction activities at any site, the project proponent will retain a geotechnical firm with local expertise in geotechnical investigation and design to prepare a site-specific geotechnical report. This report will be prepared by a licensed geotechnical engineer or engineering geologist and will be submitted to the County building department as part of the approval process. This report will be based on data collected from subsurface exploration, laboratory testing of samples, and surface mapping and will address the following issues. • Potential for surface fault rupture and turbine site location: The geotechnical report will investigate the Greenville, Corral Hollow-Carnegie,	Prior to site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
and the Midway faults (as appropriate to the location) and determine whether they pose a risk of surface rupture. Turbine foundations and power collection systems will be sited according to recommendations in this report. • Strong ground shaking: The geotechnical report will analyze the potential for strong ground shaking in project area and provide turbine foundation design recommendations, as well as recommendations for power collection systems. • Slope failure: The geotechnical report will investigate the potential for slope failure (both seismically and nonseismically induced) and develop site-specific turbine foundation and power collection system plans engineered for the terrain, rock and soil types, and other conditions present at the program area in order to provide long-term stability. • Expansive soils: The geotechnical report will assess the soil types in the program area and determine the best engineering designs to accommodate the soil conditions. • Unstable cut or fill slopes: The geotechnical report will address geologic hazards related to the potential for grading to create unstable cut or fill slopes and make site-specific recommendations related to design and engineering.				
Mitigation Measure GEO-7a: Retain a qualified professional paleontologist to monitor significant ground-disturbing activities The applicant will retain a qualified professional paleontologist as defined by the SVP's *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources* (2010) to monitor activities with the potential to disturb sensitive paleontological resources. Data gathered during detailed project design will be used to determine the activities that will require the presence of a monitor. In general, these activities include any ground-disturbing activities involving excavation deeper than 3 feet in areas with high potential to contain sensitive paleontological resources. Recovered fossils will be prepared so that they can be properly documented. Recovered fossils will then be curated at a facility that will properly house and label them, maintain the association between the fossils and field data about the fossils' provenance, and make the information available to the scientific community.	During site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Mitigation Measure GEO-7b: Educate construction personnel in recognizing fossil material The applicant will ensure that all construction personnel receive training provided by a qualified professional paleontologist experienced in teaching non-specialists to ensure that they can recognize fossil materials in the event any are discovered during construction.	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure GEO-7c: Stop work if substantial fossil remains are encountered during construction If substantial fossil remains (particularly vertebrate remains) are discovered during earth disturbing activities, activities within 100 feet of the find will stop immediately until a state-registered professional geologist or qualified professional paleontologist can assess the nature and importance of the find and a qualified professional paleontologist can recommend appropriate treatment. Treatment may include preparation and recovery of fossil materials so that they can be housed in an appropriate museum or university collection and may also include preparation of a report for publication describing the finds. The applicant will be responsible for ensuring that recommendations regarding treatment and reporting are implemented.	During construction	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Greenhouse Gas Emissions				
Mitigation Measure GHG-2a: Implement best available control technology for heavy-duty vehicles The applicant will require existing trucks/trailers to be retrofitted with the best available technology and/or ARB-approved technology consistent with the ARB Truck and Bus Regulation (California Air Resources Board 2011). The ARB Truck and Bus Regulation applies to all diesel-fueled trucks and buses with a gross vehicle weight rating (GVWR) greater than 14,000 pounds. Starting January 1, 2015, the applicant must replace lighter trucks (GVWR of 14,001 to 26,000 pounds) with engines that are 20 years or older with newer trucks. The Applicant has the option to install a PM filter retrofit on a lighter truck by 2014 to make the truck exempt from replacement until January 1, 2020, and any lighter truck equipped with a PM filter retrofit prior to July 2011 would receive credit toward the compliance requirements for a heavier truck or bus in the same fleet. Starting January 1, 2012, the applicant is required to meet the engine model year schedule shown below for heavier trucks (GVWR greater than 26,000 pounds). To	During construction and during operation if applicable	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
comply with the schedule, the applicant will install the best available PM filter on 1996 model year and newer engines and would replace the vehicle 8 years later. The Applicant will replace trucks with 1995 model year and older engines starting in 2015. Replacements with 2010 model year or newer engines meets the final requirements, but the applicant could also replace trucks with used trucks that would have a future compliance date on the schedule. For example, a replacement with a 2007 model year engine complies until 2023. By 2023 all trucks and buses must have 2010 model year engines with few exceptions.				

Engine Model Year Schedule for Heavier Trucks

Engine Year	Requirement from January 1
Pre-1994	No requirements until 2015, then 2010 engine
1994–1995	No requirements until 2016, then 2010 engine
1996–1999	PM filter from 2012 to 2020, then 2010 engine
2000–2004	PM filter from 2013 to 2021, then 2010 engine
2005–2006	PM filter from 2014 to 2022, then 2010 engine
2007–2009	No requirements until 2023, then 2010 engine
2010	Meets final requirements

In addition, the applicant could comply with a phase-in option that would allow the applicant to decide which vehicles to retrofit or replace, regardless of engine model year. The applicant must report information about all heavier trucks starting January 31, 2012, to use this option.

The Applicant could comply by demonstrating that trucks have met the percentage requirement each year as shown in the table below. For example, by 2012 the applicant's fleet would need to have PM filters on 30% of the heavier trucks in the fleet. This option counts 2007 model year and newer engines originally equipped with PM filters toward compliance and would reduce the overall number of retrofit PM filters needed. Any engine with a PM filter regardless of model year would be compliant until at least 2020. Beginning January 1, 2020, all heavier trucks would need to meet the requirements specified in the Compliance Schedule for Heavier Trucks.

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Phase-In Option for Heavier Trucks **Compliance Date — Vehicles with PM Filters** 1-Jan-12 — 30% 1-Jan-13 — 60% 1-Jan-14 — 90% 1-Jan-15 — 90% 1-Jan-16 — 100%				
Mitigation Measure GHG-2b: Install low SF_6 leak rate circuit breakers and monitoring The applicant will ensure that any new circuit breaker installed at a substation has a guaranteed SF_6 leak rate of 0.5% by volume or less. The applicant will provide Alameda County with documentation of compliance, such as specification sheets, prior to installation of the circuit breaker. In addition, the applicant will monitor the SF_6-containing circuit breakers at the substation consistent with Scoping Plan Measure H-6 for the detection and repair of leaks.	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure GHG-2c: Require new construction to use building materials containing recycled content The applicant will require the construction of all new substation and other permanent buildings to incorporate materials for which the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10% of the total value of the materials in the project.	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval
Mitigation Measure GHG-2d: Comply with construction and demolition debris management ordinance The applicant will comply with the County's revised Green Building Ordinance regarding construction and demolition debris as follows: (1) 100% of inert waste and 50% wood/vegetative/scrap metal not including Alternative Daily Cover (ADC) and unsalvageable material will be put to other beneficial uses at landfills, and (2) 100% of inert materials (concrete and asphalt) will be recycled or put to beneficial reuse.	During construction and operation	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Hazards and Hazardous Materials				
Mitigation Measure HAZ-4: Perform a Phase I Environmental Site Assessment prior to construction activities and remediate if necessary Prior to construction, the project proponent will conduct a Phase I environmental site assessment in conformance with the American Society for Testing and Materials Standard Practice E1527-05. All environmental investigation, sampling, and remediation activities associated with properties in the project area will be conducted under a work plan approved by the regulatory oversight agency and will be conducted by the appropriate environmental professional consistent with Phase I site assessment requirements as detailed below. The results of any investigation and/or remediation activities conducted in the project area will be included in the project-level EIR. A Phase I environmental site assessment should, at a minimum, include the components listed below. • An onsite visit to identify current conditions (e.g., vegetative dieback, chemical spill residue, presence of above- or underground storage tanks). • An evaluation of possible risks posed by neighboring properties. • Interviews with persons knowledgeable about the site's history (e.g., current or previous property owners, property managers). • An examination of local planning files to check prior land uses and any permits granted. • File searches with appropriate agencies (e.g., State Water Resources Control Board, fire department, County health department) having oversight authority relative to water quality and groundwater and soil contamination. • Examination of historical aerial photography of the site and adjacent properties. • A review of current and historic topographic maps of the site to determine drainage patterns. • An examination of chain-of-title for environmental liens and/or activity and land use limitations. If the Phase I environmental site assessment indicates likely site contamination, a Phase II environmental site assessment will be performed (also by an environmental professional).	Prior to site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
A Phase II environmental site assessment would comprise the following. • Collection of original surface and/or subsurface samples of soil, groundwater, and building materials to analyze for quantities of various contaminants. • An analysis to determine the vertical and horizontal extent of contamination (if the evidence from sampling shows contamination). If contamination is uncovered as part of Phase I or II environmental site assessments, remediation will be required. If materials such as asbestos-containing materials, lead-based paint, or PCB-containing equipment are identified, these materials will be properly managed and disposed of prior to or during the demolition process. Any contaminated soil identified on a project site must be properly disposed of in accordance with DTSC regulations in effect at the time. Hazardous wastes generated by the proposed project will be managed in accordance with the California Hazardous Waste Control Law (HSC, Division 20, Chapter 6.5) and the Hazardous Waste Control Regulation (Title 22, CCR, Division 4.5). If, during construction/demolition of structures, soil or groundwater contamination is suspected, the construction/demolition activities will cease and appropriate health and safety procedures will be implemented, including the use of appropriate personal protective equipment (e.g., respiratory protection, protective clothing, helmets, goggles).				
Hydrology and Water Quality				
Mitigation Measure WQ-1: Comply with NPDES requirements Project contractors will obtain coverage under the General Construction Permit before the onset of any construction activities, because all projects will entail disturbance of 1 acre or more. A SWPPP will be developed by a qualified engineer or erosion control specialist in accordance with the appropriate Board's requirements for NPDES compliance and implemented prior to the issuance of any grading permit before construction. The SWPPP will be kept onsite during construction activity and will be made available upon request to representatives of the Regional Water Boards. Compliance and coverage with the *Storm Water Management Program* and General Construction Permit will require controls of pollutant discharges that utilize BMPs	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
and technology to reduce erosion and sediments to meet water quality standards. BMPs may consist of a wide variety of measures taken to reduce pollutants in stormwater and other nonpoint-source runoff. Measures range from source control, such as reduced surface disturbance, to the treatment of polluted runoff, such as detention basins. BMPs to be implemented as part of the *Storm Water Management Program* and General Construction Permit (and SWPPP) may include the following practices. • Temporary erosion control measures (such as silt fences, staked straw bales/wattles, silt/sediment basins and traps, check dams, geofabric, sandbag dikes, and temporary revegetation or other ground cover) will be employed to control erosion from disturbed areas. • Use a dry detention basin (which is typically dry except after a major rainstorm, when it will temporarily fill with stormwater), designed to decrease runoff during storm events, prevent flooding, and allow for off-peak discharge. Basin features will include maintenance schedules for the periodic removal of sediments, excessive vegetation, and debris that may clog basin inlets and outlets. • Cover or apply nontoxic soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more) that could contribute sediment to waterways. • Enclose and cover exposed stockpiles of dirt or other loose, granular construction materials that could contribute sediment to waterways. • Ensure that no earth or organic material will be deposited or placed where it may be directly carried into a stream, marsh, slough, lagoon, or body of standing water. • Prohibit the following types of materials from being rinsed or washed into the streets, shoulder areas, or gutters: concrete, solvents and adhesives, thinners, paints, fuels, sawdust, dirt, gasoline, asphalt and concrete saw slurry, and heavily chlorinated water. • Ensure that grass or other vegetative cover will be established on the construction site as soon as possible after disturbance. The contractor will select a combination of BMPs (consistent with Section A of the Construction General Permit) that is expected to minimize runoff and remove contaminants from stormwater discharges. The final selection of BMPs will be subject to approval by the San Francisco Bay Regional Water Board and the Central Valley Water Board.				

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
The contractor will verify that an NOI has been filed with the State Water Board and that a SWPPP has been developed before allowing construction to begin. The contractor will perform inspections of the construction area, to verify that the BMPs specified in the SWPPP are properly implemented and maintained. The contractor will notify the appropriate Regional Water Board immediately if there is a noncompliance issue and will require compliance. If necessary, the contractor or their agent will require that additional BMPs be designed and implemented if those originally constructed do not achieve the identified performance standard.				
Noise				
Mitigation Measure NOI-1: Perform project-specific noise studies and implement measures to comply with County noise standards The applicant for any proposed repowering project will retain a qualified acoustic consultant to prepare a report that evaluates noise impacts associated with operation of the proposed wind turbines. This evaluation will include a noise monitoring survey to quantify existing noise conditions at noise sensitive receptors located within 2,000 feet of any proposed turbine location. This survey will include measurement of the daily A-weighted L_{dn} values over a 1-week period and concurrent logging of wind speeds at the nearest meteorological station. The study will include a site-specific evaluation of predicted operational noise levels at nearby noise sensitive uses. If operation of the project is predicted to result in noise in excess of 55 dBA (L_{dn}) where noise is currently less than 55 dBA (L_{dn}) or result in a 5 dB increase where noise is currently greater than 55 dBA(L_{dn}), the applicant will modify the project, including selecting new specific installation sites within the program area, to ensure that these performance standards will not be exceeded. Methods that can be used to ensure compliance with these performance standards include but not limited to increasing the distance between proposed turbines and noise sensitive uses and the use of alternative turbine operational modes to reduce noise. Upon completion of the evaluation, the project applicant will submit a report to the County demonstrating how the project will comply with these performance standards. After review and approval of the report by County staff, the applicant will incorporate measures as necessary into the project to ensure compliance with these performance standards.	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
Transportation/Traffic				
Mitigation Measure TRA-1: Develop and implement a construction traffic control plan Prior to starting construction-related activities, the Applicant shall prepare and implement a Traffic Control Plan (TCP) that will reduce or eliminate impacts associated with the proposed program. The TCP shall adhere to Alameda County and Caltrans requirements, and must be submitted for review and approval of the County Public Works Department prior to implementation. The TCP shall include the following elements. The County and Caltrans may require additional elements to be identified during their review and approval of the TCP. • Schedule construction hours to minimize concentrations of construction workers commuting to/from the project site during typical peak commute hours (7 a.m. to 9 a.m. and 4 p.m. to 6 p.m.). • Limit truck access to the project site during typical peak commute hours (7 a.m. to 9 a.m. and 4 p.m. to 6 p.m.). • Require that written notification be provided to contractors regarding appropriate haul routes to and from the program area, as well as the weight and speed limits on local county roads used to access the program area. • Provide access for emergency vehicles to and through the program area at all times. • When lane/road closures occur during delivery of oversized loads, provide advance notice to local fire, police, and emergency service providers to ensure that alternative evacuation and emergency routes are designated to maintain service response times. • Provide adequate onsite parking for construction trucks and worker vehicles. • Require suitable public safety measures in the program area and at the entrance roads, including fences, barriers, lights, flagging, guards, and signs, to give adequate warning to the public of the construction and of any dangerous conditions that could encountered as a result thereof. • Complete road repairs on local public roads as needed during construction to prevent excessive deterioration. This work may include construction of temporary roadway shoulders to support any necessary detour lanes.	Prior to and during all site disturbance	County—adopt a Condition of Approval; Operator—implement	County	Monitor compliance with Conditions of Approval

Mitigation Measure	Timing	Implementing Party	Monitoring Party	Monitoring Actions
• Repair or restore the road right-of-way to its original condition or better upon completion of the work. • Coordinate program-related construction activities, including schedule, truck traffic, haul routes, and the delivery of oversized or overweight materials, with Alameda County, Caltrans, and affected cities to identify and minimize overlap with other area construction projects.				

Appendix B
Settlement Agreement (2010)

AGREEMENT TO REPOWER TURBINES AT THE ALTAMONT PASS WIND RESOURCES AREA

THIS AGREEMENT (the "Agreement") is entered into as of this __ day of December 2010, by and between **Golden Gate Audubon Society, Ohlone Audubon Society, Mount Diablo Audubon Society, Santa Clara Valley Audubon Society, and Marin Audubon Society** (collectively "Audubon"); and **CAlifornians for Renewable Energy** ("CARE"); and **Green Ridge Power LLC, Windpower Partners 1990, L.P., Windpower Partners 1991, L.P., Windpower Partners 1991-2, L.P., and Windpower Partners 1992, L.P.** (collectively, "NextEra Wind"), and the **People of the State of California, ex rel Attorney General** ("AG"). Audubon, CARE, NextEra Wind and the AG are referred to individually as a "Party" and collectively as the "Parties."

RECITALS

This Agreement is made with respect to the following recitals of fact:

A. On September 22, 2005, the Alameda County Board of Supervisors approved conditional use permits ("CUPs") for the operation of existing wind turbines by NextEra Wind and other wind power companies (the "Wind Power Companies") at the Altamont Pass Wind Resources Area ("APWRA").

B. On or about October 2005 Audubon and CARE petitioned the Alameda County Superior Court for a writ of mandate to set aside the CUPs.

C. In January 2007, Audubon, CARE, Alameda County and the Wind Power Companies entered into a settlement agreement ("2007 Settlement Agreement"). On January 11, 2007, Alameda County modified the CUPs for the Wind Power Companies to be consistent with the 2007 Settlement Agreement.

D. The 2007 Settlement Agreement requires the Wind Power Companies to reduce raptor mortality by 50% and to implement adaptive management measures if a 50% reduction in mortality is not achieved. The 2007 Settlement Agreement also contemplates the development of a Natural Communities Conservation Plan ("NCCP")/Habitat Conservation Plan ("HCP") or similar agreement to address the long-term operation of wind turbines at the APWRA.

E. The Parties believe repowering old generation Kenetech 56-100 and KVS 33 turbines ("Old Generation Turbines") to be the most effective measure to reduce mortality at the APWRA.

TERMS AND CONDITIONS

NOW THEREFORE, in consideration of the mutual promises and covenants contained in this Agreement, the Parties agree as follows:

1. Relationship to 2007 Settlement Agreement

The Parties agree that ESI Energy, LLC, ESI Bay Area GP, Inc., ESI Tehachapi Acquisitions, Inc., and ESI Altamont Acquisitions, and their respective affiliates (collectively, the "NextEra Settlers") and NextEra Wind will have satisfied their obligations under the 2007 Settlement Agreement to reduce raptor mortality by 50% provided NextEra Wind is in compliance with this Agreement.

2. Repowering Schedule

NextEra Wind (or, hereinafter, any new entities formed for repowering purposes) will repower the Old Generation Turbines it currently owns and operates in the APWRA, as the APWRA is currently delineated in Alameda and Contra Costa Counties, as soon as commercially reasonable as defined below, in not more than three phases, each phase representing up to approximately 80 MW, in accordance with the terms of this Agreement. In order to repower existing Old Generation Turbines for Phases 2 and 3 as specified below, NextEra Wind may need to exchange certain Old Generation Turbines for a similar number of Old Generation Turbines that, as of the effective date of this Agreement, are under the control of another wind turbine operator in the APWRA. In the event NextEra Wind acquires additional turbines after the effective date of this Agreement, other than those Old Generation Turbines that may be acquired pursuant to an exchange to facilitate repowering of Phases 2 and 3, NextEra Wind shall repower such turbines in accordance with Section 2.4 below.

2.1 Phase 1

Phase 1 will be based in Contra Costa County. Phase 1 will be described in the Environmental Impact Report ("EIR") Contra Costa County is preparing for the Vasco Winds project. NextEra Wind will repower Phase I promptly after all necessary local, state and/or federal entitlements, permits, certifications or similar approvals (collectively referred to as "Approvals") are obtained. If Approvals are obtained by February 28, 2011, NextEra Wind will repower Phase 1 by December 31, 2011, unless there are circumstances beyond NextEra Wind's control as provided in Section 3.

Regardless of whether Approvals are obtained by February 28, 2011, NextEra Wind will continue to use all commercially reasonable efforts to repower the Phase 1 turbines by December 31, 2012.

2.2 Phase 2

Phase 2 will be based in Alameda County. Phase 2 will be described in a programmatic EIR that Alameda County prepares for repowering the Alameda portion of the APWRA or a project specific EIR to address NextEra Wind's proposed project. NextEra Wind will repower Phase 2 promptly after all Approvals are obtained. If Approvals are obtained by September 30, 2011, NextEra Wind will repower Phase 2 by December 31, 2012, barring unforeseen delays. If Approvals are obtained by September 30, 2012, NextEra Wind will repower Phase 2 by December 31, 2013, unless there are circumstances beyond NextEra Wind's control as provided in Section 3. Completion of Phase 1 shall not be a prerequisite for initiation of Phase 2.

Regardless of whether Approvals are obtained by September 30, 2012, NextEra Wind agrees it will continue to use all commercially reasonable efforts to repower the Phase 2 turbines by December 31, 2014.

2.3 Phase 3

Phase 3 will be based in Alameda County. Phase 3 may be described in a focused EIR that tiers off of Alameda County's programmatic EIR. NextEra Wind will repower Phase 3 promptly after all Approvals are obtained. If Approvals for Phase 2 are obtained by September 30, 2011 and Approvals for Phase 3 are obtained by September 30, 2012, NextEra Wind will repower Phase 3 by December 31, 2013, barring unforeseen delays. If Approvals for Phase 2 are obtained by September 30, 2012 and Approvals for Phase 3 are obtained by September 30, 2013, NextEra Wind will repower Phase 3 by December 31, 2014, unless there are circumstances beyond NextEra Wind's control as provided in Section 3. Notwithstanding the foregoing, NextEra Wind may repower Phases 2 and 3 simultaneously.

Regardless of whether Approvals are obtained by September 30, 2013, NextEra Wind agrees it will continue to use all commercially reasonable efforts to repower the Phase 3 turbines by September 30, 2015.

2.4 Subsequently acquired turbines

If, after the effective date of this Agreement, NextEra Wind (or any entities formed for such purposes relative to this subsection) acquires non-repowered turbines (including but not limited to Kenetech 56-100 and KVS-33 turbines) from current owners or operators in the APWRA, NextEra Wind will use commercially reasonable efforts to coordinate repowering of such turbines with the repowering schedule outlined above. Notwithstanding the foregoing, NextEra Wind shall shutdown such subsequently acquired turbines no later than one (1) year after the commercial operation date ("COD") for Phase 3 or the date of their acquisition, whichever is later. NextEra Wind shall use commercially reasonable efforts to remove all subsequently acquired turbines within three (3) months and in no event more than six (6) months after their shutdown. Prior to repowering, such turbines shall be subject to the 2007 Settlement Agreement. Notwithstanding the foregoing, Old Generation Turbines acquired pursuant to the exchange outlined in Section 2 shall be repowered pursuant to the schedule for Phases 2 and 3.

3. Commercially Reasonable Efforts; Meet and Confer Requirements

For each phase of repowering, NextEra Wind shall exercise all reasonable and good faith efforts and use all reasonable due diligence to enter into a power purchase agreement under commercially reasonable terms, and to obtain all necessary Approvals to satisfy the requirements of that power purchase agreement in order to meet the repowering schedules specified in Sections 2.1 through 2.4 herein. Provided NextEra Wind exercises all reasonable and good faith efforts and uses all reasonable due diligence, NextEra Wind shall not be deemed in violation of this Agreement for failing to repower in accordance with the schedules specified in Sections 2.1 through 2.4 herein. Notwithstanding the foregoing, NextEra Wind shall shut down all Old Generation Turbines it owns and operates no later than November 1, 2015 and shall remove any and all such turbines within the APRWA no later than March 15, 2016 except as provided for in

section 2.4. Notwithstanding any provision in this Agreement to the contrary, NextEra Wind shall have no liability to any of the Parties for failure to repower in accordance with its obligations under this Agreement so long as NextEra Wind satisfies its shut down and removal obligations as described in the preceding sentence.

The Parties recognize that, despite the use of commercially reasonable efforts, NextEra Wind may not be able to meet one or more of the repowering schedules specified in Sections 2.1 through 2.4, due to circumstances that are beyond its control, such as unavailability of turbines, or inability to obtain Approvals or commercially reasonable power purchase agreements despite NextEra Wind's reasonable, good faith efforts and the exercise of all reasonable due diligence. If NextEra Wind cannot meet any or all of the repowering schedules specified in Sections 2.1 through 2.4 due to circumstances beyond its control, NextEra Wind shall notify the other Parties to this Agreement in writing within thirty (30) days after NextEra Wind reasonably determines that it will be unable to do so. NextEra Wind shall propose a place within Alameda County, and possible dates and times for the Parties to meet and confer within thirty (30) days after NextEra Wind provides such written notification, unless the Parties agree in writing to an alternative time frame to meet and confer. Ten (10) days prior to the agreed upon date and time for the meet and confer meeting of the Parties, NextEra Wind shall provide written support for why one or more of the repowering schedules in Section 2 cannot be met and shall provide a proposed new schedule for repowering. Any new schedule proposed by NextEra Wind and/or agreed to by the Parties does not alter NextEra Wind's obligation to shut down all Old Generation Turbines it owns or operates within the APWRA by November 1, 2015 and remove such turbines within the APWRA by March 15, 2016 and to shut down all subsequently acquired turbines as provided for in Section 2.4.

If the Parties are unable to reach agreement on a new repowering schedule, NextEra Wind shall operate any remaining non-repowered turbines according to the Avian Wildlife Protection Program and Schedule in NextEra Wind's Conditional Use Permits adopted on January 11, 2007 (Exhibit G-1) by the Alameda County Board of Supervisors, including any requirements to remove High Risk Turbines (hazardous turbines ranked 7.0 and above) and Unproductive Turbines and other requirements described in any County-approved adaptive management plan. Notwithstanding the foregoing, NextEra Wind may apply to the Alameda County Scientific Review Committee ("SRC") for credit for removal of any High Risk Turbines due to repowering already achieved and/or removal of turbines that have been or will be required pursuant to this Agreement that are in excess of what would otherwise be required pursuant to the Avian Wildlife Protection Program and Schedule, as amended by any County-approved adaptive management plan.

4. Siting of Repowered Turbines

NextEra Wind shall site repowered turbines within each of the three phases of repowering described in Sections 2.1 through 2.3 based on the best scientific and commercial data, including studies that rely on methods in peer-reviewed scientific journals, which are available at the time the draft NextEra Wind is circulated for public and agency review and comment for each applicable phase of repowering. The Parties agree that siting of repowered turbines shall be based on field data that confirm the behavior, utilization and distribution patterns of affected avian and bat species prior to the installation of any new repowered turbines, as well as based on

appropriate computer models that predict the most dangerous locations for birds and bats based on site geography and topography. The Parties agree that utilizing field data and computer modeling prior to the installation of any new repowered turbines within each phase is essential for ensuring the maximum possible avoidance and reduction of avian and bat mortality from the current old-generation turbines.

The Parties further agree that, in addition to siting of each phase based on pre-construction geographic and topographic surveys and direct observations and modeling of bird and bat utilization and behavior at the site, siting of Phase 2 and each subsequent phase also shall be based on post-construction monitoring data from each applicable earlier phase (fatality and bird and bat utilization and behavior monitoring), as well as on monitoring data, reports and studies from other repowering projects. The post-construction monitoring data shall be used to evaluate the validity of the previous pre-construction siting evaluations and to update and improve the siting evaluations for each subsequent repowering phase.

4.1 Phase 1 siting

Phase 1 turbines will be sited by incorporating the analysis included in Smallwood and Neher, *Siting Repowered Turbines to Minimize Raptor Collisions at Vasco Winds*, 03 June 2010 ("Vasco Winds Siting Report"), which evaluates a digital elevation model (DEM) and raptor use and behavior data to develop geographical and topographical map-based predictive models of where raptors more often fly and perform specific hazardous behaviors such that location of repowered turbines in these areas would create the greatest risk to raptors.

4.2 Phases 2 and 3 and subsequently acquired turbines siting

Phases 2 and 3 and subsequently acquired turbines will be sited by incorporating (when scientifically and technically applicable) the Vasco Winds Siting Report, as well as post-construction monitoring data of each applicable earlier Phase, and pre-construction geographical and topographical map-based predictive models based on raptor use and behavior studies in the APWRA, and any additional studies published in peer-reviewed scientific journals that are in existence at the time the draft EIR for the particular repowering phase is circulated for agency and public review and comment.

The Parties shall meet and confer to discuss the siting for each repowering phase prior to NextEra Wind submitting the siting plan for the final array of turbines for each repowering phase to Alameda County for environmental review. NextEra Wind shall notify the other Parties to this Agreement in writing, proposing a place within Alameda County and possible dates for the Parties to meet and confer within twenty (20) days after NextEra Wind provides such written notification, unless the Parties agree in writing to an alternative time frame to meet and confer. Ten (10) days prior to the agreed upon date and time for the meet and confer meeting, NextEra Wind shall provide the other Parties to this Agreement a siting plan and written explanation of the siting of the proposed turbines. The written explanation shall include a justification for the deviation(s), if any, from any map-based predictive models as described above. Additionally, the consultant who prepared the map-based predictive models shall make a technical presentation during the meet and confer meeting. The Parties agree to work in good faith to resolve any disagreement they may have over the proposed siting plan. In the event the Parties are unable to

resolve their differences, the AG and/or Audubon and/or CARE may submit comments to the SRC explaining their concerns.

NextEra Wind agrees to consult with the SRC during preparation of the EIRs for Phases 2 and 3 in accordance with the terms of the Conditional Use Permits. The Parties agree that the SRC may assist in the technical evaluation of the scope and content of the EIRs to be prepared for Phases 2 and 3, respectively. The Parties agree that the SRC must be given adequate opportunity to review and comment on the draft EIRs for Phases 2 and 3.

5. Monitoring and Further Management Measures

5.1 Post-construction monitoring

Each phase of repowered turbines will be subject to three years of post-construction monitoring unless additional monitoring is required pursuant to Section 5.2 below. Post-construction monitoring shall begin no later than three (3) months after the COD for each phase. Post-construction monitoring shall include collecting field data on behavior, utilization and distribution patterns of affected avian and bat species in addition to fatalities. In addition, each phase of repowering shall be subject to two years of further monitoring commencing on the tenth anniversary of its COD. NextEra Wind also agrees to provide access to qualified third parties to conduct any additional monitoring after the initial three year monitoring period has expired and before the additional two year monitoring period has commenced, and after the additional two year monitoring period has expired, provided that such additional monitoring utilizes scientifically valid monitoring protocols that yield results which are reasonably comparable to other efforts to monitor NextEra Wind's repowered turbines. The initial three year monitoring period and the subsequent two year monitoring period together shall constitute the post-construction monitoring period.

NextEra Wind agrees to implement monitoring of all repowered turbines for fatalities pursuant to an enforceable monitoring program established in consultation with the Contra Costa County Technical Advisory Committee ("TAC") established pursuant to Contra Costa County's Vasco Winds EIR or the SRC, as applicable. The monitoring shall use red-tailed hawks, golden eagles, American kestrels and burrowing owls ("Focal Raptor Species") and bats as benchmarks for evaluating the effectiveness of the overall NextEra Wind repowering effort pursuant to Section 2 herein and to inform and update siting analyses for each subsequent phase of the overall repowering effort and for any other future repowering efforts. NextEra Wind also will conduct bird and bat utilization and behavior studies, in consultation with the TAC or the SRC, for each phase of repowering in order to inform and update siting analyses for each subsequent phase of the overall NextEra Wind repowering effort and for any other future repowering efforts. NextEra Wind also shall monitor each repowered turbine at least once per month for the duration of the post-construction monitoring period for fatalities of the four focal raptor species, bats and all other bird species, as recommended by the TAC and the SRC, as appropriate. Finally, NextEra Wind shall monitor a subset (30%) of the repowered turbines at least twice per month for the duration of the post-construction monitoring period for each phase of repowering for fatalities, bird and bat utilization and/or behavior, in consultation with the TAC or the SRC, as appropriate.

Post-construction monitoring shall be conducted by a reputable consultant with applicable experience ("Monitor"). NextEra Wind shall select the Monitor from the following list: Insignia Environmental, Ventus Environmental Solutions, CH2M Hill, or another Monitor recommended by the SRC or TAC or agreed to by the Parties. Post-construction monitoring shall not exceed $300,000 annually per phase, including the production of monitoring reports, as adjusted for inflation.

The Monitor shall prepare interim, annual monitoring reports within three months of completing each year of post-construction monitoring, and shall prepare a final three year Monitoring Report within six months of completing three years of post-construction monitoring for each phase of repowering and a final two year Monitoring Report within six months of completing two years of post-construction monitoring. All monitoring reports shall report adjusted and unadjusted annual fatalities for the Focal Raptor Species, bats and all other bird species on a per-turbine and per megawatt basis. The monitoring reports shall also summarize the results of the bird and bat behavior and use studies for the preceding one or three years, as applicable. The Monitor shall supplement the final three year Monitoring Report for each repowering phase with subsequent monitoring data collected in accordance with this Agreement.

5.2 Fatality reduction measures

The SRC or TAC, as applicable, shall review the final three year Monitoring Report for each repowering phase to evaluate whether any repowered turbines are causing significantly disproportionate Focal Raptor and/or bat fatalities relative to other turbines included within that particular phase of repowering. If one or more turbines are causing significantly disproportionate Focal Raptor or bat fatalities, then the SRC or TAC, as applicable, in consultation with the Parties, may recommend to the Planning Director of the applicable county additional focused monitoring and/or management measures designed to reduce the fatalities attributable to those turbines; provided, however, that such measures shall not include relocation or permanent shutdown of any repowered turbine. NextEra Wind, in its sole discretion, shall determine whether to implement the recommended management measures and/or conduct the additional focused monitoring. Notwithstanding the foregoing, the Parties acknowledge that fatality reduction or other measures may be required pursuant to applicable law including but not limited to the federal Endangered Species Act (16 U.S.C §§ 1530 *et seq.),* Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668d), Migratory Bird Treaty Act (16 U.S.C. §§ 703-712) or the California Endangered Species Act (California Fish and Game Code, §§ 2050, *et seq.*).

5.3 Obligations regarding existing turbines

NextEra Wind's obligations under Avian Wildlife Protection Program and Schedule in NextEra Wind's Conditional Use Permits adopted on January 11, 2007 (Exhibit G-1) to monitor existing non-repowered Old Generation and other turbines and implement winter seasonal shutdown shall continue until such turbines are removed.

5.4 Monitoring reports

All monitoring reports, including all raw monitoring data upon which the reports are based, shall be made available to members of the TAC, the SRC and the public as promptly as possible, but in any event no later than thirty (30) days after the report is produced.

5.5 Relationship to NCCP/HCP

If NextEra Wind participates in an approved Natural Communities Conservation Plan/Habitat Conservation Plan (NCCP/HCP) for the APWRA, the provisions of Section 5 of this Agreement shall be replaced by the monitoring and adaptive management requirements of the NCCP/HCP. If NextEra Wind participates in an NCCP/HCP that is ultimately approved by the federal and state wildlife agencies, such plan also shall supersede Section 6 of this Agreement, provided the NCCP/HCP contains measures to fully compensate for any ongoing fatalities of, and to provide an overall net conservation benefit for the Focal Raptor Species and other covered species, including bats.

6. Mitigation Fee for Ongoing Harm to Focal Raptor Fatalities

To compensate for ongoing fatalities of the bird and bat species identified in the monitoring reports required by Section 5.4, NextEra Wind agrees to pay a mitigation fee of $10,500 per megawatt of installed capacity for each phase of repowering (including subsequently acquired turbines). The fee shall be paid in three annual installments with the first payment due no later than three months of the COD for each phase. NextEra Wind shall notify the Parties in writing of the COD for each phase within 14 days of the COD. 50% of the total fees for each phase shall be paid to the California Energy Commission's Public Integrated Energy Research Program ("PIER") for scientific research on the effects of wind turbines on birds and bats at the APWRA; and 50% of the total fees shall be paid to a fund to be administered by the East Bay Regional Park District ("EBRPD"), the Livermore Area Regional Park District ("LARPD"), or any other entity identified in the NCCP/HCP conservation plan, or a combination of those entities for conservation efforts for the benefit of those bird and bat species and their habitat in the greater area encompassed by and surrounding the APWRA. Notwithstanding the foregoing, before providing funding to the recipient(s), the Parties shall meet with the recipient(s) in an effort to negotiate a Memorandum of Understanding ("MOU") ensuring that the funds will be used consistent with this Agreement. If no such MOU can be reached, the Parties will meet and determine how to reallocate the funds for the benefit of those bird and bat species and their habitat in the greater area encompassed by and surrounding the APWRA.

7. CEQA Process and Permitting

7.1 Comments

Provided NextEra Wind is in compliance with all material aspects of this Agreement as described in Section 10, the AG, Audubon and CARE shall not oppose or challenge the certification of any EIR or any entitlements for any repowering phase. Notwithstanding the foregoing, the AG, Audubon and CARE may submit comments on the adequacy of the environmental documentation for each phase of repowering. Prior to submitting any comments,

the AG, Audubon and/or CARE shall first meet and confer with NextEra Wind and make a good faith effort to resolve any concerns.

7.2 Relationship to mitigation measures

The Parties agree that mitigation required pursuant to this Agreement shall count towards any compensatory mitigation requirements imposed pursuant to CEQA and other local, state or federal Approvals.

7.3 Incorporation of provisions of Agreement into EIRs for repowering

While recognizing that final decisions regarding permit conditions and environmental documents are within the purview of the applicable permitting agencies, the Parties agree to use their best efforts to ensure that the provisions of this Agreement, including but not limited to siting and monitoring of repowered turbines, mortality reduction measures, and mitigation funds for unavoidable ongoing avian fatalities, will be incorporated as conditions of approval for local government permits approved for each phase of the overall NextEra Wind repowering effort, and as mitigation and monitoring measures in the final EIRs certified by Contra Costa and Alameda Counties for each phase of the overall NextEra Wind repowering effort, and any adaptive management plan approved by Alameda County.

8. Covenants Not to Sue

Except for enforcing the terms of this agreement as set forth in Paragraph 10, the AG, Audubon and CARE hereby release any and all existing and future claims against NextEra Wind (including any new entities formed for repowering or other purposes stated herein) and the NextEra Settlers, with respect to any and all avian and bat mortality at the APWRA for existing and repowered turbines. If, for any reason, this Agreement or any portion thereof is terminated or otherwise deemed invalid, the release of existing and future claims by the AG, Audubon and CARE will continue to apply to any phase of repowering for which Approvals have been obtained.

9. Successors, Assigns and Affiliates

This Agreement shall be binding upon the successors, assigns and affiliates of the Parties.

10. Enforcement

The Parties shall make all reasonable efforts to resolve their disputes and disagreements regarding the meaning of "compliance with" and/or "implementation of" this Agreement informally and in good faith prior to seeking any judicial relief to enforce the terms of this Agreement. If any Party has a dispute concerning the meaning of "compliance with" and/or "implementation of" this Agreement, that Party shall send a written notice to all other Parties that specifies the nature of the dispute and requests resolution of the dispute.

Upon receipt of such written notification, the Party receiving such notice shall either send the other Parties written notice within seven (7) days of receipt that it intends to cure and shall cure the alleged deficiency within sixty (60) days; or, if the Party receiving the notice is unable to cure the alleged deficiency or disputes the alleged deficiency, that Party receiving such notice

shall provide written notice to this effect to all Parties within seven (7) days of receipt of the notification.

If the Party receiving the notice disputes the alleged deficiency, the Parties shall initiate informal negotiations to resolve the dispute. Such period of informal negotiations shall not extend beyond sixty (60) days from the date on which the Party receiving the notice requests such negotiations, unless the Parties agree otherwise in writing. If the alleged violation is not remedied or the Parties fail to reach an agreement during the 60-day informal negotiation period, the noticing Party may seek judicial relief to enforce the terms of this Agreement in superior court.

11. Obligation to Terminate Existing Financing

Certain assets of NextEra Wind at the APWRA, including the existing Old Generation turbines, are subject to an existing financing agreement. NextEra Wind is in the process of terminating that financing agreement with respect to the existing APWRA NextEra Wind assets and has received lender approval to do so on or about December 1, 2010. Because the termination of the existing financing agreement must be completed, and the mortgage on the existing turbines and other assets satisfied, before NextEra Wind commits to decommissioning the existing turbines, this Agreement, which provides for such decommissioning, cannot become binding until the mortgage on the applicable NextEra Wind APWRA assets is satisfied. NextEra Wind characterizes the financing change as ministerial in light of the lender approval. In the very unlikely event that the financing change has not occurred by January 1, 2011, this Agreement is null and void, and NextEra Wind shall be subject to all obligations of the Avian Wildlife Protection Program and Schedule in NextEra Wind's Conditional Use Permits adopted on January 11, 2007 (Exhibit G-1), as amended by the County-approved adaptive management plan. NextEra Wind will notify the Parties to this Agreement when such satisfaction has occurred, or whether it will not occur, promptly, within 7 days after such an event becomes known to NextEra Wind. If such satisfaction has not occurred by January 1, 2011, the Parties agree to meet and confer within thirty days and use their best efforts to reach a new agreement for repowering that addresses the financing change issue.

12. No Admission of Wrongdoing

This Agreement is the result of a compromise with respect to the disputes between the Parties. In no event shall this Agreement be deemed an admission of wrongdoing or liability of any kind by any Party.

13. Amendments

Unless expressly permitted by this Agreement, no supplement, modification or amendment of any term, provision or condition of this Agreement (including this section) shall be binding or enforceable unless evidenced in a writing executed by all of the Parties to this Agreement.

14. Applicable Law

This Agreement shall be governed exclusively by and construed and enforced exclusively in accordance with and subject to the law of the state of California without regard to its choice of

law provisions, except in the event of bankruptcy by any Party, in which event the laws of the United States shall also apply, where appropriate.

15. Authority to Enter into Agreement

The Parties here represent and warrant that they have reviewed this Agreement with their respective attorneys, and that they have authority to enter into and sign this Agreement on their behalf.

16. Counterparts

This Agreement may be executed in counterparts, each of which shall be deemed an original, and each of which shall constitute together one and the same instrument. The counterparts will be binding on each of the Parties, even though the various Parties may have executed separate counterparts.

Dated: December ___, 2010 GREEN RIDGE POWER LLC

BY:_____

ITS: President_____

Dated: December ___, 2010 WINDPOWER PARTNERS 1990, L.P.

BY: ESI BAY AREA GP, INC

ITS: General Partner

BY:_____

ITS: President_____

Dated: December ___, 2010 WINDPOWER PARTNERS 1991, L.P.

BY: ESI BAY AREA GP, INC

ITS: General Partner

BY:_____

ITS: President_____

Dated: December ___, 2010 WINDPOWER PARTNERS 1991-2, L.P.

BY: ESI BAY AREA GP, INC

ITS: General Partner

BY:_____

ITS: President_____

Dated: December ___, 2010 WINDPOWER PARTNERS 1992, L.P.

BY: ESI BAY AREA GP, INC

ITS: General Partner

BY:_____

ITS: President_____

Dated: December ___, 2010

GOLDEN GATE AUDUBON SOCIETY,
OHLONE AUDUBON SOCIETY,
MOUNT DIABLO AUDUBON SOCIETY,
SANTA CLARA VALLEY AUDUBON SOCIETY and
MARIN AUDUBON SOCIETY

_____

Name: Bill Yeates, Kenyon Yeates LLP
Title: Attorney representing
Golden Gate, Ohlone, Mount Diablo, Santa Clara Valley, and Marin Audubon Societies.

Dated: December __, 2010

CALIFORNIANS FOR RENEWABLE ENERGY

_____

Name: Michael E. Boyd
Title: President of the Board of Directors

Dated: December __, 2010

PEOPLE OF THE STATE OF CALIFORNIA
EX REL. ATTORNEY GENERAL

_____

Name: Ken Alex
Title: Senior Assistant Attorney General

Appendix C
Golden Hills North Siting Report

Siting Wind Turbines to Minimize Raptor Collisions at Golden Hills North Repowering Project, Altamont Pass Wind Resource Area

K. Shawn Smallwood and Lee Neher

14 March 2017

NextEra plans to install 20 GE 2.3 MW turbines as part of its 46 MW Golden Hills North repowering project in the Alameda County portion of the Altamont Pass Wind Resource Area ("APWRA"), California. Careful siting of wind turbines is one of the principal measures available to minimize raptor fatalities caused by collisions with the turbines (Smallwood and Thelander 2004, Smallwood and Karas 2009, Smallwood and Neher 2009, Smallwood et al. 2017, Smallwood 2017). The objective of this approach is to carefully site new wind turbines to minimize the frequencies at which raptors of various species encounter the wind turbines while flying, but most especially while performing specific types of flight behaviors, such as low flights crossing ridge-like topographic features in the case of golden eagles and hovering or kiting in the cases of red-tailed hawks and American kestrels. In this study we developed simple Fuzzy Logic (FL) models (Tanaka 1997, Kainz 2004) of raptor activity quantified from behavior data collected across the APWRA between 13 November 2012 and 11 November 2014, and at special studies performed at Sand Hill sites between April 2012 and November 2014 and Patterson Pass between 15 October 2013 and 24 September 2014. The behaviors used in the modeling effort were derived from the results of Smallwood et al. (2009b), and example applications of the FL modeling approach can be seen in Smallwood et al. (2009a) and Smallwood et al. (2017).

The Fuzzy Logic approach is a rule-based system useful with noisy data or with zero-dominated data sets, and is applied to events occurring within classes that are assumed to have graduated rather than sharp boundaries (Tanaka 1997, Kainz 2004). The rules consist of assigning likelihood values of an event occurring, which in the case of this study would be the likelihood of a bird performing a specific behavior within a cell of an analytical grid laid over the project area. Likelihood values can range 0 to 1 for each predictor variable, depending on how far a value of the predictor variable differs from the mean where the event has been recorded. The magnitude of each deviation from the mean is assessed by the analyst based on error levels, data distribution, and the analyst's knowledge of the system. In our case, the events were of birds flying over terrain characterized by suites of slope conditions.

The study goal was to accurately predict the locations where golden eagles, red-tailed hawks, American kestrels and burrowing owls are most likely to perform flight behaviors putting these species at greater risk of collision with wind turbines, so that new wind turbines can be sited to avoid these locations. Achieving this goal depended on our understanding of how these species use terrain and wind, and how they perceive and react to wind turbines. It also depended on understanding patterns of fatality rates in the APWRA, so we also developed fatality rate models for golden eagle, red-tailed hawk, and burrowing owl (no model was predictive for American kestrel at the time models were developed for this project). Our model results were interpreted in tandem with Smallwood's on-site visual assessments of proposed wind turbine locations. By carefully siting the wind turbines to minimize collision risk, the Golden Hills North project

should prove safer to golden eagle, red-tailed hawk, and burrowing owl than the wind turbines being replaced. Because the Golden Hills North siting benefited from what was learned at the Vasco Winds repowering project (Brown et al. 2013, 2016), and from what was learned from research funded as mitigation for Vasco Winds (Smallwood 2016), the new turbines in the Golden Hills North project, assuming they are sited according to our recommendations, should also prove safer than those in the Vasco Winds repowering project, which had greatly reduced raptor fatality rates (Brown et al. 2013, 2014, 2016). Whether the project proves safer than Vasco Winds will probably depend on macro- rather than micro-siting factors.

METHODS

On-site Assessments

One of us (Smallwood) visited the Golden Hills North project site in December 2014 and January 2015, in June and July 2015, and in January, May, and December 2016. Smallwood visited the initially proposed wind turbine locations to gain a sense of the collision hazards that flying raptors might face once wind turbines are installed. He provided preliminary appraisals to NextEra which NextEra used to generate preliminary siting maps. He then participated with Golden Hills (NextEra) developers, engineers, and biologists in a day-long workshop to micro-site the new wind turbines in light of the collision hazard maps previously shared, infrastructure constraints, and grading considerations. The objective of the workshop was to interpret the collision hazard maps and to agree upon a wind turbine layout that balances collision risks, model uncertainties, and siting constraints. The meeting was held on 17 February 2015. After the layout was revised, Smallwood visited the candidate new turbine locations in June and July 2015. Another visit was made by Smallwood in January 2016, after the layout had been revised in December 2015. Yet another visit was made by Smallwood in May 2016 after the layout had been further revised. And another visit was made by Smallwood in November and December 2016 after the layout had been revised in July 2016.

Predictive Models

Multiple types of data were needed to develop collision hazard models. For developing collision hazard models golden eagle, red-tailed hawk, and American kestrel, flight behavior data were collected and then related to terrain. For burrowing owls, burrow locations were recorded and later related to terrain. For all four raptor species, fatality rates were estimated among individual wind turbines monitored throughout the APWRA and over various time periods since 1998. And of course the terrain needed to be measured, and this was done using imagery, digital elevation models, and geoprocessing steps to bring objectivity to decisions about where a slope transitions from trending towards concavity to trending towards convexity, as an example. All of these data and the steps used to integrate them are covered in the following paragraphs.

Behavior data

Culminating 14 years of behavior surveys and utilization surveys in the APWRA (Smallwood et al. 2004, 2005, 2009b,c; Smallwood 2013), a new methodology was developed for behavior monitoring to benefit the development of wind turbine collision hazard models. The earlier

behavior surveys recorded avian behaviors that were unmapped (Smallwood and Thelander 2004, 2005; Smallwood et al. 2009b), so no spatial analysis was possible. The mapping of bird locations emerged in 2002, but the 2002 approach was integrated with utilization surveys that were focused primarily on counting birds to estimate relative abundance. This mixing of objectives impinged on both objectives – on both the counting of birds and the mapping of their behavior patterns. On-the-minute mapping of bird locations and behaviors yielded only crude spatial patterns for only a few site-repetitive behaviors such as perching, kiting and hovering. After comparing use rates to fatality rates and seeing no significant spatial or inter-annual relationships between the two rates, it was decided to focus more on the behavior patterns to predict collision hazards. New methods were formulated to map flight behaviors.

Sixteen behavior observation stations were established among the Sand Hill sites (Figure 2), each location optimized to observe how golden eagles and other raptors behave in the airspace around Ogin's BACI experimental treatment plots. The data from these stations were supplemented with data gathered from 9 stations in Patterson Pass and 36 stations across the rest of the APWRA. Twenty-one of these stations across the APWRA were selected from those that had been ranked from 1st through 30th in order of the number of first observations per hour per km^3 of visible airspace out to the maximum survey radius at each station during use surveys performed by the Alameda County Avian Monitor from 2005 through 2009. Fifteen additional stations were added to Vasco Caves Regional Preserve, Northern Territories, Vasco Winds Energy Project, and the Buena Vista Wind Energy Project in Contra Costa County, where the Alameda County Avian Monitor did very little work.

Behavior sessions at Sand Hill lasted 30 minutes each and elsewhere they lasted 1 hour each. Between 30 April 2012 and 18 November 2014 there were 1,878 surveys completed for 939 hours. The maximum survey radius depended on the printed map image extent and how far the observer felt comfortable estimating the bird's spatial location and height above ground. Map extents rarely permitted survey distances of >300 m. One of us (Smallwood) recorded all of the behavior data within Patterson Pass, and additional behavior data were collected across the APWRA by Smallwood, Erika Walther, Brian Karas, and Harvey Wilson.

The 9 Patterson Pass stations were surveyed 167 times (167 hours) from 15 October 2013 to 24 September 2014. The 36 APWRA stations were surveyed 636 times (636 hours) from 13 November 2012 through 11 November 2014. Between all three studies, 1,742 hours of behavior surveys provided the data used for developing collision hazard models reported herein.

Each bird was recorded onto image-based maps of the survey area as point features connected by vector lines depicting the bird's flight path. Height above ground, behavior, and time into the session was recorded into Tascam digital voice recorders fitted with windjammers designed to reduce noise buffeting by high winds. Point features were recorded as often as the observer could record attribute data into the voice recorder. One objective of the behavior sessions was to obtain high quality flight paths and summaries of flight behaviors of individual birds using the surveyed airspace, and it was notably not to count birds, although it was likely that just as many raptors were recorded as would have been counted based on the use survey protocols.

Another objective of the behavior surveys was to learn how birds interact with wind turbines when they approached the wind turbines. Special attention was given to the bird's flight whenever it flew within 50 m of a wind turbine and, in the opinion of the observer, faced the possibility of colliding with the wind turbine. During this time, the bird's approach angle to the turbine was recorded, as well as any changes in flight direction, flight height, behavior, interactions with other birds, and the wind turbine's operating status. Whenever special attention was directed to such flights, the flight observation was termed an "event," or a wind turbine interaction event.

At the start of each behavior session, the observer identified which wind turbines in the survey area were operating, as well as temperature, wind direction, average and maximum wind speed, and percentage cloud cover. Behavior data were transcribed to electronic spreadsheets within 24 hours of collection. Mapped bird location points and line features representing the bird's flight path were then digitized into the GIS.

Burrowing owl burrows

Burrowing owl burrows were mapped in sampling plots throughout the APWRA using a Trimble GeoXT GPS, both during the nesting season (Smallwood et al. 2013b) and throughout the year in 2011. Additional burrow mapping efforts were made in follow-up visits in 2012, 2013, and 2014. Most of the burrows that were mapped were nest burrows, but refuge burrows were also included in the data pool. No satellite burrows were used.

Fatality rates

We estimated annual fatality rates at all old generation wind turbines that were searched at least one year between the years 1998 through 2011 in the APWRA. All fatality rates were adjusted for search detection and carcass persistence rates that were averaged among wind projects where trials were performed in similar grassland environments as compared to the APWRA (see Smallwood 2013). Fatality rates were also adjusted for variation in the maximum search radius, based on the method used by Smallwood (2013). Finally, we adjusted fatality rates for monitoring duration to account for the bias warned about in Smallwood and Thelander (2004:App. A); that is, as the number of fatalities is averaged into more years of survey effort, the resulting ratio of fatalities to years will decrease inversely with increasing number of years (Figure 1). This bias, which reflects a relatively constant number of fatalities (numerator) relative to a continuously varying number of years (denominator), was corrected by fitting an inverse function to the data, and then multiplying the ratio of observed to predicted values by the predicted value at 10 years of monitoring (Figure 1). In other words, all fatality rates at individual wind turbines were adjusted to a common 10-year period of monitoring, even if they had been monitored only one year, 4 years, or 10 years, etc.

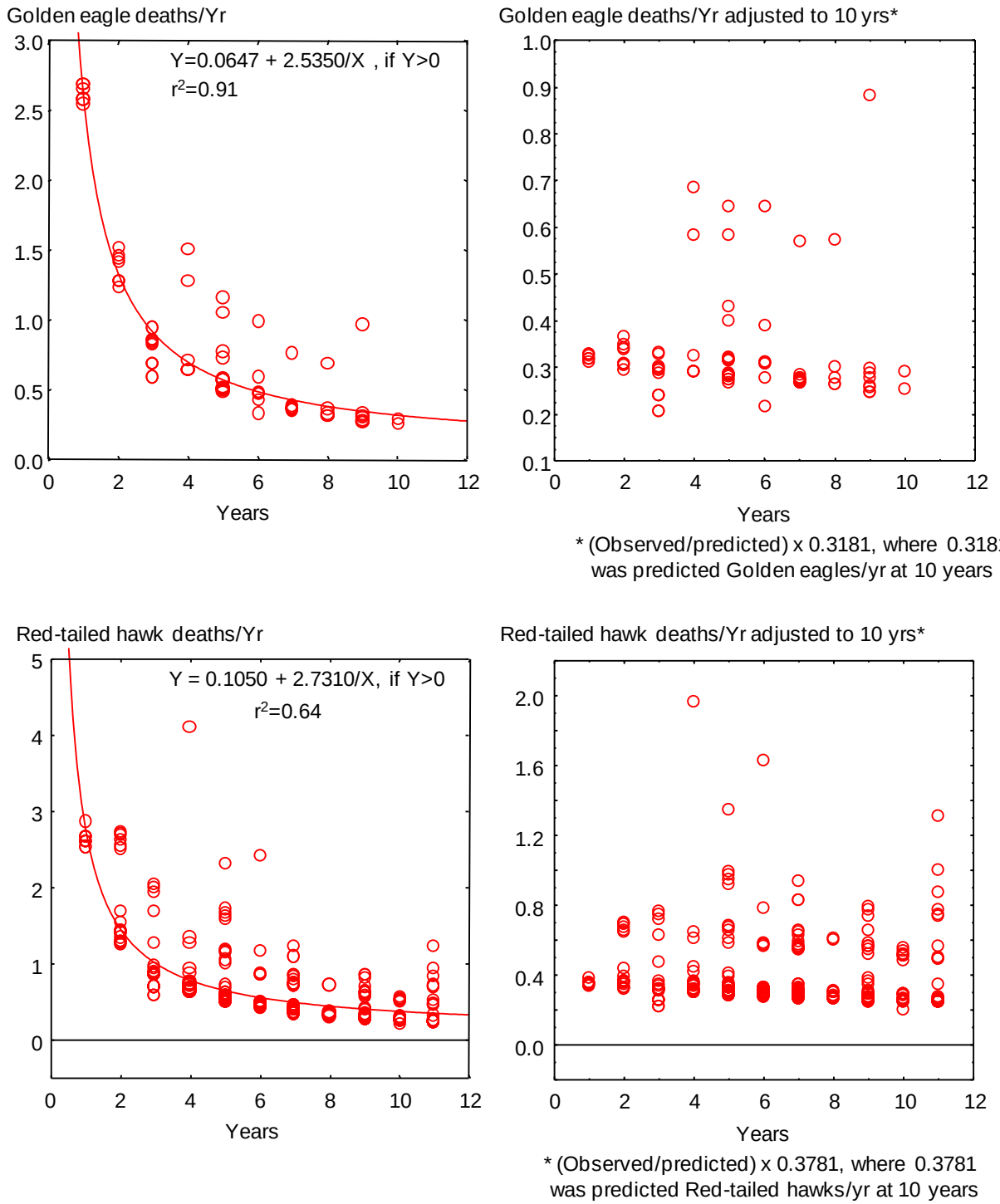

Figure 1a. *Mean annual fatalities/year declined inversely with the number of years used in the denominator for golden eagle and red-tailed hawk (left graphs), so fitting inverse functions to the data removed the effect of number of years on the metric (right graphs).*

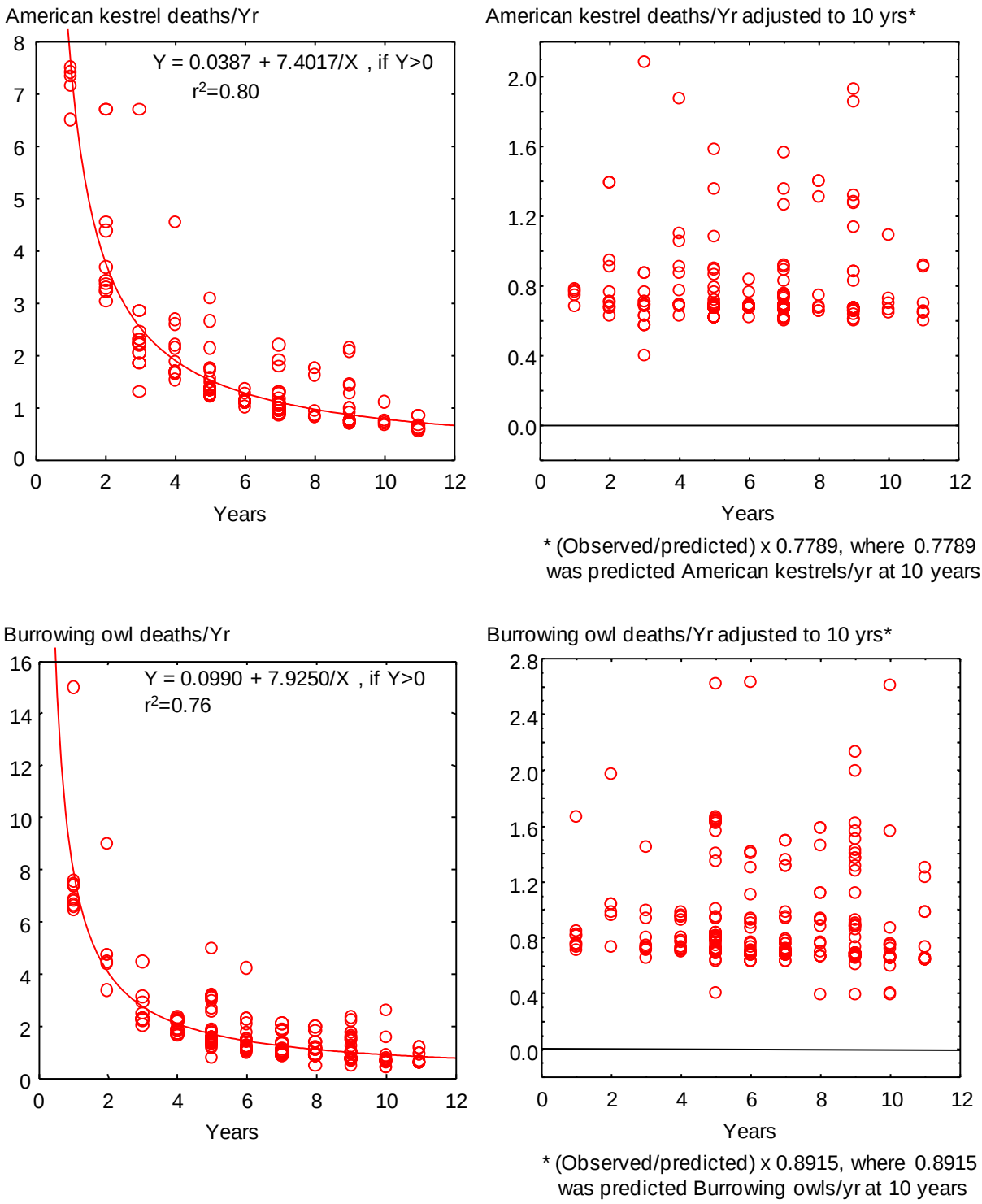

Figure 1b. *Mean annual fatalities/year declined inversely with the number of years used in the denominator for American kestrel and burrowing owl (left graphs), so fitting inverse functions to the data removed the effect of number of years on the metric (right graphs).*

Digital Elevation Model

Two separate digital elevation model (DEM) grids were utilized for this project. The geoprocessing tasks were performed using a 10 foot cell size DEM created by combining DEMs obtained from Contra Costa and Alameda Counties. These data sets were produced using LIDAR data and ARC TIN software by Mapcon Mapping Inc. during 2007-2008. The border of the APWRA was used as a mask to produce the APWRA DEM composed of 25,440,000 10x10-foot cells. This DEM was then converted to a cell centroid point feature class and each point assigned a unique membership number.

All derived parameters were calculated for the entire APWRA DEM and attributed into the cell centroid point feature class. An aggregated 792-m buffer served as our mask (limit) for analyzing previously collected bird data against the DEM parameters. The 792-m radius was converted to a 2,600 foot radius and an additional 200 feet was added to buffer modeling data for geoprocessing and to ensure that all bird observations would be covered.

The statistical analyses within the APWRA were limited (masked) to data within the areas searched for raptors within the behavior study areas, bur burrowing owl burrows within the burrowing owl sampling plots, and for fatality rates among the wind turbines that were monitored at least one year (and the grid cells on which the turbines were located). The resulting analytical grids within the behavior survey areas were composed of a 7,548,578 (30%) subset of the 10x10-foot centroid point feature class serving as the study area for the behavior surveys, and a 393,555 subset serving as the study area for the behavior surveys restricted to 10-m buffered ridge-like features. These analytical grids were used to develop and test predictive models.

The same geoprocessing steps were used to characterize terrain attributes as reported in Smallwood and Neher (2010a,b). The Curvature function was used in the Spatial Analysis extension of ArcGIS 10.2 to calculate the curvature of a surface at each cell centroid. A positive curvature indicated the surface was upwardly convex at that cell, a negative curvature indicated the surface was upwardly concave, and a value of zero indicated the cell surface was flat. The curvature data (-51 to 38) were classified using the Natural Breaks (Jenks) function with 3 classes of curvature – convex, concave and mid-range. The break values were visually adjusted to minimize the size of the mid-range class. A series of geoprocessing steps was used, called 'expand,' 'shrink,' and 'region group,' as well as 'majority filter tools' to enhance the primary slope curvature trend of a location. The result was a surface almost exclusively defined as either convex or concave (expressed as 1 or 0, respectively, for the variable *Curve*, and 2 and 1 respectively, for the variable *RidgeValley*, which will appear in the models below). The convex surface areas consisted primarily of ridge crests and peaks, hereafter referred to as ridges, and the concave surface areas consisted primarily of valleys, ravines, ridge saddles and basins, hereafter referred to as valleys.

Line features representing the estimated average centers of ridge crests and valley bottoms were derived from the following steps. ESRI's Flow direction function was used to create a flow direction from each cell to its steepest down slope neighbor, and then the Flow accumulation function was used to create a grid of accumulated flow through each cell by accumulating the weight of all cells flowing into each down slope cell. A valley started where 50 upslope cells

had contributed to it in the Flow accumulation function, and a ridge started where 55 cells contributed to it. The flow direction and flow accumulation functions were applied to the ridges by multiplying the DEM by -2 to reverse the flow. Line features that represented ridges and valley bottoms were derived from ESRI's gridline and thin functions, which feed a line through the centers of the cells composing the valley or ridge. Thinning put the line through the centers of groups of cells ≥40 in the case of valleys. Lines representing ridges and valleys were also clipped to identify the major valleys and major ridges, or the topographic features dominating the local skyline and local drainage systems.

The two-foot slope analysis grid was used to create polygons with a relatively gentle slope. A Standard Deviation classification was used to identify areas with < 7.4 % slope. These areas were then converted to polygons and intersected with the ridge/valley lines to determine polygons associated with either ridge or valley descriptions. The borders of these polygons were converted to lines and combined with the ridge/valley line datasets, respectively, and polygons in valley features were termed *valley polygons* and polygons on ridge tops were termed *ridge polygons*.

Horizontal distances (m) were then measured between each DEM grid cell and the nearest valley bottom boundary (in the valley line combined data set) and the nearest ridge top boundary or ridgeline (in the ridgeline combined data set), referred to as *distance to valley* and *distance to ridge*, respectively. These distances were measured from the DEM grid cell to the closest grid cell of a valley bottom or ridgeline, respectively, not including vertical differences in position. The *total slope distance* was the sum of *distance to valley* and *distance to ridge*, and expressed the size of the slope. The DEM grid cell's position in the slope was also expressed as the ratio of *distance to valley* and *distance to ridge*, referred to as the *distance ratio*. This expression of the grid cell's position on the slope removed the size of the slope as a factor. The same measurements were made to major valleys and major ridges.

The vertical differences between each DEM grid cell and the nearest valley bottom boundary and nearest ridge top boundary or ridgeline were referred to as *elevation difference*, and this measure also expressed the size of the slope. In addition to the trend in slope grade at each DEM grid cell, the *gross slope* was measured as the ratio of *elevation difference* and *total slope distance*. The DEM grid cell's position on the slope was also expressed as the ratio of the elevation differences between the grid cell and the nearest valley and between the grid cell and the nearest ridge, referred to as *elevation ratio*. Additionally, the grid cell's position on the slope was measured as the average of the percentage distance and the percentage elevation to the ridge top. This mean percentage was named *percent up slope*, and provided a more robust expression of the grid cell's position on the slope. The same measurements were made to major valleys and major ridges, leading to the variable we named *percent up major terrain slope*. Thus, on a small hill adjacent to a major hill in the area, a grid cell could be 90% under *percent up slope* and only 30% under *percent up major terrain slope*.

Percent up slope did not distinguish a grid cell's position between slopes on large hills versus medium or small-sized hills, so the local topographic influence of the feature where each cell was located was expressed by the variable *hill size*, which was the elevation difference between

the nearest valley bottom polygon and nearest prominent ridge top polygon. *Major hill size* was the elevation difference between the nearest major valley bottom and nearest major ridge top.

Breaks in slope were characterized with the ratio of *slope to gross slope,* and the ratio *gross slope to major gross slope* was also calculated. Additional ratios included *local to major hill size, local to major ridge elevation,* and *local to major valley elevation*.

Each DEM grid cell was classified by *aspect* according to whether it faced north, northeast, east, southeast, south, southwest, west, northwest, or if it was on flat terrain. Each grid cell was also categorized as to whether its center on the landscape was windward, leeward or perpendicular to the prevailing southwest and northwest wind directions as recorded during the behavior observation sessions.

The study area was divided into smaller polygons of land with like aspect, creating a predictor variable termed *Subwatershed Orientation*. Existing sub-watershed polygons already had been created between ridgelines and valley bottom lines. These watershed polygons were further divided by reviewing the existing 2-foot hypsography (contour) data and then dividing them into orientation polygons where the overall orientation of the contours changed. An orientation line feature layer was digitized with a line for each new polygon following the best observed orientation of that polygon's contours. Python scripts attributed the new line with its compass orientation, e.g., N, NNE, NE. These lines were non-directional, so a compass value could be either the returned value or the direction 180 degrees opposite. These same scripts calculated a perpendicular compass direction to the returned orientation line direction. The perpendicular orientation direction had two possible values, differing by 180 degrees based on which side of the ridge the line described. A reference point within each orientation polygon was georeferenced by scripts to a generalized aspect grid of the study area. The scripts determined the correct perpendicular orientation and calculated the compass direction of the orientation polygon.

Using similar steps, a predictor variable termed *Ridge Orientation* was created. Ridgelines were buffered by 10 feet and the resulting ridgeline polygons classified by orientation: north to south, north-northwest to south-southeast, northwest to southeast, west-northwest to east-southeast, west to east, west-southwest to east-northeast, southwest to northeast, and south-southwest to north-northeast. Flight paths crossing ridgelines were related to these Ridge Orientation polygons in use and availability analysis.

Steps to identify saddles, notches, and benches

Because a large amount of evidence links disproportionate numbers of raptor fatalities to wind turbines located on aspects of the landscape that are lower than immediately surrounding terrain or that represent sudden changes in elevation, a special effort was directed toward identifying ridge saddles, notches in ridges, and benches of slopes. Benches of slopes are where ridge features emerge from hill slopes that extend above the emerging ridge. These types of locations are where winds often compress by the landscape to create stronger force, and where raptors typically cross hilly terrain or spend more time to forage for prey. Compared to surrounding terrain, these types of features are often relatively flatter or shallower in slope and sometimes

include lower elevations (e.g., saddles). Geoprocessing steps were used to provide some objectively to the identification of these features, but judgment was also required because conditions varied widely in how such features were formed and situated.

The same procedures were used as used in the ridge/valley selection. The two foot slope analysis grid was used to create polygons with a relatively gentle slope. A Standard Deviation classification was used to identify areas with < 7.4 % slope. These areas were then converted to polygons. Those polygons not associated with ridge or valley polygons were examined manually. Where these polygons were visually associated with saddle and or step features, they were identified as *hazard sites* representing saddles, notches, or benches. Maps depicting contours of the variable *percent up slope* were also examined, because these contours readily revealed sudden breaks in slope typical of saddles, notches, and benches, which were then also represented with polygons.

Associations between bird behaviors and terrain attributes

The location of each raptor was characterized by aspect, slope, rate of change in slope, direction of change in slope, and elevation. These variables were also used to generate raster layers of the study area, one raster expressing the aspect of the corresponding slope (hereafter referred to as *aspect*), and the other expressing whether the landscape feature was tending toward convex versus concave orientation (expressed in a variable named *curve*). These features were defined using geoprocessing.

Fuzzy logic (FL) modeling (Tanaka 1997, Kainz 2004) was used to predict the likelihood each grid cell would be used by golden eagle, red-tailed hawk, American kestrel, and burrowing owl. FL likelihood surfaces were first created by each selected predictor variable. The mean, standard deviation, and standard error were calculated for each predictor variable among the grid cells where each targeted bird species was observed during standard observation sessions. These statistics formed the basis from which FL membership was assigned to grid cells. Depending on the pattern in the data, FL membership was assigned values of 1 whenever the value of the predictor variable was within a certain prescribed distance in value from the mean, oftentimes within 1 SD, but sometimes within 1 or 2 SE. FL membership values of 1 expressed confidence that grid cells with the corresponding value range for the predictor variable are likely to be visited by the target species. FL membership values of 0 were assigned to grid cells that were far from the mean value, usually defined by prescribed distances from the mean such as >2 SD from the mean. FL membership values of 0 expressed confidence that grid cells with the corresponding value range for the predictor variable are unlikely to be visited by the target species. All other grid cells were assigned FL membership values according to the following formulae, assuming that the likelihood of occurrence of each species will grade gradually rather than abruptly across grid cells that vary in value of the predictor variable (Y):

$$0.5 \times (1 - \cos(\pi \times (Y - V_c) \div (V_f - V_c))) \text{ below the mean}$$
$$0.5 \times (1 + \cos(\pi \times (Y - V_c) \div (V_f - V_c))) \text{ above the mean,}$$

where V_c represented the variance term (SD or SE) closer to the mean and V_f represented the variance term farther from the mean.

FL likelihood values were then summed across predictor variables contributing to a species-specific model. In earlier efforts to develop FL models for golden eagle, red-tailed hawk, American kestrel and burrowing owl in other parts of the APWRA, natural breaks were used to divide the summed values into 4 classes, but the percentages of study area composing these classes remained consistent despite use of natural breaks. Therefore, this time the class divides were established at 63.5%, 83.5%, and 95.5%. Class 1, including FL likelihood values <63.5% (i.e., 63.5% of the study area), represented the suite of grid cells including fewer bird observations other than expected. Class 2, including FL likelihood values between 63.5% and 83.5% (i.e., 20% of the study area), represented the suite of grid cells including about equal or slightly greater than equal bird observations other than expected. Class 3, including FL likelihood values between 83.5% and 95.5% (i.e., 12% of the study area), represented the suite of grid cells including more bird observations other than expected. And class 4, including the upper 4.5% of FL likelihood values, represented the suite of grid cells including substantially more bird observations other than expected.

The performance of each model was assessed by the magnitude of the ratio of the observed number to the expected number of observations representing a dependent variable and occurring within the suite of conditions specified by each FL surface class. Dependent variables included fatality rates (except for American kestrel), flights <180 m above ground, flights across ridge features and <180 m above ground, wind turbine interaction events, and hovering or kiting or surfing behaviors. FL surface models were later projected across wind project areas.

Burrowing owl model

Because burrowing owls tend to nest low on the slope, it would be rare for a predictive model of burrowing owl burrow locations to correspond with terrain where burrowing owls are killed by wind turbines. Therefore, we developed a burrowing owl fatality model and relied on hazard classes 3 and 4 of this model wherever the cell centroids were located within 60 m of class 4 predicted by the burrow model. Otherwise, all class values of the burrow model remained unchanged.

RESULTS

Surveys

Behavior surveys performed through 22 November 2014 numbered 1,877 30-min surveys at Sand Hill sites and 803 1-hr surveys elsewhere in the APWRA for 1,741.5 hours. Observers recorded 1,065 golden eagle flights, 2,368 red-tailed hawk flights, and 706 American kestrel flights. The rate of flights were 0.2845 golden eagles/hour, 0.9366 red-tailed hawks/hour, and 0.4827 American kestrels/hour at Sand Hill sites, and 0.9938 golden eagles/hour, 1.8543 red-tailed hawks/hour, and 0.3151 American kestrels/hour elsewhere in the APWRA. APWRA-wide observation rates were 0.6115 golden eagles/hour, 1.3597 red-tailed hawks/hour, and 0.4054 American kestrels/hour. We recorded events at wind turbines, including 86 golden eagle events, 156 red-tailed hawk events, and 98 American kestrel events.

Hazard Models

The golden eagle FL model was composed of 8 predictor variables, 3 of which were categorical in nature and the other 5 included fuzzy boundaries (Tables 1 and 2, Figure 2). Five variables contributed to an FL model of golden eagle flights, ridge crossings, and interaction events at wind turbines (Table 1). Four variables contributed to an FL model of golden eagle fatality rates (Table 2). These two models were subsequently normalized and combined with an equally weighted contribution from the variable *Hazard site* (Table 8) and the map-based model appears in Figure 6. As with the models developed for the other species, the golden eagle collision hazard model performed well when related to dependent variables (Figure 3).

Golden eagle flights and wind turbine interactions occurred disproportionately over ridges oriented generally west-east. Associations were also strong with subwatershed slopes facing westerly directions, especially west-southwest. Eagles also flew and interacted with wind turbines disproportionately over breaks in slope, as indicated by grid cells that were relatively shallow compared to the overall slope from valley bottom to ridge top (*slope to gross slope ratio*). Golden eagles flew and interacted with wind turbines disproportionately at 84% to 100% up the slope, and at 55% to 100% up the slope of major terrain features.

The red-tailed hawk model was composed of 7 predictor variables, 3 of which were categorical in nature and the other 4 included fuzzy boundaries (Tables 3 and 4, Figure 4). Red-tailed hawks hovered and kited disproportionately over ridges oriented west to east and north-northwest to south-southeast. They hovered and kited disproportionately over slopes oriented southwest, west-southwest and west. Red-tailed hawks hovered and kited disproportionately over ground that was between 87% and 95% to the top of the slope (Figure 4). Red-tailed hawk kiting and hovering was broader across major terrain features, with peak activity ranging between 78% and 93% to the top of the feature (Figure 4). The weightings applied to the variables appear in Table 8 and the map-based model appears in Figure 7.

The American kestrel model was composed of 4 predictor variables, 2 of which were categorical in nature and the other 2 included fuzzy boundaries (Table 5). American kestrels flew most disproportionately over ridges oriented west-east and west-northwest to east-southeast. American kestrels flew disproportionately over slopes oriented west and west-southwest, ranging mostly between three-quarters to the peak of the slope and midway to just below the peaks of major terrain features. The weightings applied to the variables appear in Table 8 and the map-based model appears in Figure 8.

The burrowing owl model was composed of 6 predictor variables 2 of which were categorical in nature and the other 4 included fuzzy boundaries (Tables 6 and 7, Figure 5). Burrowing owl burrows were located disproportionately between 5% and 30% of the way up south-facing slopes (Figure 5). Burrowing owl fatality rates were disproportionately higher at low to moderate elevations and between 35% and 42% of the way up the slopes of major terrain features and in hazard sites (Figure 5). The weightings applied to the variables appear in Table 8 and the map-based model appears in Figure 9.

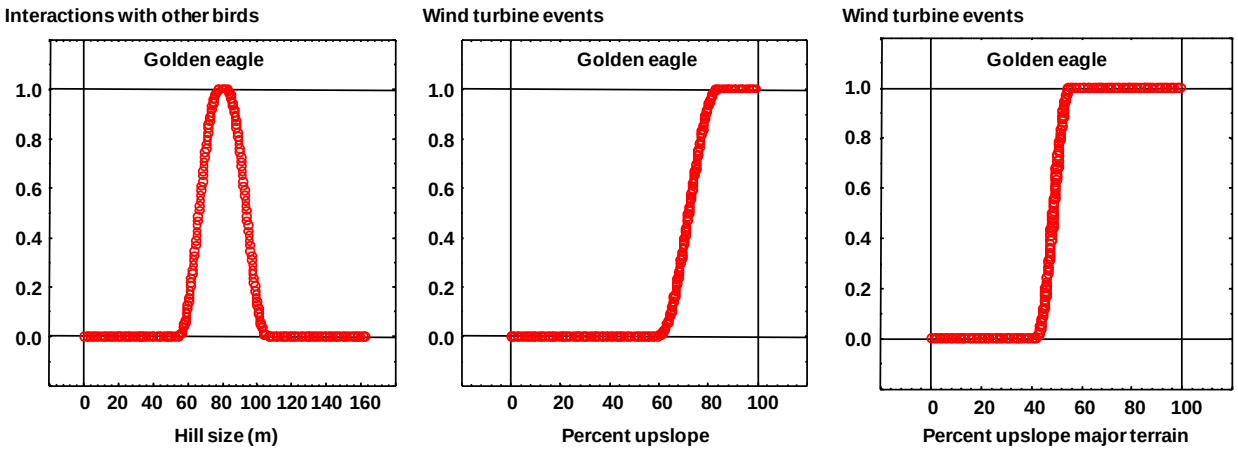

Figure 2. *Examples of grid cell membership values in respective fuzzy logic sets for three predictor variables, including of golden eagle interactions with other birds (left) and wind turbine events (middle and right).*

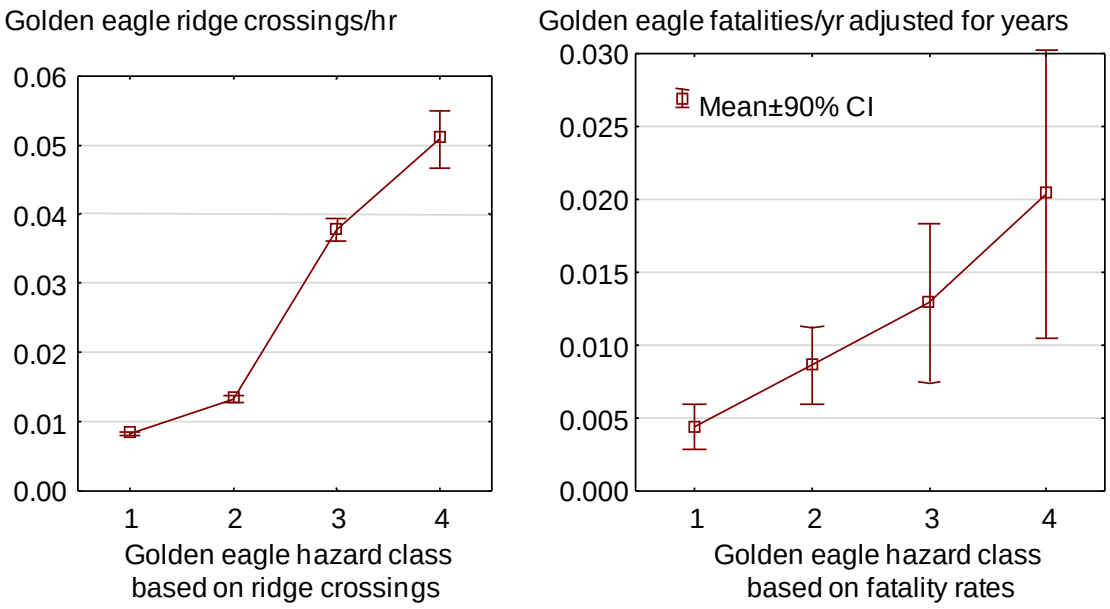

Figure 3. *Performance of golden eagle fuzzy logic models.*

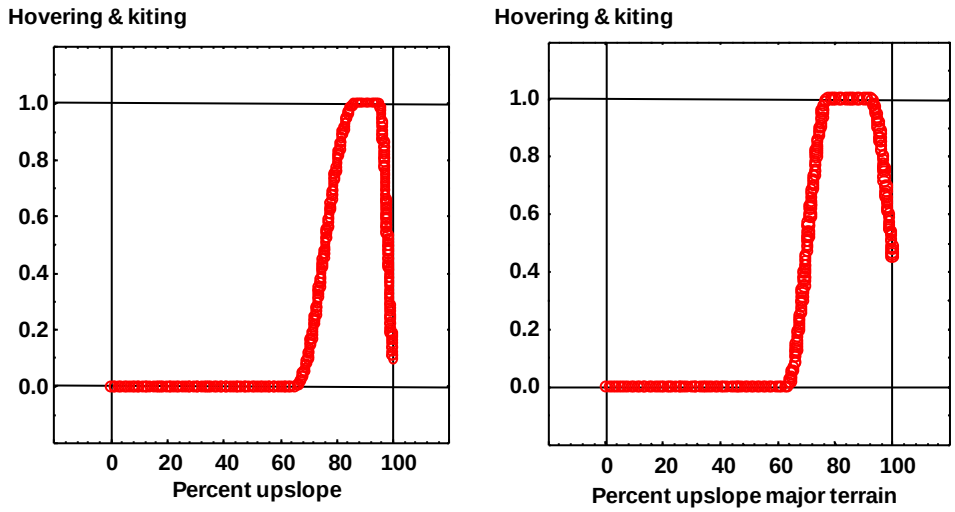

Figure 4. *Examples of grid cell membership values of red-tailed hawk hovering and kiting in respective fuzzy logic sets for percent upslope (left) and percent upslope of major terrain (right).*

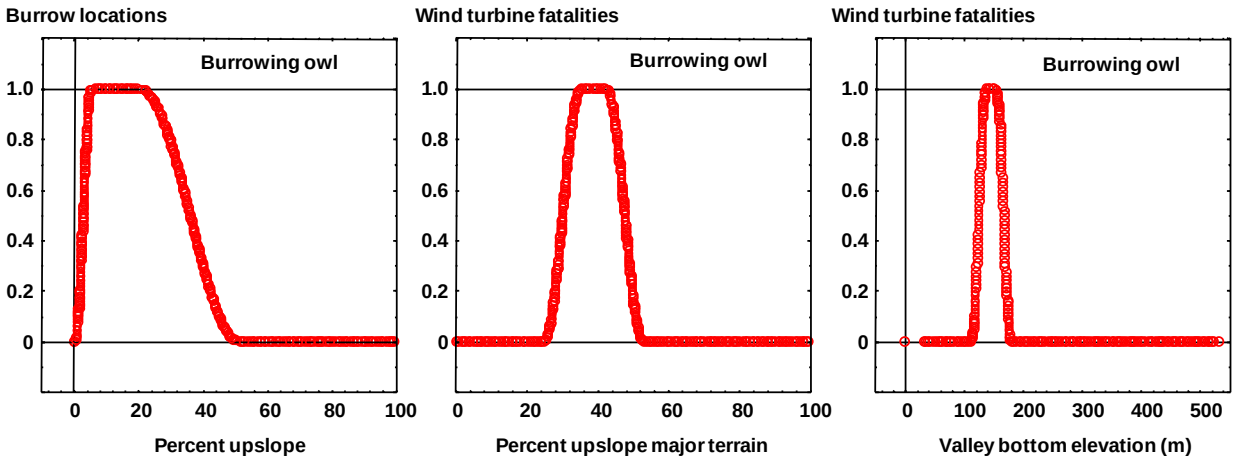

Figure 5. *Examples of grid cell membership values in respective fuzzy logic sets for three predictor variables, including of burrowing owl burrow locations (left) and burrowing owl fatalities at wind turbines (middle and right) in the study area.*

DISCUSSION

We produced simple map-based collision hazard models of golden eagle ridge crossing flights, wind turbine events, and wind turbine fatalities, as well as of red-tailed hawk fatalities and red-tailed hawk and American kestrel hovering and kiting flights in the Altamont Pass Wind Resource Area. We also produced simple collision hazard models of burrowing owls based on burrow locations and fatalities at wind turbines. We extended these models to the Golden Hills North project area, which included areas where flight behavior data and burrowing owl burrow data were collected for developing the collision hazard models. The models performed well against the data used to develop them, and although this type of model validation tends to be over-optimistic, earlier collision hazard models performed well in the Vasco Winds Energy Project after it was built. After the three years of operations at Vasco Winds, and compared to the old-generation wind project that preceded it, Brown et al. (2016) estimated fatality rate reductions of up to 82% for golden eagle, 47% for red-tailed hawk, 57% for American kestrel and 59% for burrowing owl.

The collision hazard models developed for Golden Hills North should perform better at micro-siting than the models implemented at Vasco Winds. Also, the micro-siting workshop was effective (Table 9). However, this better performance will likely be offset to some unknown degree by high use of the project area by golden eagles, i.e., macro-siting factors. The golden eagle model was based on a larger data set, including from directed behavior surveys and fatality rates based on surveys performed between 1998 and 2011 throughout the APWRA. The golden eagle model should be more robust than the simple model of golden eagle flights that was developed for Vasco Winds. Nevertheless, the Golden Hills North project area has caused some of the highest documented fatality rates of golden eagle in the APWRA, and remains a high use area.

The red-tailed hawk and American kestrel models were based on the same behavior patterns as used to develop the models for Vasco Winds, but this time we had data from throughout the APWRA and collected over six years rather than just 18 months in the Vasco Caves study. We also incorporated fatality rates into the collision hazard model for red-tailed hawk. For American kestrels we were unable to incorporate fatality rates because we were unable to find any significant relationships between fatality rates and terrain measurements at the time we developed models for Golden Hills North. Since that time, however, we have developed predictive models based on American kestrel fatality rates (Smallwood and Neher 2017).

The collision hazard models included some scattered small areas of surface class 4, which Smallwood tended to ignore during the micro-siting workshop on 17 February 2015. Collision hazard models based on millions of analytical grid cells will always include such scatterings of anomalous results, which is why they need to be regarded as guidance tools rather than hard boundaries. Map-based collision hazard maps need to be interpreted carefully, meaning the hazards of specific terrain and wind situations – ridge saddles, apices of southwest and northwest-facing concave slopes, and breaks in slope – should always trump model predictions.

As an example of the need for interpreting hazard maps, our collision hazard models do not account for grading that will be necessary for access roads and wind turbine pads. Changes in

the shape of the hills due to grading may have moved turbines into more hazardous areas in the Vasco Winds area. During the micro-siting workshop for Golden Hills North, we considered the level and location of grading needed for each wind turbine, and sometimes overruled the collision hazard map predictions to prevent adverse consequences of grading.

We harbor three reservations going forward. One reservation is that golden eagles are highly active within the project area, which also has a record of high golden eagle fatality rates. A project of this size and location will surely affect some golden eagles, as well as red-tailed hawks, American kestrels, and burrowing owls. The annual numbers killed will be smaller than the fatality rates at the same project location since the 1980s, but some fatalities will be inevitable. Our second reservation is that, except for burrowing owl, our collision hazard models improved since the models we prepared for Golden Hills North. Since we developed collision hazard models for Golden Hills North, we developed new models for the Sand Hill and Summit Winds repowering projects. We used more data and had more measured variables available for model development. The newer models perform better than did the models for Golden Hills North, and a reasonably small modification to the burrowing owl model would greatly improve its performance. Our third reservation stems from our belief that micro-siting might have been more effective had we learned more about where and how many of each of the four focal raptor species have been found as fatalities in the Golden Hills project, and where and how many were found at Vasco Winds since fatality monitoring ended at the latter project. However, it remains unknown whether the new and improved collision hazard models or lessons learned from fatalities at Golden Hills would have actually improved the micro-siting of Golden Hills North.

As the 21 February 2017 Meet and Confer meeting approached among the Parties to the 2010 settlement agreement (Audubon and Office of the California Attorney General) regarding NextEra's repowering efforts in the APWRA, NextEra requested that I identify the turbines that I felt remained the most hazardous to golden eagles. I identified those turbines. As a result, NextEra removed turbine addresses 7, 10, Alt 4 and Alt 5 from the July 2016 layout, and agreed to consider moving Alt 1 to a safer location now that the removal of turbine 10 freed up some siting space. It was also agreed that turbine address Alt 6 would be relocated farther up the ridgeline to the south. These decisions were conveyed to the Parties at the 21 February 2017 meeting. The final layout, however, eliminates turbines 7, 10 and Alt 6, but keeps Alt 1 where it was and keeps Alt 4 and Alt 5 as alternative sites renamed Alt 2 and Alt 3. We cannot recommend turbines at Alt 1 or Alt 2 locations, as both of these sites would be disproportionately hazardous to golden eagles and other raptors.

So long as the Alt sites are not used, the final layout should be safer to raptors than were the earlier layouts (Table 10). The SRC-style hazard ratings averaged 6.25 among non-Alt turbines, and only 6.55 in the worst-case scenario (Table 10). Unseen in these ratings, however, is the likely reduced fatality rates that will result from using a larger turbine and fewer turbine sites than proposed in previous layouts. Also unseen is the opening of considerable airspace to safe travel by raptors and other birds through the project area, especially over relatively low terrain where golden eagle and burrowing owl collision risk tends to be greatest.

Table 1. *Golden eagle fuzzy logic membership functions of DEM grid cells based on flights involving ridge crossings, interactions with other birds, and wind turbine interaction events.*

Value of variable Y for *i*th grid cell	**Basis of membership function about $\bar{x}$**	**Membership function of grid cell (Values >1 include weightings)**
Y = Ridge Orientation (Ridge crossings)		
Y = WSW-ENE	Not applicable	5
Y = W-E	Not applicable	5
Y = WNW-ESE	Not applicable	3
Y = N-S	Not applicable	0.5
Y = NE-SW	Not applicable	0.5
Y = NW-SE	Not applicable	0.5
Y = WNNW-SSE	Not applicable	0.5
Y = NNE-SSW	Not applicable	0
Y = Subwatershed Orientation (events)		
Y = WSW	Not applicable	2
Y = W	Not applicable	2
Y = NW	Not applicable	2
Y = WNW	Not applicable	1
Y = Other orientation	Not applicable	0
Y = Percent up slope (events)		
84.29 <Y<100.33	Within 3 SE of $\bar{x}$	1
60.23 < Y < 84.29	Within 12 & 3 SE < $\bar{x}$	$0.5 \times (1 - \cos(\pi \times (Y - 60.23) / (84.29 - 60.23)))$
100.33 < Y < 124.4	Within 3 & 12 SE > $\bar{x}$	$0.5 \times (1 + \cos(\pi \times (Y - 100.33) / (124.4 - 100.33)))$
Y < 60.23 or Y> 124.4	< > $\bar{x}$ ± 12 SE	0
Y = Percent up major terrain slope (events)		
55.66 <Y< 100.62	Within 0.25 SD < $\bar{x}$ & 1.6 SD > $\bar{x}$	1
42.30 < Y < 55.66	Within 1 SE & 0.5 SD < $\bar{x}$	$0.5 \times (1 - \cos(\pi \times (Y - 42.3) / (55.66 - 42.3)))$
Y < 42.3	< ($\bar{x}$ - 0.25 SD)	0
Y = Hill Size (interactions)		
78.34 < Y < 82.58	Within 1 SE of $\bar{x}$	1
54.98 < Y < 78.34	Within 12 & 1 SE < $\bar{x}$	$0.5 \times (1 - \cos(\pi \times (Y - 54.98) / (78.34 - 54.98)))$
82.58 < Y < 105.94	Within 1 & 12 SE > $\bar{x}$	$0.5 \times (1 + \cos(\pi \times (Y - 82.58) / (105.94 - 82.58)))$
Y < 78.34 or Y > 105.94	< > $\bar{x}$ ± 12 SE	0

Table 2. *Golden eagle fuzzy logic membership functions of DEM grid cells based on fatality rates at wind turbine locations.*

Value of variable Y for *i*th grid cell	**Basis of membership function about $\bar{x}$**	**Membership function of grid cell (Values >1 include weightings)**
Y = Ridge elevation (if slope convex)		
219.84 < Y < 273.88	Within 5 SE of $\bar{x}$	1
70.60 < Y < 219.84	Within 2 SD & 5 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y – 70.60) / (219.84 – 70.60)))
273.88 < Y < 423.12	Within 5 SE & 2 SD > $\bar{x}$	0.5 × (1 + COS(π × (Y – 273.88) / (423.12 – 273.88)))
Y < 70.60 or Y> 423.12	>2 SD from $\bar{x}$	0
Y = Major valley elevation (if slope convex)		
160.36 < Y< 211.41	Within 5 SE of $\bar{x}$	1
102.62 < Y < 160.36	Within 1 SD & 5 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y – 102.62) / (160.36 – 102.62)))
211.41< Y < 269.16	Within 5 SE & 1 SD > $\bar{x}$	0.5 × (1 + COS(π × (Y – 211.41) / (269.16 – 211.41)))
Y < 102.62 or Y> 269.16	>1 SD from $\bar{x}$	0
Y = Slope to gross slope ratio (if slope convex)		
0.36 <Y< 0.49	Within 3 SE of $\bar{x}$	1
0.08 < Y < 0.36	Within 1 SD & 3 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y –0.08) / (0.36 – 0.08)))
0.49 < Y < 0.77	Within 3 SE & 1 SD > $\bar{x}$	0.5 × (1 + COS(π × (Y – 0.49) / (0.77 – 0.49)))
Y < 0.08 or Y > 0.77	>1 SD from $\bar{x}$	0
Y = Hazard site		
Y = Within polygon	Not applicable	8

Table 3. *Red-tailed hawk fuzzy logic membership functions of DEM grid cells based on kiting, hovering, and surfing flights.*

Value of variable Y for *i*th grid cell	**Basis of membership function about $\bar{x}$**	**Membership function of grid cell (Values >1 include weightings)**
Y = Ridge Orientation		
Y = W-E	Not applicable	2
Y = NNW-SSE	Not applicable	2
Y = WSW-ENE	Not applicable	1
Y = N-S	Not applicable	1
Y = WNW-ESE	Not applicable	1
Y= NW-SE	Not applicable	1
Y = Other orientation	Not applicable	0
Y = Subwatershed Orientation		
Y = SW, WSW, W	Not applicable	3
Y = WNW	Not applicable	2
Y = N, NNW	Not applicable	1
Y = Other orientation	Not applicable	0
Y = Percent up slope		
86.76 <Y< 95.24	Within $\bar{x}$ ± 5 SE	1
65.53 < Y < 86.76	Within 30 & 5 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y – 65.53) / (86.76 – 65.53)))
95.24 < Y < 101.19	Within 5 & 12 SE > $\bar{x}$	0.5 × (1 + COS(π × (Y – 95.24) / (101.19 – 95.24)))
Y < 95.24 or Y > 101.19	<($\bar{x}$ - 30 SE) or >($\bar{x}$ + 12 SE)	0
Y = Percent up major terrain slope		
77.72 <Y< 92.28	Within $\bar{x}$ ± 10 SE	1
63.16 < Y < 77.72	Within 30 & 10 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y –63.16) / (77.72 – 63.16)))
92.28< Y < 106.84	Within 10 & 30 SE > $\bar{x}$	0.5 × (1 + COS(π × (Y – 92.28) / (106.84 – 92.28)))
Y < 63.16 or Y > 106.84	Outside 30 SE of $\bar{x}$	0

Table 4. *Red-tailed hawk fuzzy logic membership functions of DEM grid cells based on fatality rates at wind turbine locations.*

Value of variable Y for *i*th grid cell	**Basis of membership function about $\bar{x}$**	**Membership function of grid cell (Values >1 include weightings)**
Y = Elevation		
166.42 <Y< 291.07	Within $\bar{x}$ ± 5 SE	1
131.39 <Y< 166.42	Within 1 SD & 5 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y – 131.39) / (166.42 – 131.39)))
291.07 <Y< 326.1	Within 5 SE & 1 SD > $\bar{x}$	0.5 × (1 + COS(π × (Y – 291.07) / (326.1 – 291.07)))
Y < 131.39 or Y > 326.1	Outside 1 SD of $\bar{x}$	0
Y = Ridge elevation		
199.06 <Y< 273.62	Within $\bar{x}$ ± 3 SE	1
139.28 <Y< 199.06	Within 1 SD & 3 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y – 139.28) / (199.06 – 139.28)))
273.62 <Y< 333.4	Within 3 SE & 1 SD > $\bar{x}$	0.5 × (1 + COS(π × (Y – 273.62) / (333.4 – 273.62)))
Y < 139.28 or Y > 333.4	Outside 1 SD of $\bar{x}$	0
Y = Percent up major terrain slope		
45.34 <Y< 67.16	Within $\bar{x}$ ± 3 SE	1
27.85 < Y < 45.34	Within 1 SD & 3 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y – 27.85) / (45.34 – 27.85)))
67.16 < Y < 84.65	Within 3 SE & 1 SD > $\bar{x}$	0.5 × (1 + COS(π × (Y – 67.16) / (84.65 – 67.16)))
Y < 27.85 or Y > 84.65	Outside 1 SD of $\bar{x}$	0
Y = Hazard site		
Y = Within polygon	Not applicable	3

Table 5. *American kestrel fuzzy logic membership functions of DEM grid cells based on kiting, hovering and surfing flights.*

Value of variable Y for *i*th grid cell	**Basis of membership function about $\bar{x}$**	**Membership function of grid cell (Values >1 include weightings)**
Y = Ridge orientation		
Y = W-E	Not applicable	3
Y = WNW-ESE	Not applicable	3
Y = SSW-NNE	Not applicable	1
Y = Other orientation	Not applicable	0
Y = Subwatershed orientation		
Y = W	Not applicable	4
Y = WSW	Not applicable	3
Y = NW, SE	Not applicable	2
Y = SSE, SSW	Not applicable	1
Y = WNW, NNW	Not applicable	1
Y = Other orientation	Not applicable	0
Y = Percent up slope		
71.27 < Y < 99.22	Within ($\bar{x}$ -2 SE) & ($\bar{x}$ + 13 SE)	1
48.92 < Y < 71.27	Within 14 & 2 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y – 48.92) / (71.27 – 48.92)))
99.22 < Y < 101.08	Within 13 & 14 SE > $\bar{x}$	0.5 × (1 + COS(π × (Y – 99.22) / (101.08 – 99.22)))
Y < 48.92 or Y > 101.08	Outside $\bar{x}$ ± 14 SE	0
Y = Percent up major terrain slope		
63.7 <Y< 96.9	Within 5 SE < $\bar{x}$ & 15 SE > $\bar{x}$	1
42.12 < Y < 63.7	Within 18 & 5 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y –42.12) / (63.7 – 42.12)))
96.7 < Y < 101.88	Within 15 & 18 SE > $\bar{x}$	0.5 × (1 + COS(π × (Y – 96.7) / (101.88 – 96.7)))
Y < 42.12 or Y > 101.88	Outside $\bar{x}$ ± 18 SE	0

Table 6. *Burrowing owl fuzzy logic membership functions of DEM grid cells based on burrow locations.*

Value of variable Y for *i*th grid cell	**Basis of membership function about $\bar{x}$**	**Membership function of grid cell (Values >1 include weightings)**
Y = Subwatershed orientation		
Y = S	Not applicable	2.5
Y = ESE, SE	Not applicable	1.5
Y = ENE, E, SSE	Not applicable	1
Y = Other orientation	Not applicable	0
Y = Percent up slope		
5.56 < Y < 20.83	Within ($\bar{x}$ -0.25 SD) & ($\bar{x}$ + 0.5 SD)	1
0.47 < Y < 5.56	Within 0.5 & 0.25 SD < $\bar{x}$	0.5 × (1 - COS(π × (Y – 0.47) / (5.56 – 0.47)))
20.83 < Y < 51.37	Within 0.5 & 2 SD > $\bar{x}$	0.5 × (1 + COS(π × (Y – 20.83) / (51.37 – 20.83)))
Y < 0.47 or Y > 51.37	Outside ($\bar{x}$ -0.5 SD) & ($\bar{x}$ + 2 SD)	0

Table 7. *Burrowing owl fuzzy logic membership functions of DEM grid cells based on fatality rates at wind turbine locations.*

Value of variable Y for *i*th grid cell	**Basis of membership function about $\bar{x}$**	**Membership function of grid cell (Values >1 include weightings)**
Y = Elevation		
168.78 < Y < 193	Within $\bar{x}$ ± 2 SE	1
120.36 < Y < 168.78	Within 10 & 2 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y – 120.36) / (168.78 – 120.36)))
193 < Y < 241.42	Within 2 & 10 SE > $\bar{x}$	0.5 × (1 + COS(π × (Y – 193) / (241.42 – 193)))
Y < 120.36 or Y > 241.42	Outside $\bar{x}$ ± 10 SE	0
Y = Valley elevation		
138.42 < Y < 155.09	Within $\bar{x}$ ± 1.5 SE	1
113.41 < Y < 138.42	Within 6 & 1.5 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y – 113.41) / (138.42 – 113.41)))
155.09 < Y < 180.1	Within 1.5 & 6 SE > $\bar{x}$	0.5 × (1 + COS(π × (Y – 155.09) / (180.1 – 155.09)))
Y < 113.41 or Y > 180.1	Outside $\bar{x}$ ± 6 SE	0
Y = Percent up major terrain slope		
35.51 < Y < 42.49	Within $\bar{x}$ ± 2 SE	1
25.05 < Y < 35.51	Within 8 & 2 SE < $\bar{x}$	0.5 × (1 - COS(π × (Y – 25.05) / (35.51 – 25.05)))
42.49 < Y < 52.95	Within 2 & 8 SE > $\bar{x}$	0.5 × (1 + COS(π × (Y – 42.49) / (52.95 – 42.49)))
Y < 25.05 or Y > 52.95	Outside $\bar{x}$ ± 8 SE	0
Y = Hazard site		
Y = Within polygon	Not applicable	2

Table 8. *Fuzzy logic models developed for Golden Hills North.*

Dependent variable	Model	Max score possible
Golden eagle flights	2×Ridge orientation + 2×Subwatershed orientation + 0.5×(Percent up slope + Percent up major terrain slope) + 0.75×Hill size	15.75
Golden eagle fatalities	Hazard site + (Ridge elevation + Major valley elevation)×RidgeValley + Slope to gross slope×RidgeValley	11
Golden eagle combined	GOEA flights/15.75 + GOEA fatalities/11 + Hazard site	3
Red-tailed hawk kiting	2×(Percent up slope + Percent up major terrain slope) + Ridge orientation + 2×Subwatershed orientation	12
Red-tailed hawk fatalities	Hazard site + 2×Elevation + Percent up major terrain slope	7
Red-tailed hawk combined	(Red-tailed hawk kiting/12 + Red-tailed hawk fatalities/7)/2 + Hazard site	2
American kestrel kiting	2×Subwatershed orientation + Ridge orientation + 4×(Percent up slope + Percent up major terrain slope)	19
Burrowing owl burrows	2.5×Percent up slope + Subwatershed orientation	3.5
Burrowing owl fatalities	Hazard site + Elevation + 2×Valley elevation + Percent up major terrain slope	6
Burrowing owl combined	Burrowing owl fatalities + 2×Burrowing owl burrows	13

Table 9. *Micro-siting actions taken and recommendations made during and after the micro-siting workshop of 17 February 2015 at proposed wind turbine addresses as of 13 July 2015, and followed by revised layouts in December 2015, February 2016, May 2016, July 2016, and March 2017, and site visits in January, May and December 2016. The workshop was held after NextEra had already laid out turbines to minimize collision risk per the models that we provided, so the workshop was mostly about confirming that the wind turbines were planned for relatively less hazardous locations. After the workshop, new sites were added for turbines 15 and 16, which Smallwood visited in June and July 2015 along with other sites where turbines had been moved. The layout was revised again in December 2015, and Smallwood visited the proposed new wind turbine locations in January 2016. The layout was revised again in February and May 2016, and Smallwood visited the proposed new wind turbine locations in May 2016. The layout was revised again in July 2016, and Smallwood visited the proposed new wind turbine locations in December 2016. In the table, stand-alone capital letters refer to cardinal directions, such as N for north and SSE for south-southeast, and "high use areas" refers to golden eagle activity. The color-shaded columns identify the final layout and the final SRC-style hazard ratings. Rows shaded gray denote those addresses removed from the final layout.*

Wind turbine generator						**Golden eagle hazard rating on SRC scale**			**Explanation**	**Smallwood (KSS) recommendation or NextEra action taken**
JUL 2015	**DEC 2015**	**FEB 2016**	**MAY 2016**	**JUL 2016**	**MAR 2017**	**FEB 2015**	**JUL 2015 through JUL 2016**	**MAR 2017**		
1	1	1	1	1	1	6	6	6	High use area, but best micro-site.	None
2	2	2	2	2	2	7	7	7	High use. Site lower than ridge to W & saddles to N & S. No safer site nearby.	None
---	Alt4	Alt 7	Alt 3	Alt 3	3	---	6	6	SRC rating of <7; small history of fatalities.	None
---	Alt5	Alt 8	Alt 2	Alt 2	4	---	8	8	Steep slopes on east-west ridge, an orientation associated with more eagle fatalities. Pad will need deep cut to slope. Old turbines 1313-1319 rated 8, 8, 7.5, 7.5, 7 by SRC, and documented fatalities of 1 golden eagle, 3 red-tailed hawks, 1 ferruginous hawk, 1 prairie falcon, and 4 burrowing owls.	Sited after 2015 workshop. Alt3 site of JUL 2015 would be safer. This site poses considerable risk to golden eagles.
3	3	3	3	3	5	6	6	6	Ridge crest, but within high use area.	None
4	4	4	4	4	6	8.5	7	7	High use area. Was too low in saddle.	Moved 51 m SE to peak
5	5	5	5	5	7	8.5	7.5	7.5	Was within saddle. New site still breaks slope on south side of saddle.	Moved 98 m SSE

Wind turbine generator						Golden eagle hazard rating on SRC scale			Explanation	Smallwood (KSS) recommendation or NextEra action taken
JUL 2015	DEC 2015	FEB 2016	MAY 2016	JUL 2016	MAR 2017	FEB 2015	JUL 2015 through JUL 2016	MAR 2017		
6	6	6	6	6	8	5	5	5	No safer micro-site.	Moved 24 m ESE
8	8	8	8	8	9	7.5	6.5	6.5	High use area, but new site atop ridge.	Moved east
9	9	9	9	9	10	8	6	6	Was within shallow draw in high use area, but new site on higher ground.	Moved 141 m ESE
Alt 3	13	Alt 2	11	11	11	10	8	8	High use on bench at canyon edge, and was close to turbine with worst eagle fatality record in the APWRA. New site farther from canyon.	Moved east 73 m. This site poses relatively high hazard (KSS).
10	14	11	12	12	12	5	5	5	Ridge crest	None
11	15	12	13	13	13	8	7	7	Was low on W-facing slope. New site still close to ravine – rotor might overlap ravine's airspace.	Moved 42 m NNE
12	16	13	14	14	14	4	4	4	West slope	None
13	17	14	15	15	15	5	5	5	Minor ridge next to draw.	None
14	18	15	16	16	16	7	6.5	6.5	N side of saddle, near top. New site is farther from saddle bottom.	Moved 18 m NW
15	19	16	17	17	17	---	5	5	Gradual east slope.	Sited after 2015 workshop
18	23	17	18	18	18	9.5	7.5	7.5	Was in saddle. New site still in high use canyon.	Moved 67 m NW
16	20	18	19	19	19	---	5	5	Gradual east slope.	Sited after 2015 workshop
19	24	19	20	20	20	8.5	7	7	Was in draw, but now on E side of E-W ridge.	Moved 71 m NNW
---	21	Alt 6	Alt 1	Alt 1	Alt 1	---	9.5	9.5	Saddle and break in slope in low terrain at apex of NW concave slope and SW concave slope. SRC rated old turbines 7.5. That portion of string has fatality history of 2 golden eagles, 2 red-tailed hawks and 4 burrowing owls. Telemetered eagle also collided with a turbine in immediate vicinity.	Sited after 2015 workshop. KSS cannot recommend this site due to hazard to golden eagle and other raptors. KSS recommended 2 alternate sites to the south.
---	Alt2	Alt 9	Alt 4	Alt 4	Alt 2	---	10	10	Saddle against larger hill. Old turbines 1277-1280 rated 9 by SRC, and removed 1/15/09 due to hazard rating. Despite brief monitoring history, 1277-1280 were documented with fatalities of 2 golden eagles, 6 red-tailed hawks, 1 American	Sited after 2015 workshop. KSS cannot recommend this site due to hazard to golden eagle and other raptors. Had been removed from

Wind turbine generator						Golden eagle hazard rating on SRC scale			Explanation	Smallwood (KSS) recommendation or NextEra action taken
JUL 2015	DEC 2015	FEB 2016	MAY 2016	JUL 2016	MAR 2017	FEB 2015	JUL 2015 through JUL 2016	MAR 2017		
									kestrel, and 1 burrowing owl. Another 3 burrowing owls recorded at 1275 & 1276. Another 2 red-tailed hawks and 1 American kestrel recorded at 1281 & 1282.	consideration by Meet & Confer of 21 FEB 2017, but returned to final layout.
---	Alt1	Alt 3	Alt 5	Alt 5	Alt 3	---	7.5	7.5	SRC didn't rate the old turbines at this site. Known fatalities between turbines 1281 and 1285 included 2 red-tailed hawks and 1 American kestrel.	Sited after 2015 workshop.
7	7	7	7	7		10	9.5		Within ravine downwind & downslope of intensely used, taller ridge. New site nearly as hazardous as original.	Moved 89 m NNE. KSS cannot recommend site. Removed from final layout.
Alt 2	10	10	10	10		9	9		Complex saddle in high use area. Move did not change hazard profile.	Moved 24 m east. KSS cannot recommend site. Removed from final layout.
17	22	Alt 1	---	---		8	8		Steep W slope of E-W ridge & E side of canyon. Move was too small to matter. Expect high golden eagle use & hovering red-tailed hawk & American kestrel.	Moved 21 m SSW
20	---	20	---	---		9.5	---		Was in middle of saddle. Grading for pad will enhance saddle at new site, & rotor will partially overlap saddle.	Moved 67 m SSE, but FEB 2016 version had it back in the saddle.
21	---	21	---	---		4	---		No terrain issues	None except shifts to accommodate moves of WTG-20 and WTG-22
22	---	22	---	---		4	---		No terrain issues	None other than shifts to accommodate moves of WTG-20 and WTG-23
23	---	23	---	---		10	---		Was in deep saddle between two concave slopes oriented NW-SE	Moved 163 m SSW

Wind turbine generator						Golden eagle hazard rating on SRC scale			Explanation	Smallwood (KSS) recommendation or NextEra action taken
JUL 2015	DEC 2015	FEB 2016	MAY 2016	JUL 2016	MAR 2017	FEB 2015	JUL 2015 through JUL 2016	MAR 2017		
24	---	24	---	---		4	---		No terrain issues	None
---	11	Alt 5	---	---		---	9.5		Low terrain in an area heavily trafficked by eagles. Turbines 1246-1249 were here. Turbine 1249 was rated a 10 by SRC and removed in 3/13/08 and others were rated 8.5 by SRC and removed on 1/20/09. These turbines, despite brief monitoring history, were documented with 1 golden eagle, 9 red-tailed hawks, 1 burrowing owl and 1 northern harrier.	Sited after workshop. KSS cannot recommend a safer location in the immediate area, which is relatively low and intensely used by GOEA.
---	12	Alt 4	---	---		---	8.5		Turbines 1250-1252 were located near here. SRC rated 1251 a 7.5 and 1252 an 8.5, the latter of which was removed on 9/28/10. Turbines 1250-1252 were documented with 1 golden eagle, 4 red-tailed hawks and various other birds.	Sited after workshop. Site of Bonus 1251 would be safer, but GOEA fatality recorded there.
---	---	---	Alt 6	Alt 6		---	---		In saddle at apex of concave slopes to west and east and near old turbine 1249 site, which was rated 10 by SRC and removed 3/13/08. Turbine 1249 and others in string were documented in brief monitoring history with fatalities of 1 golden eagle, 9 red-tailed hawks, 1 burrowing owl and 1 northern harrier.	Sited after workshop. KSS cannot recommend a safer location in the immediate area, which is relatively low and intensely used by GOEA.
Alt 1	21	---	---	---		6	6		West side of canyon. High use.	None

*Note: turbine numbering changes throughout the development of a project, so comments here may refer to alternatively numbered (or removed) turbines.

Table 10. *Average hazard ratings among Golden Hills North wind turbines by proposed layout and wind turbine selection scenario, where the ratings were made by Smallwood during field visits and were based on the Alameda County Scientific Review Committee hazard scale. Note that the total number of turbines in the March 2017 layout is smaller than earlier layouts due to the use of larger-capacity turbines.*

	Average hazard rating (SRC scale) among turbines						
Wind turbine selection scenario	**FEB 2015**	**JUL 2015**	**DEC 2015**	**FEB 2016**	**MAY 2016**	**JUL 2016**	**MAR 2017**
All proposed turbine sites	7.12	6.28	6.98	6.79	6.92	6.92	6.61
Excluding Alt sites	6.95	6.10	7.23	6.21	6.48	6.48	6.25
Best-case toward project capacity	7.00	5.96	6.48	5.94	6.23	6.23	6.25
Worst-case toward project capacity	7.25	6.56	7.44	7.63	7.55	7.55	6.55

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Figure 6. *Fuzzy Logic likelihood surface classes of golden eagle ridge crossing and fatality locations across the Golden Hills North project area, Altamont Pass Wind Resources Area, California, where red corresponds with the highest likelihood of golden eagle collision, orange corresponds with the second highest likelihood, dark green corresponds with the third highest likelihood, and light green corresponds with the least likelihood.*

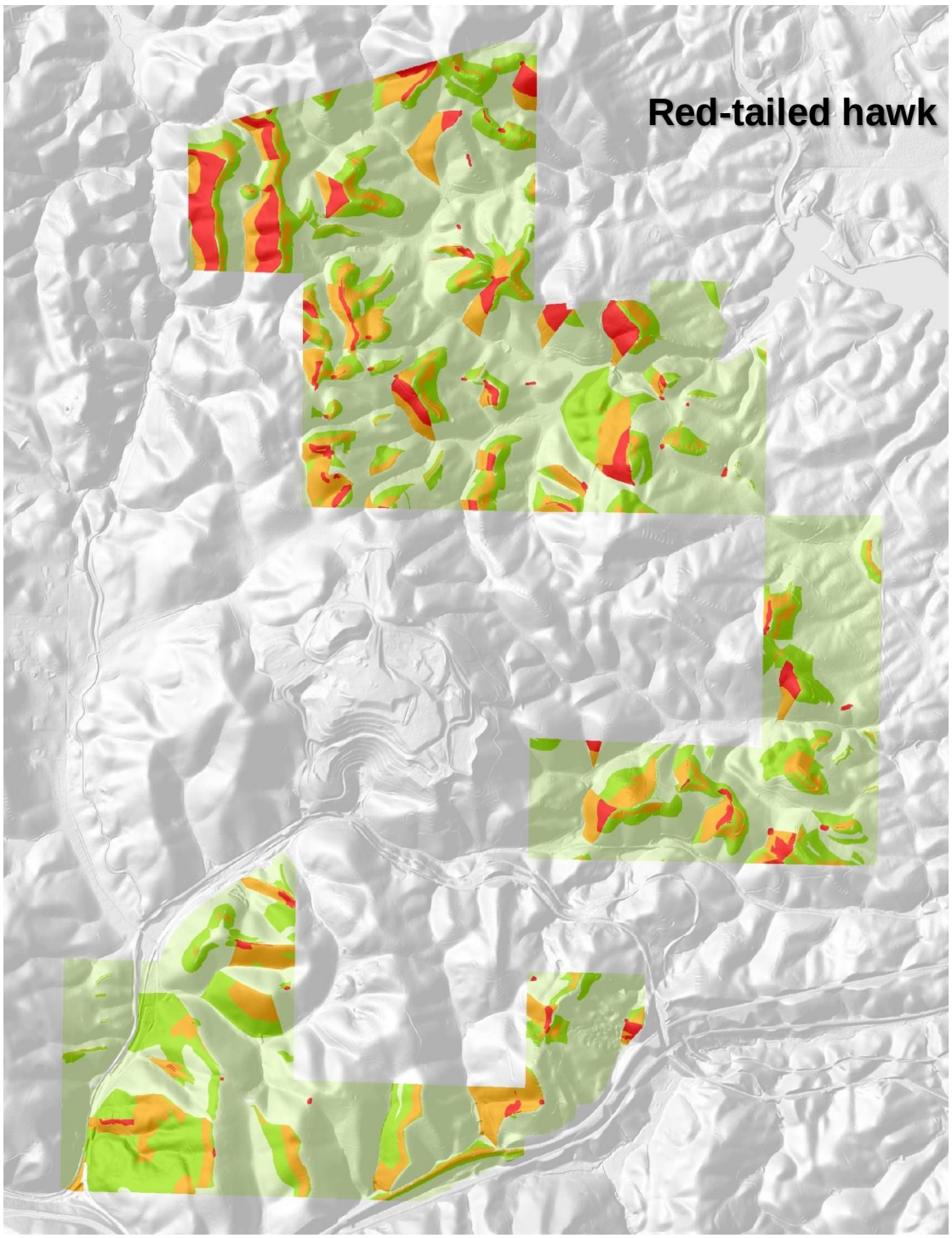

Figure 7. *Fuzzy Logic likelihood surface classes of red-tailed hawk kiting and hovering locations across the Golden Hills North project area, Altamont Pass Wind Resources Area, California, where red corresponds with the highest likelihood of red-tailed hawk collision, orange corresponds with the second highest likelihood, dark green corresponds with the third highest likelihood, and light green corresponds with the least likelihood.*

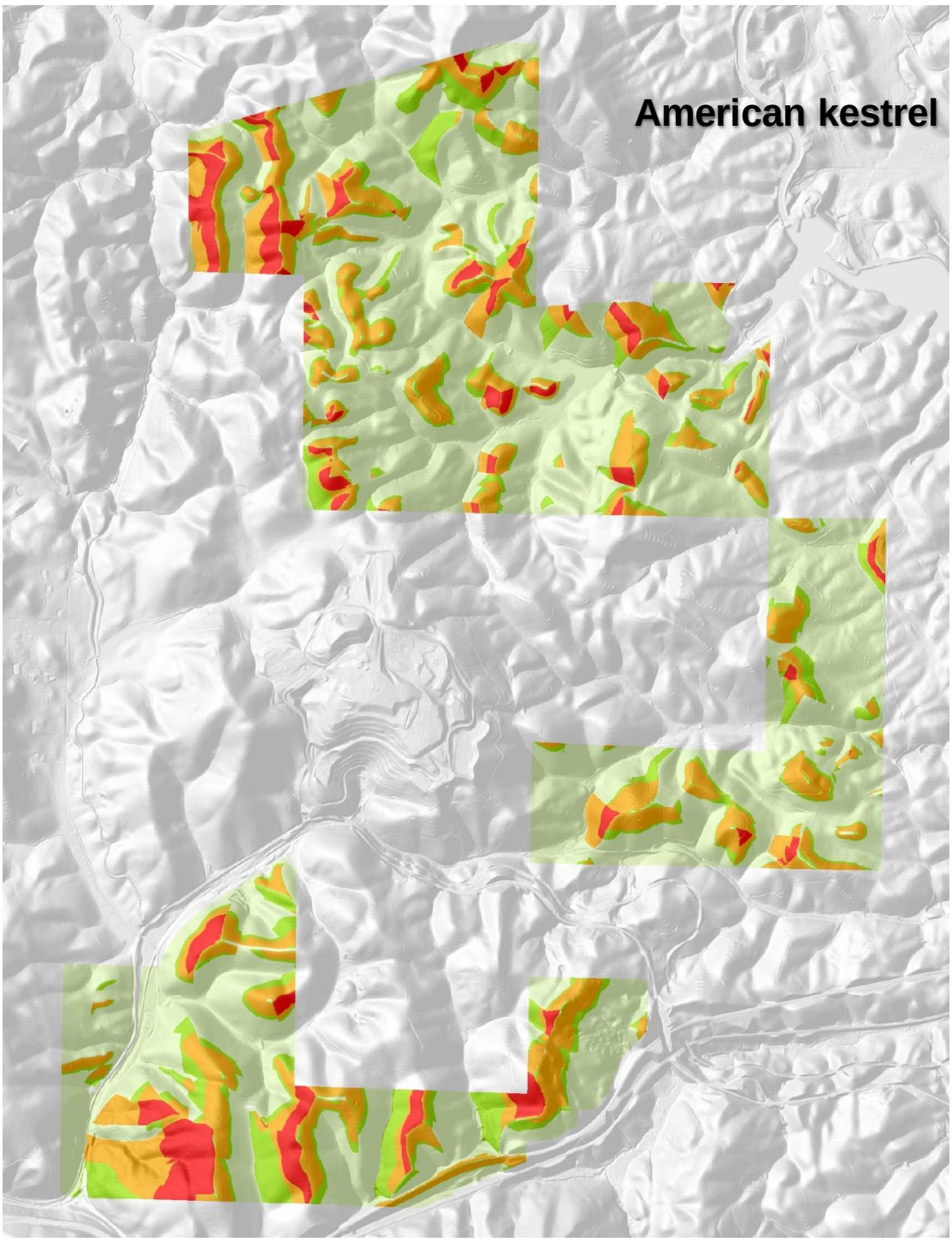

Figure 8. *Fuzzy Logic likelihood surface classes of American kestrel kiting and hovering locations across the Golden Hills North project area, Altamont Pass Wind Resources Area, California, where red corresponds with the highest likelihood of American kestrel collision, orange corresponds with the second highest likelihood, dark green corresponds with the third highest likelihood, and light green corresponds with the least likelihood.*

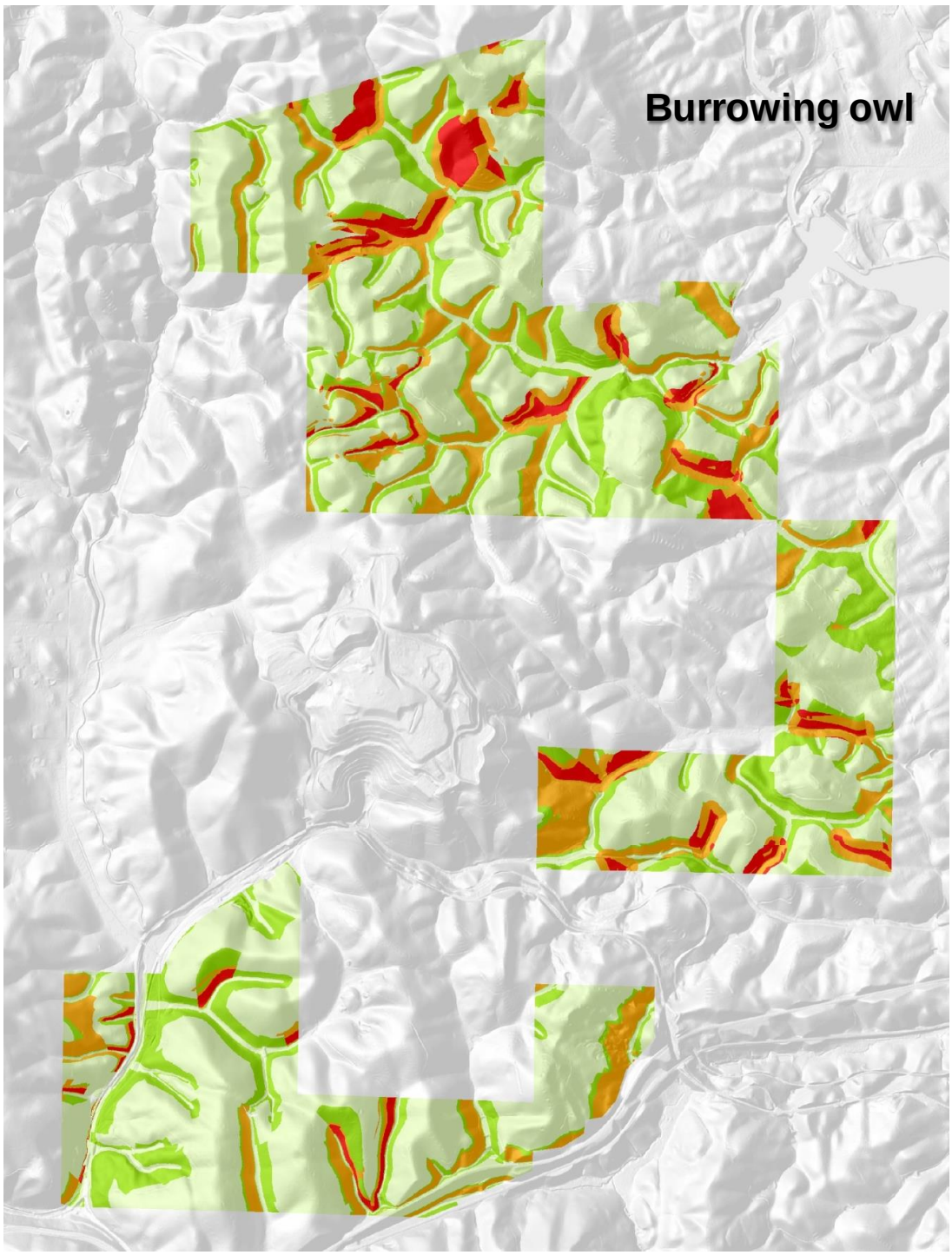

Figure 9. *Fuzzy Logic likelihood surface classes of Burrowing owl burrow and fatality locations across the Golden Hills North project area, Altamont Pass Wind Resources Area, California, where red corresponds with the highest likelihood of American kestrel collision, orange corresponds with the second highest likelihood, dark green corresponds with the third highest likelihood, and light green corresponds with the least likelihood.*

Appendix D
Golden Hills North Avian Mitigation Funds Research Summary

Golden Hills North Avian Mitigation Funds: Research

$241,500 was invested by Golden Hills North, LLC (Phase III of NextEra's Altamont Repowering) and administered by East Bay Regional Park District (EBRPD) for scientific research on the effects of wind turbines on birds and bats in the APWRA. Funds for each phase of repowering are to be transferred within 3 month of Commercial Operation Date (COD).

Proposal	**Total**
An Assessment of the Population-Level Consequences of Wind Turbine-Caused Fatalities to Golden Eagles at the Altamont Pass Wind Resource Area	$133,308
Research of Wind Turbine Impacts on Wildlife in the Altamont Pass Wind Resource Area	$126,473

Remaining $17,681 from Phase II are being held by EBRPD to be administered as supplementary funds for existing projects or to be added to Phase III Mitigation funds for future research.