Appendix F

Historical Documents

Appendix F1

Draft Avian Protection Program

DRAFT

AVIAN PROTECTION PROGRAM

FOR THE

COUNTY OF ALAMEDA ALTAMONT PASS WIND RESOURCE AREA

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Acronyms and Abbreviations

ACAFMT	Alameda County Avian Fatality Monitoring Team
ACPs	advanced conservation practices
AMMs	adaptive management measures
APP	Avian Protection Program
APWRA	Altamont Pass Wind Resource Area
Audubon	Audubon Society
AWI	Altamont Winds Inc.
BACI	before-after-control-impact
BBS	Breeding Bird Survey
BCS	Bird Conservation Strategies
BGEPA	Bald and Golden Eagle Protection Act
Buena Vista	Buena Vista Wind Energy Project
CARE	Californians for Renewable Energy
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CEC Guidelines	California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development
Center	California Raptor Center
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
COD	commercial operation date
County	County of Alameda
CPUC	California Public Utilities Commission
CUP	Conditional Use Permit
Diablo Winds	Diablo Winds Energy Project
Draft ECP Guidance	Draft Eagle Conservation Plan Guidance
ECP	Eagle Conservation Plan
EIR	Environmental Impact Report
enXco	enXco, Inc.
ESA	Federal Endangered Species Act
FAA	Federal Aviation Administration
FR	Federal Register
GPS	global positioning system
HCP	Habitat Conservation Plan

Acronyms and Abbreviations

km2	square kilometer
kW	kilowatt
LUPs	land use permits
MBTA	Migratory Bird Treaty Act
mi2	square mile
MW	megawatt
NCCP	Natural Community Conservation Plan
NextEra	NextEra Energy Resources, LLC
PEIR	Programmatic Environmental Impact Report
QAQC	Quality Control/Quality Assurance
SRC	Scientific Review Committee
SSP	species of special concern
TAC	Technical Advisory Committee
USC	U.S. Government Code
USFWS	U.S. Fish and Wildlife Service
WRA	Wind Resource Area

Purpose and Scope

The County of Alameda (the County) has prepared an Avian Protection Program (APP) that provides a framework and process for wind-energy development to comply with applicable statutes (e.g., the Migratory Bird Treaty Act [MBTA] and Bald and Golden Eagle Protection Act [BGEPA]) within the County portion of the Altamont Pass Wind Resource Area (APWRA), also referred to herein as the Project Area. This APP provides a broad evaluation of existing environmental conditions, bird use, and avian fatalities in the Project Area. It also describes subsequent, project-specific requirements that will streamline permitting and ensure that mitigation and minimization measures are consistent across the County. This APP focuses on the direct impact to avian species from the operation of repowered turbines in the Project Area. It will be included as an addendum to the Repowering Environmental Impact Report (EIR), which will address indirect effects of repowering such as displacement from habitat loss as well as effects from other repowering-related activities, such as construction or maintenance. The Repowering EIR will also address direct and indirect impacts to bat species.

The document is partitioned into two parts. Part 1 of the document addresses the programmatic framework of the effort. Part 2 establishes the goals of the APP as it applies to repowering projects and describes the project-specific measures that will need to be implemented by each project proponent in order to achieve these goals and to obtain a Conditional Use Permit (CUP) from the County. Together, these parts establish a program that mitigates unavoidable impacts to birds from repowering projects in compliance with the 2007 Settlement Agreement and with respect to federal, state, and county policy and regulations (See Section 1.3).

The APP provides requirements for project-specific analyses that will inform the siting, construction, operation, and decommissioning of wind-energy repowering. The APP provides a programmatic evaluation of bird use, existing turbine-related fatality, and estimated impacts based on a series of assumptions about how the Project Area will be repowered. It also includes analyses of eight focal species that were selected based on a) presence in the APWRA, b) the level of impact through collision with wind turbines, c) status as rare or sensitive species, and d) potential for population-level impacts from wind-energy development (See Section 1.2). Subsequent, site-specific Bird Conservation Strategies (BCS) will use this foundational analysis, along with site-specific information, to comply with the requirements of this APP and to streamline additional project-level permitting such as a programmatic eagle take permit (See Section 1.3.1.3). The Project Area for the APP encompasses the entire Alameda County portion of the APWRA (approximately 43,358 acres). The APP itself applies to all repowering projects in the Project Area, excluding the Diablo Winds Energy Project (Diablo Winds), which was constructed in 2004, and the FloDesign research project, which is currently in the planning stages. The APP is organized as follows:

- Part 1 – Programmatic Framework
    - Section 1.0 – Background on the APWRA and the regulatory setting as it applies to wind-energy facilities in the Project Area.
    - Section 2.0 – Existing conditions in the APWRA and its vicinity, including a description of bird use by focal species within the APWRA.
    - Section 3.0 – Impact assessment, including an estimate of future fatalities for the eight focal species based on a fully repowered scenario.

- Part 2 – Project-Specific Requirements
    - Section 4.0 – Preconstruction risk assessment.
    - Section 5.0 – Conservation measures to reduce impacts to birds, including avoidance and minimization and compensatory mitigation.
    - Section 6.0 – Post-construction monitoring and adaptive management.

PART 1
PROGRAMMATIC FRAMEWORK

1.0 Introduction

1.1 Background

In 1980, the California Energy Commission (CEC) identified the Altamont Pass region—spanning the northeast corner of Alameda County and the southeast corner of Contra Costa County—as a "wind resource area," part of a state-wide wind resource system for the production of alternative energy. In September 1998, an Alameda County Zoning Ordinance included wind-energy facilities as an acceptable use and this language was adopted into the County's General Plan as part of the East County Area Plan in 1997. Turbines have operated in the APWRA since the early 1980s.

Currently, two major issues affect the continued generation of wind energy in the APWRA: declining energy production and high avian mortality. Attrition of aging wind turbines (i.e., turbines break down and are not replaced) and the removal of turbines that present a high collision risk to birds have reduced the amount of energy produced overall. Most of the turbines operating in the APWRA were installed in the 1980s. These turbines have a 20-year operating life; many of the existing wind turbines have exceeded this lifespan but continue to operate. Most wind companies in the APWRA have not yet repowered; only one repowering project (Diablo Winds), consisting of 31 turbines, was constructed in the Project Area in 2004 (Map 1); the Vasco Winds repowering project began operation in the Contra Costa County portion of the APWRA in 2012. Two other repowering projects in the APWRA are in planning stages; Tres Vaqueros in Contra Costa County has completed California Environmental Quality Act (CEQA) documentation and is anticipated to go to construction in 2014 or 2015, and FloDesign in the Project Area is in the initial planning stages of installing a research project for a new turbine design.

Several state and federal regulations prohibit taking[1] various bird species (see Section 1.3). The operation of wind turbines are known to result in fatalities (California Energy Commission 1989; Howell and DiDonato 1991; Orloff and Flannery 1992; Erickson et al. 2001). Researchers initially identified turbine-related deaths for birds in the mid-1980s, giving rise to ongoing research to facilitate improvements in design, operational characteristics, and siting of wind turbines that could reduce the number of fatalities. The science associated with understanding collision risk for birds at wind-energy facilities continues to evolve.

In 2005, the County Board of Supervisors issued CUPs for the continued operation of wind turbines in the APWRA, concluding that the decision was categorically exempt from CEQA. Shortly thereafter,

[1] Defined by California Department of Fish and Game (Fish and Game Code §86) as: "To hunt, pursue, catch, capture or kill, or attempt to hunt, pursue, catch, capture, or kill." Under the federal Migratory Bird Treaty Act, "take" means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect (50 CFR 10.12). Under the Bald and Golden Eagle Protection Act, "take" includes to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb (50 CFR 22.3).

five chapters of the Audubon Society (Audubon) and Californians for Renewable Energy (CARE) petitioned the Alameda County Superior Court for a writ of mandate to set aside the County's issuance of the CUPs on various grounds, including that the action violated the County's General Code and CEQA. Beginning in January 2006, Audubon, CARE, and several wind-energy companies engaged in discussions to resolve issues related to the CUPs and wind-turbine operation in the APWRA. The outcome of these discussions was the 2007 Settlement Agreement between Audubon, CARE, and three of the four wind-energy companies then operating in the Project Area: SeaWest Power Resources[2], LLC (also referred to as AES Wind Generation), enXco, Inc. (enXco), and NextEra Energy Resources, LLC (NextEra).

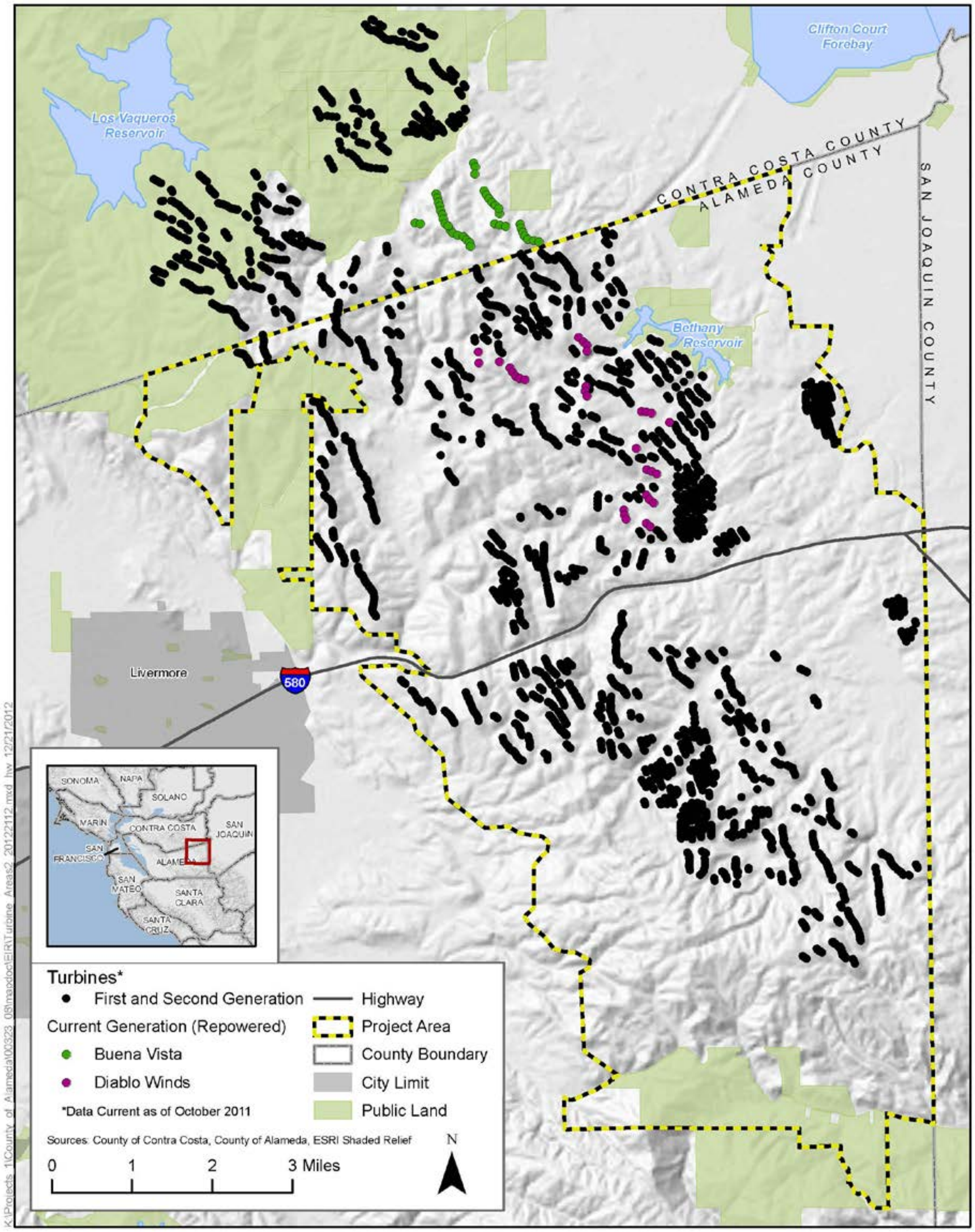
As a result of the 2007 Settlement Agreement, the CUPs of participating wind-energy companies were modified to include measures to reduce raptor turbine-related fatalities in the Project Area. The modified CUPs were approved by the County concurrently with the County's approval of the 2007 Settlement Agreement. The approval of the updated CUPs allowed the wind-energy companies to continue operation while implementing new minimization measures and working towards other provisions of the 2007 Settlement Agreement, including the long-term conservation of impacted species. The 2007 Settlement Agreement identified four species by which to measure the reduction in raptor fatalities against an established baseline: American kestrel (*Falco sparverius*), burrowing owl (*Athene cunicularia*), golden eagle (*Aquila chrysaetos*), and red-tailed hawk (*Buteo jamaicensis*).

The Diablo Winds repowering project in Alameda County and the Buena Vista Wind Energy Project (Buena Vista) in Contra Costa County provide the only two repowered projects in the APWRA for which avian fatality monitoring data are available.[3] Recent data from these projects indicate that current-generation wind turbines may provide a less-risky environment for raptors resulting in lower fatality rates. As such, repowering of all wind turbines in the APWRA has become a focus of recommendations by the APWRA Scientific Review Committee (SRC) (Altamont Pass Wind Resource Area Scientific Review Committee 2011) and a renewed goal for wind-energy companies and environmental stakeholders. However, repowering is not expected to eliminate avian turbine-related fatalities.

[2] SeaWest Power Resources sold all of its assets to FloDesign, Inc. in 2012.

[3] Vasco Winds began operation in January 2012 and monitoring results have not yet been compiled for the first year of operation.

1 **Map 1. Wind Turbines in the Altamont Pass Wind Resource Area**



2

1.2 Focal Species

Although all migratory and resident birds are expected to benefit from the minimization and mitigation measures prescribed in this APP, it specifically addresses eight focal species, including the four species addressed by the 2007 Settlement Agreement (listed above) as well as the barn owl (*Tyto alba)*, loggerhead shrike (*Lanius ludovicianus*), prairie falcon (*Falco mexicanus*), and Swainson's hawk (*Buteo swainsoni*). These additional species were selected based on the results of fatality monitoring within the APWRA (ICF International 2012a; Smallwood 2010) and include rare or special-status species with the potential to be impacted based on fatality monitoring (loggerhead shrike [California species of special concern [SSP]], prairie falcon [CDFW Watch List], Swainson's Hawk [listed as threatened under the California Endangered Species Act [CESA]) or species that experience particularly high fatality rates in the APWRA (barn owl) thus meeting the CEQA criteria for mandatory findings of significance (Section 15065)[4]. Focal species are analyzed to determine the potential effects of repowering the APWRA, but this APP supports the continued tracking and monitoring of all bird fatalities within the Project Area.

1.3 Regulatory Setting

Federal, state, and county regulations require protection for bird species. These regulations, and how they apply to repowering in the APWRA, are briefly summarized below.

1.3.1 Federal and State Regulations

1.3.1.1 Federal Endangered Species Act

The USFWS and the National Marine Fisheries Service have jurisdiction over species listed as threatened or endangered under Section 9 of the federal Endangered Species Act (ESA). The ESA protects listed species from *take*, which is broadly defined as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." For any project requiring a federal agency to take an action where by a listed bird species could be affected, the federal action agency must consult with USFWS in accordance with ESA Section 7. USFWS issues a Biological Opinion and, if the project does not jeopardize the continued existence of the listed species, an incidental take statement is provided. For projects with no federal nexus, proponents of the project affecting a listed species must consult with USFWS and apply for an incidental take permit under Section 10 of the ESA. Section 10 requires an applicant to submit a Habitat Conservation Plan (HCP) that specifies project impacts and mitigation measures. Based on avian use and fatality data (Appendix A), there are no ESA-listed bird species with the potential to be taken in the APWRA.

1.3.1.2 Migratory Bird Treaty Act

The MBTA (16 U.S. Government Code [USC] 703–712) enacts the provisions of treaties between the United States, Great Britain, Mexico, Japan, and the Soviet Union and authorizes the U.S. Secretary of the Interior to protect and regulate the taking of migratory birds. It protects migratory birds (over

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[4] According to CEQA guidelines, a project is considered to have a significant effect on the environment if "it has the potential to… cause a fish or wildlife population to drop below self-sustaining levels" or if it "threaten(s) to eliminate a plant or animal community." (CEQA 15065(a)1).

1,000 species), their occupied nests, and their eggs (16 USC 703; 50 Code of Federal Regulations [CFR] 21; 50 CFR 10). Most actions that result in take—defined as hunting, pursuing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof—are prohibited under the MBTA. Examples of permitted actions that do not violate the MBTA are the possession of a hunting license to pursue specific game birds, legitimate research activities, display in zoological gardens, bird-banding, and other similar activities. The U.S. Fish and Wildlife Service (USFWS) is responsible for overseeing compliance with the MBTA. Monitoring data in the APWRA suggest the potential for turbine related fatalities for multiple bird species protected under the MBTA. The *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines* (Land-based Wind Energy Guidelines; U.S. Fish and Wildlife Service 2012a) identify effective means of documenting measures to avoid and minimize the taking of birds listed under the MBTA and, while permits are not issued for take of these species, the USFWS will take such avoidance and minimization into account when employing its prosecutorial discretion. The Land-based Wind Energy Guidelines are described in more detail below in Section 1.3.2.1.

1.3.1.3 Bald and Golden Eagle Protection Act

The BGEPA (16 USC 668) prohibits take and disturbance of eagles and their nests. Take permits for birds or body parts are limited to religious, scientific, or falconry pursuits. However, the BGEPA was amended in 1978 to allow mining developers to apply to USFWS for permits to remove inactive golden eagle (*Aquila chrysaetos*) nests in the course of “resource development or recovery” operations. In 2009, USFWS issued a final rule on new permit regulations that allow some disturbance of eagles “in the course of conducting lawful activities” including two new permit types: 1) individual permits that can be authorized in limited instances of disturbance and in certain situations where other forms of take may occur, such as human or eagle health and safety; and 2) programmatic permits that may authorize incidental take that occurs over a longer period of time or across a larger area (74 Federal Register [FR] 46836–46879). In April 2012, additional changes were proposed to the regulations governing eagle permitting (77 FR 22267, 2012).

USFWS’s description of its 2009 rule suggests that physical take of an eagle will only be authorized if every avoidance measure has been exhausted. Golden eagles nest in the vicinity of the Project Area and have been killed by wind turbines in the APWRA. In 2011, the USFWS issued guidance regarding the development of an Eagle Conservation Plan (ECP) to comply with BGEPA and to receive take permits under the Act. Although project-level requirements in the APP (see Chapters 4- 6) generally adhere to the approach of the Draft ECP guidance, compliance with this APP is not meant to serve as a comprehensive vehicle for a programmatic take permit under BGEPA; additional advanced conservation measures in coordination with the USFWS may be required as well as analysis under NEPA, for the service to issue a programmatic eagle take permit for project proponents. The Draft ECP guidance is described in more detail in Section 1.3.2.3 below.

1.3.1.4 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]). Research has indicated that APWRA is a population sink for golden eagles due to turbine related fatalities (Hunt and Hunt 2006), thereby suggesting that impacts to golden eagles in the Project Area must be fully mitigated under CEQA if feasible mitigation is available. Section 5 of this APP provides a summary of feasible mitigation.

1.3.1.5 California Endangered Species Act

California implemented CESA in 1984. The act prohibits the take of endangered and threatened species, except as authorized by special permits. Under CESA, *take* is defined as an activity that would directly or indirectly kill an individual of a species, but the definition does not explicitly include non-lethal harm, harassment, or habitat destruction. The California Department of Fish and Wildlife (CDFW) administers CESA and may issue a consistency determination under Section 2080.1 for species that are listed under both the ESA and CESA or a take permit under Section 2081. Fatality monitoring in the APWRA has documented one Swainson's hawk and one sandhill crane fatality, both listed as threatened under CESA. There have been no other documented fatalities of state-listed species in the APWRA.

1.3.1.6 California Fish and Game Code

Fully Protected Species

The California Fish and Game Code provides protection from take of a variety of vertebrate species, referred to as *fully protected species*. Section 3511 lists fully protected birds; and Section 4700 lists fully protected mammals. The California Fish and Game Code defines *take* as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." Until recently, permits for take of fully protected species were only granted related to scientific research, and CDFW could not issue other types of take permits for fully protected species. However, in October 2011 the Governor signed a bill allowing CDFW to permit the incidental take of a fully protected species through a Natural Community Conservation Plan (NCCP) permit. The golden eagle and white-tailed kite are fully protected species that occur within the APWRA for which monitoring indicates the potential for turbine-related fatalities (ICF International 2012a; Smallwood 2010). No NCCP for the incidental take of these species due to wind turbine operation in the APWRA is in place or under development.

Sections 3503 and 3503.5 (Protection of Birds and Raptors)

Section 3503 of the California Fish and Game Code prohibits the killing of birds and the destruction of bird nests. Section 3503.5 prohibits the killing of raptor species and destruction of raptor nests. Typical violations include destruction of active nests as a result of tree removal and failure of nesting attempts (loss of eggs or young) due to disturbance caused by nearby human activity. Consultation with CDFW and appropriate permitting is required if construction activities or project operations will affect nesting birds. Several species of raptors, including American kestrel, red-tailed hawk, and burrowing owl, nest within the APWRA and have had turbine-related fatalities documented during monitoring activities (ICF International 2012a; Smallwood 2010).

1.3.2 Federal and State Guidelines

The USFWS has issued various guidelines to aid wind-energy developers in complying with the MBTA and BGEPA. The CEC and CDFW have also developed guidelines for the permitting and study of wind-energy developments to comply with state regulations. These guidelines and how they relate to this APP are summarized below.

1.3.2.1 U.S. Fish and Wildlife Service Guidelines for Land-Based Wind Development

On March 23, 2012, the USFWS released the final Land-Based Wind Energy Guidelines (U.S. Fish and Wildlife Service 2012a). They provide wind-energy developers with a recommended approach for complying with applicable laws and USFWS regulations to minimize impacts on wildlife species. The guidelines recommend a tiered approach:

- Tier 1 – Preliminary evaluation or screening of potential sites (landscape-scale screening of possible project sites)[5]
- Tier 2 – Site characterization (broad characterization of one or more potential project sites)
- Tier 3 – Pre-construction monitoring and assessments (site-specific assessments at the proposed project site)
- Tier 4 – Post-construction monitoring of effects (to evaluate fatalities and other effects)
- Tier 5 – Research (to further evaluate direct and indirect effects, and assess how they may be addressed)

In general, the guidelines emphasize the importance of careful site evaluation, risk assessment, and post-construction monitoring and research to avoid impacts to wildlife species and assess mitigation measures. The guidelines also include best management practices for turbine repowering and a recommended communication protocol for project proponents and the USFWS. The USFWS notes that voluntary communication and adherence to the guidelines, which are voluntary, will constitute evidence of due care with respect to avoiding, minimizing, and mitigating significant adverse impacts to species protected under the MBTA; it identifies Bird Conservation Strategies (previously termed Avian Protection Plans) as a means of documenting such avoidance, minimization, and mitigation measures. It will take such measures into account when exercising its discretion to enforce the MBTA.

1.3.2.2 Draft Eagle Conservation Plan Guidance

On February 8, 2011, the USFWS (2011) released the *Draft Eagle Conservation Plan Guidance* (Draft ECP Guidance), which provides recommendations for siting and permitting wind-energy projects consistent with BGEPA. In April of 2012, additional changes were proposed to the regulations governing eagle permitting (77 FR 22267, 2012). The USFWS developed the Draft ECP Guidance to resolve uncertainty associated with the Final Eagle Permit Rule (74 FR 46836, 2009), which provided a mechanism for permitting under the BGEPA. The Draft ECP Guidance provides a framework for satisfying requirements for a programmatic take permit under BGEPA. Because the operation of wind-energy facilities leads to ongoing (vs. one-time) impacts to eagles, all BGEPA permits for the wind industry that cover turbine operation are "programmatic" in nature (50 CFR 22.26). The Draft ECP Guidance proposes that proponents comply with BGEPA by:

- Conducting preconstruction assessments to identify eagle-use areas.
- Avoiding, minimizing, and, if necessary, compensating for impacts to eagles.
- Monitoring for impacts during project construction and subsequent turbine operation.

[5] Note that because the APP is focused on the repowering of existing facilities in the Project Area, rather than siting of new facilities, Tier 1 is not relevant to this effort.

The Draft ECP Guidance addresses the full process of project development from the earliest phase of conceptual planning, including turbine siting, to minimization through the improved operation of turbines to compensatory mitigation and monitoring. This overall process includes the following five stages similar to those proposed by the draft Land-Based Wind Development Guidelines:

- Stage 1—Landscape-scale site assessments
- Stage 2—Site-specific assessments
- Stage 3—Risk analysis
- Stage 4—Development of advanced conservation practices
- Stage 5—Post-construction monitoring

The USFWS specifies that the Draft ECP Guidance is not a requirement but recommends that proposed alternatives be closely coordinated with USFWS to meet the regulatory standards for permit issuance. For proponents engaged in development of an HCP under Section 10 of the ESA, the HCP may serve as a permit under BGEPA, as long as the avoidance, minimization, and other measures in the HCP meet BGEPA permit-issuance criteria. This APP includes measures to ensure that potential adverse effects to golden eagles from repowered turbines in the Project Area are compatible with the goal of "stable or increasing breeding populations" as set forth in the *Draft Bald and Golden Eagle Protection Act Standards for Review of Wind Energy Projects* (U.S. Fish and Wildlife Service 2010) and the Draft ECP Guidance (see Chapters 4-6). Specifically, requirements in the APP for preconstruction surveys, risk assessments, fatality estimation, turbine siting, and other conservation measures at the project level generally adhere to the approach of the Draft ECP guidance, which is currently in draft form, to assess risk and minimize impacts to eagles. The emphasis of the Draft ECP Guidance is directed toward establishment of new projects and addressing the importance of siting such projects to minimize disturbance of primary golden eagle use areas. Because the APWRA has already been developed for wind energy, micrositing of repowered turbines will be used to minimize interactions with eagles (see *5.0 Conservation Measures* for discussion).

1.3.2.3 California Energy Commission Guidelines

Published by the CEC and the CDFW, the *California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development* (CEC Guidelines) (California Energy Commission and California Department of Fish and Game 2007) outline the generally accepted procedures for the permitting and study of wind-energy developments in the state. The CEC Guidelines are intended to provide a strategy to reduce impacts on birds and bats from new wind energy-developments or repowering of existing wind-energy projects in California. The CEC Guidelines include recommendations for screening proposed sites; study design; impact assessment; and development of avoidance, minimization, and mitigation measures. Although following the CEC Guidelines is voluntary, they represent predominantly the current state of knowledge on wind-wildlife interactions and generally are accepted by industry and agencies as among the best available resources and frameworks for assessing potential impacts on birds and bats from wind-energy projects in California. Many of the feasible practices to minimize impacts to birds that have been adopted by the wind-energy industry are described in the CEC Guidelines and are incorporated in this APP.

The CEC Guidelines describe four project categories used to determine recommended levels of pre-project study:

- Category 1—Project Sites with Available Wind-Wildlife Data.
- Category 2—Project Sites with Little Existing Information and No Indicators Of High Wildlife Impacts.
- Category 3—Project Sites with High or Uncertain Potential for Wildlife Impacts.
- Category 4—Project Sites Inappropriate for Wind Development.

The CEC Guidelines note that a reduced study effort may be appropriate for Category 1 projects, although they warrant caution in extrapolating existing data to unstudied nearby sites. Factors to consider in determining whether or not data from an adjacent facility would allow a project to be classified as Category 1 include (California Energy Commission and California Department of Fish and Game 2007):

1. Whether the field data were collected using a credible sample design
2. Where the data were collected in relation to the proposed site
3. Whether the existing data reflect comparable turbine type, layout, habitat
4. Suitability for migratory species, physical features, and winds
5. Whether the data are scientifically defensible and still relevant

The Project Area likely falls into Category 1 because there have been extensive fatality monitoring efforts coupled with the collection of bird use and behavior data for both old generation and repowered projects. However, the CEC Guidelines recommend consultation with the lead agency, USFWS, CDFW, biologists with specific expertise, and other appropriate stakeholders (such as a conservation organization representative) when considering whether a project qualifies as Category 1.

1.3.3 County Policy

The *East County Area Plan* (County of Alameda Community Development Agency 2000) contains the following policies and programs pertaining to minimizing adverse impacts to wildlife from wind-energy development:

> **Policy 169:** The County shall allow for continued operation, new development, redevelopment, and expansion of existing and planned wind farm facilities within the limits of environmental constraints.
>
> **Policy 171:** The County shall work with the wind-energy industry, public utilities, other agencies, and energy experts to monitor trends in wind-energy developments, technology, and environmental safeguards.
>
> **Policy 172:** The County shall establish a mitigation program to minimize the impacts of wind turbine operations on bird populations.
>
> **Program 73:** The County shall work with other agencies (federal, state, and local) to establish feasible mitigation for avian collisions with wind turbines. The County will take a lead role with windfarm operators and other agencies in developing and managing a Mitigation Monitoring Program in the Wind Resource Area.

Program 74: The County shall amend the Zoning Ordinance to incorporate siting and design standards for wind turbines to mitigate biological, visual, noise, and other impacts generated by windfarm operations.

Program 75: The County shall revise, as necessary, the conditions of existing conditional use permits for wind turbine operations at the time a permit is due for its five year review to mitigate the effects of wind turbines.

1.3.4 2007 Settlement Agreement

In 2007, Audubon, CARE, and three wind-energy companies (AES, NextEra, and EnXco) entered into a Settlement Agreement to resolve litigation regarding the County's issuance of CUP approvals. The 2007 Settlement Agreement, including Exhibit G-1 of the 2005 CUPs, requires participants to develop an NCCP or a similar agreement to "address the long-term operation of wind turbines at the APWRA and the conservation of impacted species of concern and their natural communities." In particular, the 2007 Settlement Agreement committed the Companies to achieve a 50 percent reduction in avian fatalities from estimated annual fatalities of four focal raptor species (golden eagle, burrowing owl, American kestrel, and red-tailed hawk). Companies who could not demonstrate that these requirements were being met were required by the 2007 Settlement Agreement to institute an adaptive management plan. The adaptive management plan and other components of the Settlement Agreement require strategies to provide protection and enhancement for habitat of raptors and other wildlife. It is the intention of this APP to meet the requirements of the 2007 Settlement Agreement to develop an agreement that addresses the "long-term operation of wind turbines within the APWRA" and to reduce fatalities for the above-mentioned raptor species.

1.4 Bird Abundance and Fatality Studies

Researchers have investigated bird abundance and turbine-related fatalities in the APWRA for over two decades. These various studies include (1) initial studies of bird abundance and turbine-related fatalities, (2) ongoing bird activity and fatality monitoring conducted by the Alameda County Avian Fatality Monitoring Team (ACAFMT; see *1.4.2 Monitoring Program*); and (3) studies investigating bird abundance and turbine-related fatality, including research investigating the potential effect of repowering on birds in the APWRA.

Avian-use surveys conducted by the ACAFMT and other studies as noted below informed Section 2.2, *Avian Use*. Fatality data from the current monitoring program (ICF International 2012b), as well as targeted studies assessing the potential effect of repowering the APWRA on avian fatalities, were used to inform the Impact Assessment (see *3.0 Impact Assessment*).

1.4.1 Initial Studies

Initial bird use and fatality studies in the APWRA began in the late 1980s. Alameda and Contra Costa counties and the California Energy Commission funded bird abundance and mortality research after studies indicated that turbine-related fatalities in the APWRA may have caused population-level impacts to raptor species (Orloff and Flannery 1992, Howell and DiDonato 1991). These studies included raptor observation and fatality surveys around turbines. Orloff and Flannery (1992) estimated 403 wind-farm related deaths to raptors during the first year of surveys and 164 during the second year, with an estimated 39 golden eagles killed each year, finding that American kestrels, red-tailed hawks, and golden eagles were killed more often than would be predicted by their abundance. Continuing their initial study, Orloff and Flannery (1996) further analyzed fatality and observation data collected during the original study and collected and analyzed new data. Among other findings, the analysis indicated that turbine position in row and proximity to canyons was significantly associated with turbine-related fatalities; however, the study was not able to clearly define the causality of varying fatality rates at different turbine types.

Bird abundance and mortality research continued into the 2000s, forming the baseline fatality levels for raptors against which post-repowering fatality reduction in the APWRA is measured, according to the 2007 Settlement Agreement. Funded by the National Renewable Energy Laboratory, these studies estimated APWRA-wide fatalities and investigated other causal factors such as bird behavior, raptor prey availability, and turbine design and distribution, among other landscape attributes (Thelander et al. 2003, Smallwood and Thelander 2004, Smallwood and Thelander 2005). Based on fatality sampling from 1998 to 2003, these efforts concluded that turbines in the APWRA were killing over one thousand raptors each year and thousands of all bird species combined (Smallwood and Thelander 2008).

1.4.2 Monitoring Program

Following the initial studies of avian fatality in the APWRA, a comprehensive, APWRA-wide avian-fatality monitoring program was established and has been operating continuously since 2005. The ACAFMT monitored approximately 2,500 (55%) of the approximately 4,500 turbines currently operating in the APWRA from 2005 through 2009 bird years[6] (ICF International 2012a). The number of turbines monitored was reduced in 2010 to approximately 1,200 turbines. The primary objective of this program is to assess progress toward reducing raptor fatalities by 50% (see Section 1.3.4). The ACAFMT provides annual fatality reports documenting estimated turbine-related fatalities in the APWRA (ICF International 2012a), and uses the available data to assess the effectiveness of management actions such as the seasonal shutdown and removal of hazardous turbines in reducing avian fatalities. Reports have also addressed the potential of repowering for reducing turbine-related avian fatalities. Attempts to assess reductions in avian fatalities from the baseline derived from Smallwood and Thelander (2004) and codified by the 2007 Settlement Agreement failed, primarily because differences in sampling methodology search interval made a valid comparison of the two studies impossible with the data available at the time.

Since October 2005, the ACAFMT has conducted avian-use surveys, which were first implemented at the 31 Diablo Winds repowered turbines from eight observation points, then expanded to the entire APWRA adding seventy additional observation points. The number of observation points has changed over time, and there are presently 77 being monitored. Currently, two 10-minute point surveys are conducted each month at each observation point, recording bird species observed within 600 meters (1,968 feet).

1.4.3 Causality and Repowering Studies

Since the early 1990s, many researchers have investigated bird activity and mortality in the APWRA in an attempt to establish causal relationships and to determine ways to reduce the number of turbine-related fatalities (Orloff and Flannery 1996, Orloff and Flannery 1992). These studies

[6] To better reflect the timing of annual movements of birds through the APWRA, the Monitoring Program bases its analyses on a *bird year*, defined as October 1 through September 30, rather than a calendar year.

include surveys to estimate raptor abundance (Barclay and Harman 2008 unpublished data, Smallwood et al. 2007, Camp 2006 unpublished data, Hunt et al. 1999, Hunt and Hunt 2006), bird use and fatality surveys at repowering projects in the APWRA (Western Ecosystems Technology, Inc. 2008, Insignia Environmental 2012), studies analyzing bird use and behavior to minimize the impacts of repowered turbines (Smallwood and Neher 2011, Smallwood and Neher 2010, Smallwood et al. 2009, Smallwood et al. 2008), and studies estimating the potential reduction in turbine-related fatalities from repowering (Smallwood 2010, Smallwood and Karas 2009, Smallwood and Neher 2004).

2.0 Existing Conditions

2.1 Project Area and Vicinity

2.1.1 Characteristics and Land Use

The Project Area for the APP is located in the Alameda County portion of the APWRA, east of the San Leandro Hills and Walpert Ridge. The Altamont Hills range in elevation from 250 feet in valley bottoms to 1,700 feet at the hilltops. Situated in the Diablo Range west of California's Central Valley, the mostly treeless terrain is characterized by steep slopes in the west changing to gently rolling hills in the east as the Altamont Hills transition to the floor of the Central Valley. Differential air temperatures between the warmer Central Valley east of Altamont Pass and the cooler marine air from the San Francisco Bay cause steady winds of 15 to 30 miles per hour to blow across the Project Area during the mid-afternoon and evening periods between April and September (County of Alameda Community Development Department 1998). This seasonal high wind period is when 70 to 80% of the wind turbine power is generated at the APWRA. Winter wind speeds are lower, averaging 9 to 15 miles per hour.

The prevailing winds, topographic features, and open space that make the APWRA an excellent location for wind-energy production and the area supports extensive wind-energy development. The Project Area is designated as Large Parcel Agriculture under the County Zoning Ordinance and the *East County Area Plan*. Single-family residences, general agriculture, grazing, and riding or hiking trails are all allowed uses. Conditional uses permitted under the CUP include outdoor recreation facilities, transmission facilities, solid waste landfills, and wind-energy facilities (County of Alameda Community Development Agency 2000). The Wind Resource Area (WRA) designation, created within Large Parcel Agriculture in east Alameda County, pertains to existing wind-energy facilities and the County's intention to allow continued development and utilization of wind resources into the future. The WRA designation facilitates real estate disclosures about existing wind-energy facilities and the potential for future wind facilities. In addition to wind energy, the primary land use in this area is grazing.

The same prevailing winds, topographic features, and open space that make the APWRA an excellent location for wind-energy production also support a broad diversity of resident and migratory bird species that regularly move through the wind turbine area (Orloff and Flannery 1996). Diurnal raptors (eagles and hawks), in particular, use the prevailing winds and updrafts for soaring and gliding during daily movement, foraging, and migration. *2.2 Avian Use* provides an overview of bird species that are present in the APWRA with additional descriptions of the focal species. Appendix A lists all bird species observed within the APWRA.

2.1.2 Wind Turbines

There are several thousand wind turbines currently installed in the APWRA (Figure 1). The terms *first-generation*, *second-generation*, and *current-generation* are used to group wind-turbine types with similar technologies currently installed or to be installed in the Project Area. Within the Project Area, first-generation and second-generation wind turbines were designed and installed during the

1980s and 1990s, respectively. The tower height of first- and second-generation turbines ranges from 18 meters to 55 meters. These turbines have an approximate 20-year operating life (the length of time that an individual wind turbine is designed to remain in operation) with 40- to 500-kilowatt (kW) rated capacities and 20 percent to 25 percent capacity factors[7]. Most of the turbines now operating in the APWRA were installed in the 1980s and are first- and second- generation, utility-grade commercial wind turbines, now considered old technology. Current-generation wind turbines are wind turbines designed and installed (or that will be installed) in the 21st century. The tower height of current-generation turbines ranges from 50 meters to 105 meters. Current-generation wind turbines anticipated to be installed by the project proponents have an approximate 25- to 30-year operating life, 1 to 3 MW rated capacity, and a 30 to 35 percent average capacity factor.

Three wind-energy facilities in the APWRA support current-generation turbines: Diablo Winds repowering project (located in the Project Area and operational as of 2004), Buena Vista repowering project (located in Contra Costa County and operational as of 2006), and Vasco Winds repowering project (located in Contra Costa County and operational as of January 2012). Although the 31 Diablo Winds turbines in the APWRA are considered current generation, they are only 50 meters tall with a rated capacity of 660 kW. The Buena Vista repowering project installed 38 turbines, each with a 1 MW capacity rating. The majority of these towers are 55 meters in height, 7 turbines are 45 meters tall, and 2 of the turbines are up to 65 meters tall. The Vasco Winds repowering project installed 34 2.3-MWturbines that are 80 meters tall. The Tres Vaqueros repowering project, located in Contra Costa County and in the planning stages, anticipates installing 2.3-MW rated capacity, 80-meter tower height turbines (Contra Costa County Department of Conservation and Development 2011). As described in the County of Alameda Repowering Program Programmatic Environmental Impact Report (PEIR), three repowering projects—Summit Wind (Altamont Winds Inc. [AWI]) Patterson Pass (enXco) and Golden Hills (NextEra)—are proposed in the Project Area.

Most first- and second-generation wind turbines in the Project Area are operational between February 15 and October 31 because they are restricted by seasonal shutdown requirements resulting from the 2007 Settlement Agreement. The period of shutdown coincides with a period of heavy use by wintering birds, as well as the low-wind periods of the year. The purpose of seasonal shutdown is to reduce the level of avian fatalities. Repowered turbines in the Project Area are exempt from the seasonal shutdown requirements. Variables influencing operation of turbines include wind conditions, maintenance needs, and operational requirements described in the CUPs issued by the County and the land use permits (LUPs) issued by the County of Contra Costa. Seasonal shutdowns have varied from year to year but are currently required annually in Alameda County between November 1 and February 15 of the following year.

2.2 Avian Use

The APWRA supports a broad diversity of resident, migratory, and wintering bird species that regularly move through the wind turbine area (Orloff and Flannery 1996). In particular, diurnal raptors (eagles and hawks) use the prevailing winds and updrafts for soaring and gliding during daily movement, foraging, and migration.

[7] Capacity factor is the ratio of the actual power output of a turbine over a period of time and its potential power output if it had operated at full nameplate capacity the entire time.

Bird use surveys conducted by Western EcoSystems Technology (2008) at the Diablo Winds repowering project, in the north-central portion of the Project Area, from April 2005 to February 2007 documented 27 bird species, including six special-status species: American white pelican (California SSP) golden eagle (fully protected species), northern harrier (SSP), loggerhead shrike (SSP), white-tailed kite (fully protected species), and yellow-billed magpie (USFWS Bird of Conservation Concern).

Insignia Environmental (2012) conducted bird use surveys for the Buena Vista repowering project from February 2008 to January 2011. The six observation points were within the Buena Vista site north and adjacent to the Project Area in Contra Costa County. The six most common species in the area were observed to be red-tailed hawk, common raven (*Corvus corax*), golden eagle, turkey vulture (*Cathartes aura*), American crow (*Corvus brachyrhynchos*), and American kestrel. Raptors, including red-tailed hawk, golden eagle, American kestrel, ferruginous hawk (*Buteo regalis*), burrowing owl, northern harrier (*Circus cyaneus*), and Swainson's hawk (*Buteo swainsoni*; state-listed as threatened), constituted approximately 62 percent of all records. All species identified during these surveys are documented in Appendix A. Additionally, the ACAFMT has documented bird use for the American kestrel, burrowing owl, golden eagle, and red-tailed hawk throughout the APWRA since 2005. Background information regarding the biology of the eight focal species of the APP and their documented presence in the APWRA is provided in the proceeding sections.

2.2.1 Focal Species

2.2.1.1 American Kestrel in the APWRA

Overview of American Kestrel Biology

American kestrels are found in a variety of open to semi-open habitats, including meadows, grasslands, deserts, early field successional communities, open parkland, agricultural fields, and both urban and suburban areas (Smallwood and Bird 2002). Grinnell and Wythe (1927) described the American kestrel as a common resident throughout the San Francisco Bay region. Local nesting records exist in western Alameda County (DiDonato 1987 unpublished data; Seibert 1942) and southern Solano County (Stoner 1937), but no nests have been documented within the Project Area. This species is observed in fields, meadows, and on open hillsides, perched on trees, rocks, fence posts, utility poles and wires, or hovering in mid-air (Polite and Ahlborn 1990).

American kestrels forage on a wide variety of insects, including grasshoppers, cicadas, beetles, dragonflies, butterflies, and moths; small rodents, especially voles and mice; and small birds (Sherrod 1978). Individual diets probably reflect prey availability with respect to season and locale. American kestrels are perch and pounce or hover and pounce predators, rarely pursuing prey on wing (Polite and Ahlborn 1990, Sibley 2000); they tend to perch lower as wind speed increases (Smallwood 1990 as cited in Smallwood and Bird 2002).

The American kestrel is a cavity nester, using tress, snags, rock crevices, cliffs, banks, and buildings (Polite and Ahlborn 1990). Nesting densities vary greatly: typically from 0.11 to 1.74 pairs per square kilometer (km^2) (0.28 to 4.5 pairs per square mile [mi^2]) but as high as 5.4 and 24.7 pairs/km^2 (14.0 and 63.0 pairs/mi^2) (Bird and Palmer 1988). Kestrels often compete with other cavity nesters such as woodpeckers, starlings, owls, bluebirds, nuthatches, chipmunks, and squirrels (Polite and Ahlborn 1990). American kestrels display strong site fidelity to breeding territories and wintering areas; however, little information exists regarding the actual delineation of territory size

(Smallwood and Bird 2002). The breeding season in California occurs between late February and August, with egg laying occurring from mid-March to late June (Smallwood and Bird 2002; B. Power pers. comm.). Reproductive success varies with age, prior breeding experience, prey availability, and weather (Smallwood and Bird 2002). Average age at first breeding is 1 year. Information on lifetime reproductive output in the wild remains undetermined.

Presence in the APWRA

While the California Natural Diversity Database (CNDDB) does not contain records for American kestrel as they are not a federal or state-listed species, previous studies in the region have found the area around the APWRA to be an important winter foraging area and migration corridor for raptors, including American kestrels (California Department of Fish and Game 1993). Natural perches from which this species hunts were scarce before development of the APWRA. Turbines and transmission towers, poles, and lines provide abundant perches and have likely resulted in a substantial increase in American kestrel numbers in the APWRA over historic numbers (Orloff and Flannery 1992). The first year of post-construction monitoring for the Diablo Winds repowering project recorded 18 observations of American kestrels (Western EcoSystems Technology, Inc. 2008). Forty-four observations were recorded in post-construction bird use surveys at the Buena Vista repowering project from February 2008 to January 2011 (Insignia Environmental 2012). Kestrels have been observed throughout the APWRA during surveys conducted by the ACAFMT (ICF International 2012b) with monthly mean usage rates ranging between < 0.01 observations per minute per kilometer^3 (obs/min/km^3) in May to approximately 0.09 obs/min/km^3 in January during the 2010 bird year (ICF International 2012a).

2.2.1.2 Barn Owl in the APWRA

Overview of Barn Owl Biology

The barn owl is found throughout most of the United States, except in the northern portions of the Rockies, Midwest, and Northeast (Marti et al. 2005). Within California, this species is a year-round resident ranging from sea level to 5,500 feet, preferring habitat in grasslands, agricultural fields, chaparral, marshes, and other wetland areas. Barn owls nest in a wide variety of cavities, natural and artificial, such as trees, cliffs, caves, riverbanks, church steeples, barn lofts, haystacks, and nest boxes. Its breeding numbers seem limited by the availability of nest cavities in proximity to adequate densities of prey. Most hunting occurs while flying about 5 to 15 feet above the ground in open habitats, using excellent low-light vision and sound to detect prey (Bunn et al. 1982; Marti 1974). The species occasionally hunts from perches and feeds primarily on mice, rats, voles, pocket gophers, and ground squirrels. It also consumes shrews, insects, crustaceans, reptiles, amphibians, and birds, including meadowlarks and blackbirds (Polite 1990).

The barn owl breeding season in California occurs between January and November, with egg laying potentially occurring during most months as barn owls typically have two broods a year (Marti et al. 2005; Polite 1990). Reproductive success varies with age, prior breeding experience, prey availability, and weather (Marti et al. 2005). Average age at first breeding is 1 year. In northern Utah, Marti (1997) found lifetime reproductive success for breeding females was 1 to 66 eggs (mean = 10.2 ± 7.87) and from 0 to 50 fledglings (mean = 5.98 ± 6.28), while breeding males tended 1 to 35 eggs (mean = 8.7 ± 5.46) and from 0 to 17 fledglings (mean = 4.72 ± 3.87). Barn owls defend only the immediate vicinity of the nest, allowing two or more pairs to nest in close proximity and share the same foraging habitat.

There is no significant continent-wide barn owl population trend. Population declines have been evident in the Midwest and Northeast U.S., while Western U.S. populations appear to be mostly stable. Local threats or declines do not pose a major conservation problem from a global perspective (NatureServe 2012).

Presence in the APWRA

The CNDDB does not contain records for barn owls as they are not a federally or state-listed species. Studies of wind-turbine-related fatalities in the APWRA have found numerous barn owls, suggesting this species is fairly common in portions of the planning area. Barn owls are particularly common in the areas of Brushy Peak and Vasco Caves Regional Preserves, using available rock outcrops, palm trees, and structures for nesting and roosting (EBRPD 2000, EBRPD 2002). Additionally, barn owls have been observed nesting in small numbers in structures including turbines in the APWRA (L. Nason pers. comm.).

2.2.1.3 Burrowing Owl in the APWRA

Overview of Burrowing Owl Biology

In California, the range of the burrowing owl extends through the lowlands south and west from north central California to Mexico, with a small (perhaps extirpated) population in the Great Basin bioregion in northeast California (Cull and Hall 2007) and the desert regions of southeast California (Gervais et al. 2008). Burrowing owl populations have been extirpated from much the San Francisco Bay Area (Trulio 1997; DeSante et al. 2007), although they persist in San Jose, the Tri-Valley area of Alameda County, and the Altamont Hills (Barclay and Harman 2008 unpublished data). Burrowing owl numbers are greatly reduced along most of the California coast from San Francisco to Los Angeles. The remaining major population densities of burrowing owls in California are in the Central and Imperial Valleys (DeSante et al. 2007).

California supports year-round resident burrowing owls and over-wintering migrants (Gervais et al. 2008). Dispersal and migration in burrowing owls that nest in California is variable depending on location and the age of the owls. Many owls remain resident throughout the year in their breeding locales (especially in central and southern California) while some apparently migrate or disperse in the fall (Haug et al. 1993; Coulombe 1971; Harman and Barclay 2007). Owls breeding north of California, in northern California, and at higher altitudes (e.g., Modoc Plateau) are believed to move south during the winter with some birds overwintering in California (Grinnell and Miller 1944; Coulombe 1971; Zeiner et al. 1990; Harman and Barclay 2007).

Burrowing owls typically forage in habitats characterized by low-growing, sparse vegetation and opportunistically consume arthropods, small mammals, birds, amphibians, and reptiles (Haug et al. 1993; Gervais et al. 2008). Insects are often taken during the day, while small mammals are taken at night. In California, crickets and meadow voles were found to be the most common food items (Thomsen 1971). Owls have been detected foraging out to 1 mile from their burrows. Inter-nest distances, which may indicate the limit of an owl's breeding territory, have been found to average between 61 and 214 meters (200 and 702 feet) (Thomsen 1971; Haug and Oliphant 1990).

In California, burrowing owls typically begin pair formation and courtship in February or early March. Burrowing owls are primarily monogamous and typically breed once per year. Both sexes reach sexual maturity at 1 year of age. Clutch sizes range from one to 14 eggs proportional to prey abundance. Eggs hatch asynchronously, which is an adaptation to annual variation in prey abundance allowing for more young to be raised during years when prey is plentiful (Newton 1977, 1979; Wellicome 2005). The young fledge at 44 days but remain near the burrow and join the adults in foraging flights at dusk (Thomsen 1971; Haug et al. 1993; Rosenberg et al. 1998). Productivity in four different regions of California ranged from 1.6 to 2.8 young per nesting attempt and 2.9 to 4.0 young per successful nesting attempt (Klute et al. 2003). Annual nesting success can range from 33% (Thomsen 1971) to 100% (Martin 1973).

Presence in the APWRA

The CNDDB (2012) contains 129 occurrences of burrowing owls in the 10 miles of the Project Area, 31 of which are in the Project Area, with many of these records attributed to sightings of several breeding individuals over multiple years and sightings of birds during the non-breeding season (Map 2). A large number of the CNDDB records occur in the area encompassed by Vasco Road, Diablo Camino, Byron Highway, and Interstate 580. Smaller concentrations of owls have been detected near Mountain House Golf Course on Altamont Pass Road and Lawrence Livermore National Laboratory Site 300 lands along the Alameda and San Joaquin County lines. Using a predictive model, Smallwood et al. (2007) estimated the breeding population of burrowing owls in the APWRA to be between 35 and 75 pairs. At the end of the breeding season, the population was estimated to be between 208 and 446 owls. Focused surveys in 2006–2007 through the central portion of the APWRA found 31 pairs and 46 pairs respectively, suggesting the original breeding population estimate in the APWRA was underestimated (Barclay and Harman 2008 unpublished data). Smallwood et al. (2012) surveyed the APWRA for breeding burrowing owls in 2011 and 2012 across 46 sampling plots from 40 to 100 hectares (99 to 247 acres) in size. They estimated 537 to 635 breeding pairs in 2011 and 576 to 607 pairs in 2012, confirming that prior studies may have underestimated the breeding population. It is believed that the APWRA may contain the largest number of breeding pairs in the San Francisco Bay Area (Barclay and Harman 2008 unpublished data). During the 2010 bird year, monthly mean burrowing owl usage rates across the APWRA ranged between < 0.05 obs/min/km^3 in December to approximately 0.25 obs/min/km^3 in November (ICF International 2012a).

2.2.1.4 Golden Eagle in the APWRA

Overview of Golden Eagle Biology

The golden eagle is a large raptor with resident populations in California. While it can be found in a broad range of habitats where sufficient, accessible prey and satisfactory nest sites are present, golden eagles generally avoid forested, urban, and cultivated agricultural areas, preferring open landscapes of native vegetation. The highest density of golden eagles in the world is found in the Altamont Hills within the County, where the updrafts are favorable and mature oaks interspersed with grassland provide both ideal nest sites and abundant California ground squirrels for prey (Peeters and Peeters 2005).

Golden eagles are most likely to occur where there are dense populations of ground squirrels or rabbits. In addition to their favored prey species, a wide variety of food items are taken: birds, reptiles, carrion, foxes, bobcats, and ungulates (e.g., deer). They may hunt by diving from a high soar, but often fly low, following the contours of the land to surprise their prey.

Golden eagles prefer to locate their nests on cliffs or trees near forest edges or in small stands near open fields (Bruce et al. 1982; Hunt et al. 1995, 1999). Placement of nests in trees just below a ridgeline or hilltop allows nesting eagles to drop down to the nest with heavier prey (Peeters and

Peeters 2005). Golden eagles usually have more than one nest site in a given territory. It is not uncommon for a nest to go unused for a period of years before being refurbished and occupied again, although golden eagles, in general, tend toward high site fidelity for both nesting and wintering areas (Kochert et al. 2002).

Mating occurs from late January through August; eggs are laid from early February to mid-May. Clutch size varies from one to four eggs, but two is the most common number (Johnsgard 1990; Hunt et al. 1995). Incubation lasts 43 to 45 days (Kochert et al. 2002), and the fledging period is about 72 to 84 days (Johnsgard 1990); juveniles may remain in the vicinity of their natal site until evicted by the parents (Brown 1969). During the breeding season, the average foraging home range is roughly 20 to 33 km^2 (8.5 to 12.7 mi^2). In the non-breeding season, resident pairs continue to inhabit and defend their nesting territory, though they may shift their utilization and range size during winter. Floaters (nonbreeding adult eagles without breeding territories) commonly move about regionally until they find a suitable vacant territory or are able to evict a territorial owner (Hunt et al. 1995, 1999). Some migrants may temporarily move into areas used by resident birds during the winter. During the 2010 bird year, monthly mean golden eagle usage rates across the APWRA ranged between approximately 0.10 obs/min/km^3 in July to approximately 0.37 obs/min/km^3 in January (ICF International 2012a).

Presence in the APWRA

The Predatory Bird Research Group estimated that at least 70 active golden eagle territories existed within 20 miles of the APWRA boundary, based on annual surveys from January 1994 to December 1997 (Hunt et al. 1999). These territories were resurveyed and occupancy verified in 2005 (Hunt and Hunt 2006). The CNDDB (2012) includes 18 occurrences of golden eagles within 10 miles of the Project Area; no nests are documented within the Project Area (Map 2). The majority of these records are located to the northwest of the Project Area around Los Vaqueros Reservoir. Nine of the occurrence records documented nesting pairs of golden eagles during at least one breeding season between 2005 and 2008 (CNDDB 2012). Post-construction monitoring at Diablo Winds repowering project over a 2 year period documented 122 golden eagle sightings in the Project Area.

2.2.1.5 Loggerhead Shrike in the APWRA

Overview of Loggerhead Shrike Biology

Loggerhead shrikes once occurred in suitable lowland habitats throughout most of the Bay Area (Grinnell and Wythe 1927). Loggerhead shrikes inhabit open country with a moderate amount of grass cover and areas of bare ground, including shrublands, pastures with fence rows, mowed roadsides, cemeteries, golf courses, agricultural fields, riparian areas, and open woodlands (Yosef 1996; Humple 2008). Preferred territory sites include tall shrubs, trees, fences, or power lines for perching; open areas composed of short grasses, forbs, or bare ground for hunting; plants with thorns or multiple stems and barbed-wire fences for impaling prey; and large shrubs or trees for nesting.

Loggerhead shrike is a sit-and-wait predator using high perches and hovering and diving at prey below. It also hovers while foraging (Yosef 1996). It favors fence lines and utility lines and poles for perching, so it is frequently found along roadways (Yosef 1996). The diet of shrikes varies seasonally, and consists of arthropods, including grasshoppers, crickets, beetles, and caterpillars, reptiles, amphibians, small rodents, and birds (Craig 1978; Yosef 1996). They are perch hunters and take prey primarily from the ground, but occasionally in flight. Banding studies suggest that in the northern portion of their breeding range, loggerhead shrikes move south from areas that have 10 to 30 days of snow cover, with most wintering south of latitude 40°N (Yosef 1996). In California, shrikes are entirely resident south of 39°N (Grinnell and Miller 1944). However, little information exists on the migration routes, timing of migration, and wintering areas, especially for the California population. Loggerhead shrikes in California typically begin pair formation and courtship in February or early March, although resident birds remain paired year-round (Yosef 1996). There is little information on lifetime reproductive success, life span, or juvenile or adult survivorship (Yosef 1996).

Presence in the APWRA

The CNDDB (2012) contains eight occurrences of loggerhead shrikes within 10 miles of the Project Area, three of which are within the Project Area (Map 2). Previous research in the APWRA indicates that this species is widely distributed in the region. Between March 1998 and September 2001, 139 sightings of loggerhead shrikes were documented during behavioral observations across the APWRA (Smallwood and Thelander 2005). Additionally, the species has been observed in many locations across the APWRA, including nests in or on turbine structures (L. Nason pers. comm.) and a nest on a water tower west of Del Valley Reservoir during surveys conducted by the ACAFMT (ICF International 2012b).

2.2.1.6 Prairie Falcon in the APWRA

Overview of Prairie Falcon Biology

The prairie falcon inhabits arid environments of western North America in open plains and shrub-steppe deserts with cliffs, bluffs, or rock outcroppings. An efficient and specialized predator of medium-sized desert mammals and birds, the Prairie Falcon ranges widely, searching large areas for patchily distributed prey. Nesting, postnesting, and wintering ranges are generally widely separated, with movements between ranges being potentially dependent on seasonal availability of prey. A diurnal hunter, the prairie falcon's prey consists predominantly of ground squirrels, small birds, reptiles, and insects. Hunting strategies include still-hunting from a perch, soaring, and low active flight (Phipps 1979). Prairie falcons nest on cliffs with eagles, ravens, and red-tailed hawks, but have also been known to use trees, caves, buildings, and transmission lines (MacLaren et al. 1984, Roppe et al. 1989, Bunnell et al. 1997, Nelson 1974, Pitcher 1977, Haak and Denton 1979). Prairie falcons are monogamous (Platt 1981); however, information regarding mate fidelity is not available. Territory sizes based on records from California (Kaiser 1986) are a 300-400 meter- (984-1312 foot-) horizontal radius from the nest location as well as 100 meters (328 feet) vertically (Ogden and Hornocker 1977, Harmata et al. 1978). Winter territories are not defended (Beauvais et al. 1992), while breeding season territories are patrolled daily (Ogden and Hornocker 1977). Depending on the availability and continuity of cliffs and species density, distances between nests can range from an average of 664 meters (2,178 feet) in southwest Idaho (USGS/BRD Unpub.) to 10.5 km (6.5 miles) in west central Arizona (Millsap 1981). Egg laying begins as early as March with hatching dates ranging from the beginning of April to the end of June in southwest Idaho (USGS/BRD Unpub.). There is typically one brood per year and clutch sizes have been observed to range from 2-6 eggs per nest (Steenhoff 1998).

Presence in the APWRA

Thirteen observations of prairie falcons were recorded during monitoring at two sites within the APWRA, including one nest observed with both male and female adults and one young present (Howell and DiDonato 1991). The CNDDB (2012) documents two prairie falcon occurrences within the Project Area, and 11 more within 10 miles of the Project Area boundary. Twenty-six observations of prairie falcons were recorded during fixed point surveys around the Diablo Winds repowering project from 2005 to 2007 (Western Ecosystems Technology 2008). Historically, rock outcrops in the north of Vasco Road north of the Project Area have supported nesting prairie falcons (L. Nason, pers. comm.).

2.2.1.7 Red-tailed Hawk in the APWRA

Overview of Red-tailed Hawk Biology

Red-tailed hawks occur in California throughout the year. Large numbers of migratory and wintering red-tailed hawks enter the Central Valley from October through February, augmenting the population occurring within the state significantly. Migratory, wintering, and resident red-tailed hawks inhabit California in open areas, such as grasslands, agricultural fields, pastures, and open brush habitats, interspersed with patches of trees or structurally similar features for nesting, perching, and roosting (Polite and Pratt 1990). This species is primarily a sit-and-wait predator that requires elevated perch sites for hunting; however, red-tailed hawks can also be seen soaring over open landscapes and swooping for prey. Their diet includes a wide variety of small to medium-sized mammals, birds, and snakes, with occasional insects and fresh carrion (Preston and Beane 1993). Nest locations vary with vegetation and topography.[8] In the western United States, satellite tracking indicates that adult red-tailed hawks show high fidelity to their summer and winter ranges and to migration routes (Goodrich and Smith 2008).

Pair formation and courtship begins in late winter or early spring (Preston and Beane 1993). Some resident red-tailed hawks remain together and defend territories throughout the year. In California, territories vary from 0.1 to 0.3 square mile with a density of 2.1 breeding pairs per square mile (Fitch et al. 1946). Egg-laying begins between February and June, with the peak laying period occurring between March and May. Clutch sizes in California average 2.92 eggs per nest with a range of two to five eggs. Reproductive success varies with prey abundance, perch density and distribution, and proximity of nests to cogeners (Preston and Beane 1993). Average age at first breeding is not known, but few juveniles (<2 years; possessing a brown tail) of either sex have been observed breeding (Wiley 1975). Lifetime reproductive output remains undetermined.

Presence in the APWRA

While the CNDDB does not contain records for red-tailed hawks as they are not a federal or state-listed species, previous studies found the APWRA and the surrounding region to be an important winter foraging area and migration corridor for raptors, including red-tailed hawks (California Department of Fish and Game 1993). Natural perches from which this species hunts were scarce before development of the APWRA. Turbines and transmission towers, poles, and lines provide abundant perches and may have resulted in a substantial increase in wintering red-tailed hawks in the Project Area over historic numbers (Orloff and Flannery 1992). Despite only a small number of

[8] Observations of nesting red-tailed hawks in the APWRA in 2005 to 2006 were confirmed in the field by Jones & Stokes wildlife biologist Julia Camp.

suitable sites in the APWRA, pairs of red-tailed hawks have been observed nesting in trees or transmission towers (L. Nason pers. comm.).

The first year of post-construction monitoring for the Diablo Winds repowering project recorded 291 observations of red-tailed hawks (Western EcoSystems Technology, Inc. 2008). Red-tailed hawks were the most commonly observed species at the Buena Vista repowering project from February 2008 to January 2011, constituting 26 percent of the observation records (Insignia Environmental 2012). During the 2010 bird year, monthly mean red-tailed hawk usage rates across the APWRA ranged between approximately 0.50 obs/min/km^3 in July to approximately 3.00 obs/min/km^3 in January (ICF International 2012a).

2.2.1.8 Swainson's Hawk in the APWRA

Overview of Swainson's Hawk Biology

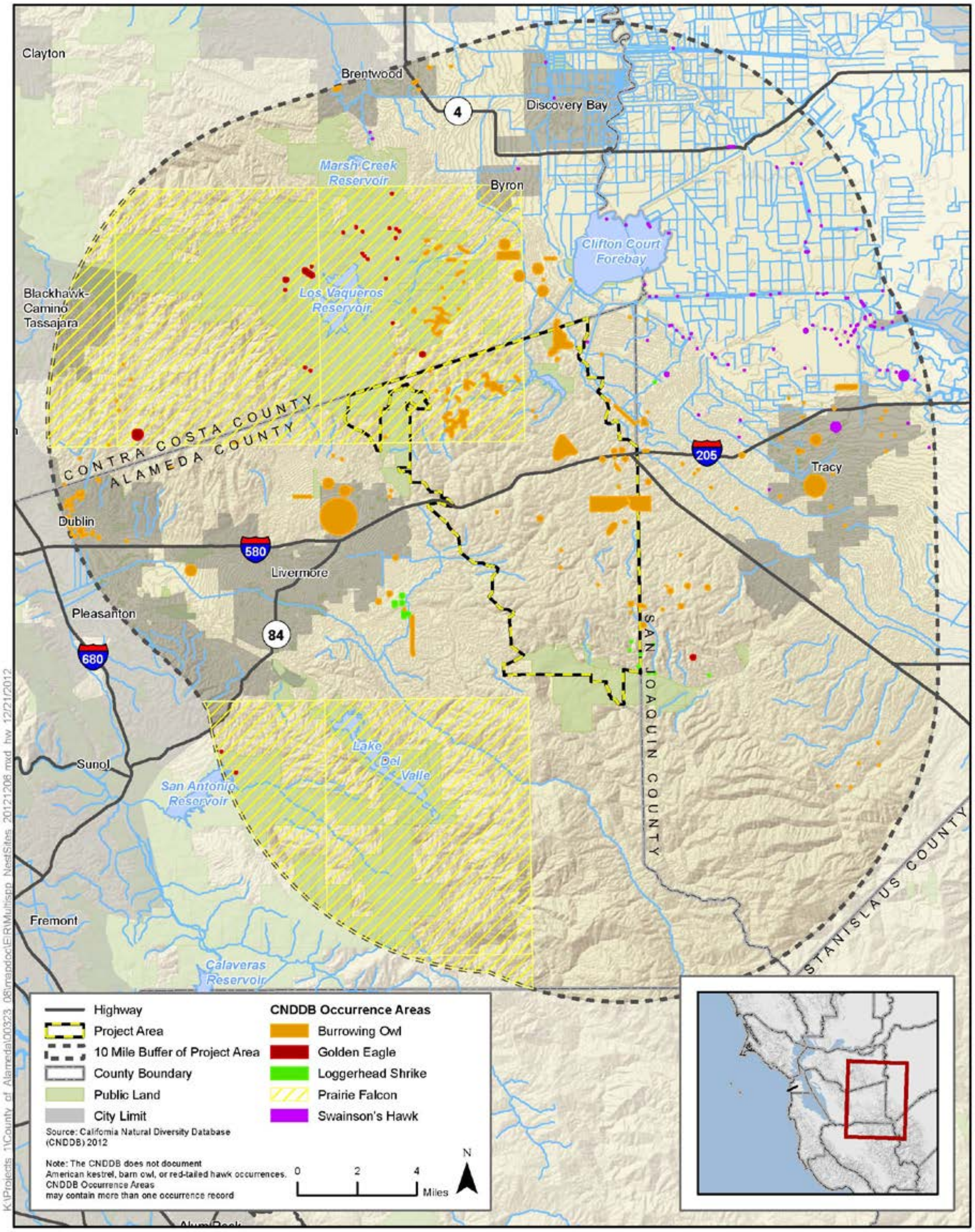
The Swainson's hawk is a diurnal, migratory, highly mobile raptor. Individuals have large home ranges. Swainson's hawks breed in desert, shrub-steppe, grassland, and agricultural habitats in areas throughout most of the western U.S. and Canada, and northern Mexico (England et al. 1995). Historically, breeding populations probably occurred throughout the state of California, except in bioregions characterized by mountainous forested terrain (Bloom 1980). Breeding populations in California currently occur predominantly in two locations, the Great Basin and the Central Valley. Nearly 94% of nesting Swainson's hawks in California are found in the Central Valley (an estimated 1,948 nesting pairs) (Anderson et al. 2007) from Tehama County south to Kern County. This species nests in riparian forest or in remnant riparian trees and forages primarily in agricultural lands (such as fallow fields and alfalfa fields; Estep 1989; Babcock 1995) and natural grasslands. Historically, Swainson's hawk probably foraged in upland and seasonally flooded perennial grasslands (Woodbridge 1998), soaring over open habitats. Central Valley Swainson's hawks prey on small mammals, birds, toads, crayfish, and insects.

During the breeding season, Swainson's hawks form monogamous pairs and will defend territories against conspecifics (Estep 1989). The clutch size is typically one to four eggs (Fitzner 1980; England et al. 1997). In general, Central Valley Swainson's hawks will have a single clutch, which will be completed by mid-April (Estep 1989). Rarely does this species attempt to re-nest if first nest attempt fails. The majority of the North American Swainson's hawk population migrates each winter to Central or South America; a small number of birds (10 to 30 individuals, largely adults) winter in the Sacramento–San Joaquin River Delta each year (Herzog 1996).

Presence in the APWRA

The CNDDB (2012) documents two occurrences of Swainson's hawk within 10 miles of the Project Area (Map 2), but it does not document any Swainson's hawks nesting in the Project Area or within the APWRA. However, Swainson's hawk nests have been documented within approximately 5 miles of the Project Area (Contra Costa County Department of Conservation and Development 2010). In 2003, an active nest was observed on Old River, at the southeast corner of Clifton Court Forebay. In 2006, a pair was observed nesting southeast of Brentwood, 0.25 mile west of the intersection of Kellogg Creek and Bixler roads. A third active nest was recorded in 2009 on private property, near the intersection of Bruns and Christensen Road (CNDDB 2012). Additionally, observations of foraging Swainson's hawk have been made during surveys conducted by the ACAFMT (ICF International 2012b).

Map 2. Focal Species CNDDB Occurrences within 10 Miles of the Project Area



3.0 Impact Assessment

This APP uses data from post-construction monitoring studies for pre- and post-repowering projects within the APWRA to develop an approach for estimating the number of turbine-related fatalities for birds and to provide an estimate of impacts under a scenario in which all of the Project Area is repowered. This chapter begins with an overview of existing fatality estimates (Section 3.1), and is followed by a discussion of post-repowering impacts, or potential future effects (Section 3.2). This analysis is directed at each of the focal species, although some data are presented as generalized impacts to raptors and/or resident and migratory birds. This impact assessment focuses on the direct impact from the operation of repowered turbines in the Project Area. The Repowering EIR addresses indirect effects of repowering such as displacement from habitat loss as well as effects from other repowering-related activities, such as construction or maintenance; however, this APP does seek to minimize effects from these activities through measures detailed in *5.0 Conservation Measures*. This analysis serves as a program-level impact assessment; the project-specific requirements in *4.0 Risk Assessment* and *6.0 Monitoring and Adaptive Management* will provide more accurate and current information on impacts to bird species as a result of repowering the Project Area.

3.1 Pre-Repowering Fatality Estimates

Over 20 years of avian fatality monitoring has taken place within the APWRA (Smallwood and Thelander 2008; ICF International 2012a), and turbine-related fatalities for birds are well documented. Pre-repowering fatality monitoring shows that golden eagles, red-tailed hawks, American kestrels, burrowing owls, barn owls, prairie falcons, and a diverse mix of non-raptor species are killed each year in turbine-related incidents (Howell and DiDonato 1991; Orloff and Flannery 1996; Howell 1997; Smallwood and Thelander 2004; Smallwood 2010; ICF International 2012a).

The ACAFMT has monitored turbines throughout the APWRA (see *1.4.2 Monitoring Program*) since 2005; this monitoring data provides an estimate of existing fatality rates, or baseline, for bird impacts throughout the APWRA. Table 1 presents fatality rate estimates from monitored first- and second-generation (non-repowered) turbines in the APWRA. Table 2 presents the annual fatality rates from all monitored turbines in the APWRA (including Diablo Winds turbines but not Buena Vista turbines) as an indicator of existing impacts to bird species in the Project Area. Table 2 presents estimates of avian impacts from existing turbines in the Project Area and a fully repowered Project Area.

3.2 Post-Repowering Fatality Estimates

Smallwood and Thelander (2004) concluded that the most effective way to reduce bird fatalities in the APWRA is to replace the numerous small turbines currently installed with fewer, larger turbines that generate more energy per turbine. They acknowledged, however, that the effect of repowering on birds was relatively unknown in 2004. Due to changes in technology (e.g., turbine height, distance of rotor to ground, rotations per minute, etc.) as well as revised siting (e.g., strings versus individual placement), the fatality rate under a repowered scenario is expected to be significantly reduced (ICF International 2012a; Smallwood 2010; Smallwood and Karas 2009; Insignia Environmental 2012). In addition, it is possible that different species will be impacted by old- versus current-generation turbines.

Several studies have been conducted to predict the effect of repowering within the APWRA. Monitoring data for the Diablo Winds repowering project (repowered in 2004) from Smallwood and Karas (2009) indicate that fatality rates were 54% and 66% lower for raptors and all birds, respectively, relative to concurrently operating first- and second-generation turbines (2005–2007). Additionally, they predicted that repowering across the APWRA could produce similar reductions for raptors and all birds in general (54% and 65%, respectively). Smallwood (2010) used fatality data from 2005 to 2009 throughout the APWRA to develop multiple baseline fatality-rate estimates, and he compared those to predicted fatality rates at the proposed Tres Vaqueros repowering project in Contra Costa County. He concluded that current-generation turbines would reduce fatality rates by 65% and 61% for raptors and all birds, respectively.

The ACAFMT compared the average of annual adjusted fatality rates at the Diablo Winds and Buena Vista repowering projects to non-repowered turbines across the APWRA to determine if repowering may reduce the number of turbine related fatalities for American kestrel, burrowing owl, golden eagle, and red-tailed hawk (ICF International 2012a). The estimates of the adjusted fatalities rates for the Diablo Winds turbines were significantly lower than the corresponding estimates for the non-Diablo turbines for all species, except burrowing owl, the only species with overlapping 95 percent confidence intervals. The decrease was greatest for golden eagle (89%) followed by American kestrel (88%), red-tailed hawk (36%) and burrowing owl (19%). For the four species as a whole, the decrease was 46%. Reductions were even greater for the Buena Vista site for red-tailed hawk (77%) and burrowing owl (100%, no burrowing owl fatalities were detected at the Buena Vista site). However, the decrease in fatalities for American kestrel and golden eagle were not as great at Buena Vista turbines as they were at Diablo Winds turbines (ICF International 2012a).

It should be noted that the studies estimating fatality rates for repowered turbines summarized above were conducted at current-generation turbines ranging from 660 kW (Diablo Winds) to 1 megawatt (MW) (Buena Vista). Newer turbines used for future repowering will further increase the size and rated capacity of turbines. The repowering project at Vasco Winds is using 2.3 MW turbines, and other projects may use up to 3 MW turbines. Some evidence exists that these larger turbines will continue to reduce fatality rates per MW for birds species currently killed at the APWRA (Smallwood 2010). However, there remains a possibility that larger turbines may affect bird species left unaffected by older (i.e., smaller) turbines. In addition, fatality rates in the APWRA are highly variable (e.g., species impacts may differ between sites due to different levels of use between sites) and potentially imprecise (ICF International 2012a; Smallwood 2010). Nonetheless, these two repowering projects represent the best available science locally to understand the potential reduction in avian mortality associated with repowering and as such, these projects are used to form the bases for reduction estimates.

Tables 1 and 2 summarize estimated fatality rate trends for all monitored turbines in the APWRA, only non-repowered turbines, and repowered turbines (Diablo Winds and Buena Vista). Table 1 depicts the difference in annual estimated fatality rates between non-repowered and repowered turbines. Detection probabilities based on Smallwood (2007), as described in ICF International (2012a), were used in Table 1 in order to include Buena Vista monitoring data in this comparison. Table 2 depicts fatality rates for all monitored turbines and for Diablo Winds turbines using the Quality Control/Quality Assurance (QAQC) detection probabilities (see ICF International [2012a] for an explanation of the QAQC study). The QAQC detection probabilities, generated from a study to provide better estimates of the probability of detecting a fatality that more directly apply to the APWRA monitoring program, provide more accurate fatality rate estimates, and are therefore the rates used to estimate annual fatalities under existing conditions (all monitored turbines in the APWRA since 2005), a non-repowered scenario, and a repowered scenario. Compared to the modified Smallwood (2007) detection probabilities, the QAQC detection probabilities tend to result in lower fatality estimates for larger birds (e.g., golden eagle, red-tailed hawk) and higher fatality estimates for smaller birds (e.g., American kestrel, burrowing owl). QAQC fatality estimates are not available for the Buena Vista repowering project.

Sections 3.3.1–3.3.8 describe potential impacts to each focal species from turbine-related mortality in the Project Area under a fully repowered scenario. Overall bird use observations and all identified species with documented fatalities in the APWRA, including Diablo Winds and Buena Vista repowering projects, are presented in Appendix A.

Table 1. Annual Adjusted Fatality Rates for Non-repowered and Repowered APWRA Turbines

Species	Non-Repowered (Average Annual Fatalities/MW [95% CI]) [a]	Repowered (Average Annual Fatalities/MW [95% CI])	
		Diablo Winds [b]	Buena Vista[c]
American kestrel	0.76 (0.46-1.06)	0.09 (0.06-0.12)	0.15 (0.06–0.24)
Barn owl	0.14 (0.12-0.17)	0.02 (0.02-0.02)	NA[d]
Burrowing owl	0.99 (0.60-1.38)	0.84 (0.53-1.16)	0.00 (0.00-0.00)[e]
Golden eagle	0.09 (0.07-0.10)	0.01 (0.01-0.01)	0. 04 (0.01–0.07)
Loggerhead shrike	0.01 (0.00-0.10)	0.00 (0.00-0.00)	0.00 (0.00-0.00)[e]
Prairie falcon	0.01 (0.00-0.01)	0.00 (0.00-0.00)	NA[d]
Red-tailed hawk	0.32 (0.26-0.38)	0.20 (0.17-0.24)	0. 10 (0.05–0.15)
Swainson's hawk	0.00 (0.00-0.00)	0.00 (0.00-0.00)	0.00 (0.00-0.00)[e]
All raptors	2.39 (1.59-3.20)	1.21 (0.80-1.61)	0.31[f]
All native non-raptors	6.71 (0.04-13.37)	2.51 (0.20-4.81)	1.01[f]

Note: See Figures 1a and 1b for a graphical depiction of these data.

Source: ICF International (2012a, 2012b) and Insignia Environmental (2012).

CI confidence interval

NA Adjusted fatality rates not available. One barn owl fatality and one prairie falcon fatality were documented at Buena Vista (Insignia Environmental 2012).

[a] Fatality rates were averaged across monitored turbine operating groups that do not contain repowered turbines for the bird years 2005 through 2010 (October 1 through September 30) based on modified Smallwood (2007) detection probabilities (ICF International 2012a).

[b] Fatality rates were calculated using Diablo Winds turbines only for the 2005 through 2010 bird years based on modified Smallwood (2007) detection probabilities (ICF International 2012b).

[c] Fatality rates based on monitoring conducted from February 2008 through January 2011 based on modified Smallwood (2007) detection probabilities (ICF International 2012a).

[d] One documented fatality.

[e] No documented fatalities.

[f] Confidence intervals not available.

Table 2. Estimated Fatalities per Year for Existing and Repowered Project Area

Species	Project Area 2005-2010 Average (95%CI) [a]	Repowered Project Area Based on Diablo Winds 2005-2009 Average (95%CI)[b]	Percent Decrease (%)	Repowered Project Area Based on Buena Vista 2008-2011 Average (95%CI)[c]	Percent Decrease (%)
American kestrel	227.7 (158.2-297.3)	27.2 (18.9-35.6)	88.0	62.5 (25.0-99.9)	72.6
Barn owl	89.8 (67.8-111.8)	14.2 (11.6-16.7)	84.2	NA[d]	–
Burrowing owl	279.7 (183.0-376.3)	264.8 (178.5-351.1)	5.3	0.0 (0.0-0.0)	100.0
Golden eagle	41.8 (34.5-49.0)	4.5 (4.1-4.9)	89.2	16.7 (4.2-29.1)	60.1
Loggerhead shrike	54.9 (25.7-84.1)	0.0 (101.7-142.2)	100.0	0.0 (0.0-0.0)	100.0
Prairie falcon	5.0 (3.0-7.1)	0.0 (0.0-0.0)	100.0	NA[d]	–
Red-tailed hawk	185.5 (145.3-225.7)	122.0 (332.2-573-2)	34.2	41.6 (20.8-62.5)	77.6
Swainson's hawk	0.69 (0.18-0.50)	0.0 (0.0-0.0)	100.0	0.0 (0.0-0.0)	100.0
All raptors	865.2 (246.0-619.2)	452.7 (332.2-573.2)	47.7	128.0[d]	85.2
All native non-raptors	1,355.27 (732.2-1,978.3)	739.1 (404.0-1,074.1)	45.5	422.3[d]	68.8

Note: See Figures 2a and 2b for a graphical depiction of these data.

Source: ICF International (2012a), ICF International (2012b), Insignia Environmental (2012)

CI Confidence interval

NA Adjusted fatalities rates not available. Post-construction monitoring documented one fatality.

[a] Annual fatalities were averaged across all monitored turbine operating groups in the Project Area, including Diablo Winds turbines, for the 2005 through 2010 bird years (October 1 through September 30) using the Quality Assurance/Quality Control (QAQC) detection probabilities (ICF International 2012a).

[b] Average annual fatalities for the 2005 through 2009 bird years using the QAQC detection probabilities (ICF International 2012a) were multiplied by the maximum allowed installed capacity of the Project Area, 416.4 megawatts, as documented in County of Alameda Community Development Department (1998).

[c] Average annual fatalities from 2008 through 2011 based on modified Smallwood (2007) detection probabilities (ICF International 2012a) were multiplied by the maximum allowed installed capacity of the Project Area, 416.4 megawatts, as documented in County of Alameda Community Development Department (1998).

[d] Annual fatalities from Insignia Environmental (2012). Confidence intervals not available.

3.3 Focal Species Impact Assessment

3.3.1 American Kestrel Impact Assessment

Estimate of Fatalities

As shown in Table 2, a fully repowered Project Area is estimated to result in 27 American kestrel fatalities per year (0.07 fatalities/MW/year) based on Diablo Winds monitoring data (ICF International 2012b), or 62 fatalities per year (0.15 fatalities per MW per year) based on Buena Vista monitoring data (ICF International 2012b). Based on these projections, repowering the Project Area could decrease the average annual fatalities of American kestrels by 88 percent or 73 percent, respectively. Over a 30-year CUP permit term, approximately 566 to 1067 American kestrel fatalities are anticipated, based on the 95 percent confidence interval of the annual fatality rate at Diablo Winds turbines. The 95 percent confidence interval of the Buena Vista fatality estimate would project 749 to 2,998 kestrel fatalities per year from a repowered Project Area.

Potential Impact of Repowering

The North American population of American kestrels is estimated at more than 4,000,000 birds, representing 75 percent of the global population (Hawk Mountain 2007). Populations have declined over the western U.S. since the 1980s, pronouncedly so since the 1990s (Hawk Mountain 2007). This trend is also apparent for California's foothill and Central Valley populations (Sauer et al. 2008). North American Breeding Bird Survey (BBS) data indicate a decline in American kestrels for Coastal California and the state as a whole (Sauer et al. 2011), as do Christmas Bird Count data for California (National Audubon Society 2011).

Based on the estimated annual fatalities in Table 2, adverse effects to American kestrel from wind turbines will substantially decrease with repowering in the Project Area. In addition, the conservation measures in *5.0 Conservation Measures* will further limit prey availability and reduce the number of potential perch sites in the Project Area, potentially reducing the exposure of American kestrels to turbine hazards. Furthermore, the wind-swept zone of repowered turbines will be higher off the ground, potentially reducing the risk to kestrels, as they are generally perch and pounce predators, perching lower in higher wind speeds (see Section 2.2.1.1).

Annual fatality rates for American kestrel in the APWRA from 2005 to 2010, in the range of 0.34 to 0.59 fatalities/MW/year, do not indicate any trend (ICF International 2012a). Considering that American kestrel fatalities are likely to substantially decline with repowering (ICF International 2012a; Smallwood 2010; Smallwood et al. 2009), repowering the Project Area is unlikely to have adverse impacts on American kestrels at the population level.

3.3.2 Barn Owl Impact Assessment

Estimate of Fatalities

As shown in Table 2, a fully repowered Project Area is estimated to result in 14 barn owl fatalities per year (0.03 fatalities/MW/year) based on Diablo Winds monitoring data (ICF International 2012b). No adjusted fatality rate for barn owls is available from Buena Vista, although post-construction monitoring from 2008 to 2011 documented only a single fatality. Based on Diablo

Winds monitoring projection, repowering the Project Area could decrease the average annual fatalities of barn owls by 84 percent. Over a 30-year CUP permit term, approximately 349 to 501 barn owl fatalities are anticipated, based on the 95% confidence interval of the average annual fatality rate at Diablo Winds.

Potential Impact of Repowering

Barn owls are common in California with a stable population in the state (Audubon California 2010). Although BBS results may indicate a declining population in the state (Sauer et al. 2011), the data are of limited creditability due to sampling deficiencies (Sauer et al. 2011). Barn owls are used throughout California for rodent control in orchards and vineyards (Barn Owl Box Company 2012). It is uncertain what the effect of repowering the Project Area will have on local barn owl populations. The higher wind-swept zone of repowered turbines may reduce the risk of turbine collision as most hunting is done in low quartering flights at about 1.5-4.5 meters above the ground (Marti 2005). The conservation measures in *5.0 Conservation Measures* will also reduce the perch availability in the Project Area. It is unclear what the effects of the estimated 349 to 501 turbine-related fatalities of barn owls over a 30-year period will have on the local population, but the species' relative abundance in the state would indicate that fatalities as a result of repowering would be unlikely to have adverse impacts on the species at the population level.

3.3.3 Burrowing Owl Impact Assessment

Estimate of Fatalities

As shown in Table 2, a fully repowered Project Area is estimated to result in 265 burrowing owl fatalities per year (0.64 fatalities/MW/year) based on Diablo Winds monitoring data (ICF International 2012b). As shown in the table, this rate would result in a 5 percent decrease in burrowing owl fatalities per year. Over a 30-year CUP permit term, approximately 5,490 to 11,290 burrowing owl fatalities are anticipated, based on the 95 percent confidence interval of the average annual fatality rate at Diablo Winds. However, post-construction monitoring at the Buena Vista repowering project of a three-year period did not document a turbine-related burrowing owl fatality, indicating highly variable burrowing owl abundance in the Project Area and suggesting the fatality estimate from Diablo Winds monitoring may overstate the number of fatalities resulting from a fully repowered Project Area.

Potential Impact of Repowering

Focused surveys in Contra Costa County in 2006 on 3.3 mi^2 and 2007 on 4.4 mi^2 in the APWRA found 56 pairs and 67 pairs, respectively (Barclay and Harman 2008 unpublished data), suggesting that the APWRA could support several hundred pairs of burrowing owls dispersed in clumps. Smallwood et al.'s (2012) surveys in 2011 and 2012 estimated approximately 500 to 600 breeding pairs, ranging in density from 0 to approximately 28 breeding pairs per km^2. Since this species has been extirpated from much of the San Francisco Bay Area, it is believed that the APWRA may contain the largest number of breeding pairs in the San Francisco Bay Area (Barclay and Harman 2008 unpublished data). Studies of burrowing owls in the APWRA have suggested that turbine-related mortalities may lower adult and juvenile survivorship sufficiently to make the local population not self-sustaining in some years (Smallwood et al. 2008), but recent surveys indicate that burrowing owl abundance in the APWRA may be much greater than previously estimated (Smallwood et al. 2012).

Monitoring at Diablo Winds indicates only a slight reduction in annual fatalities in a fully repowered Project Area (Table 2). However, these estimates are based on monitoring at Diablo Winds turbines only, which may not be an accurate characterization of the risk to burrowing owls from repowering the Project Area. For example, the higher wind-swept area of repowered turbines (Diablo Winds turbines are smaller than current generation turbines to be installed; see Section 2.1.2) is likely to reduce the exposure of the species to turbine collisions. The species feeds primarily on the ground from both perch and by hovering low to the ground. Hunting typically occurs at about 33 feet (10 meters) above ground, while direct flights back to the nest (prey delivery) are 3 to 6 feet (1 to 2 meters) (Haug, et al. 2011) limiting exposure to the higher wind-swept zone of repowered turbines. Furthermore, results of post-construction mortality monitoring over 3 years at the Buena Vista repowering project (i.e., taller turbines) recorded zero burrowing owl fatalities (Insignia Environmental 2012). Considering the evidence of burrowing owl density in the APWRA may be greater than previous estimates (Barclay and Harman 2008 unpublished data) and that burrowing owls may be at less risk of turbine collision from repowering (Smallwood 2010; Smallwood et al. 2009; Insignia Environmental 2012), the proposed project is unlikely to have an adverse impact to burrowing owls at the population level.

3.3.4 Golden Eagle Impact Assessment

Estimate of Fatalities

As shown in Table 2, a fully repowered Project Area is estimated to result in 5 golden eagle fatalities per year (0.01 fatalities/MW/year) based on Diablo Winds monitoring data (ICF International 2012b), or 17 fatalities per year (0.04 fatalities/MW/ year) based on Buena Vista monitoring data (ICF International 2012b). Based on these projections, repowering the Project Area could decrease the average annual fatalities of golden eagles by 89 percent or 61 percent, respectively. Over a 30-year CUP permit term, approximately 122 to 148 golden eagle fatalities are anticipated, based on the 95% confidence interval of the average annual fatality rate at Diablo Winds. The 95 percent confidence interval of the Buena Vista fatality estimate would project 125 to 875 golden eagle fatalities over the permit term.

Potential Impact of Repowering

Portions of the Diablo Range in southern Alameda County and eastern Contra Costa County support some of the highest known densities of golden eagle nesting territories in the world (Hunt and Hunt 2006). In the past 15 years, several comprehensive studies, discussed below, estimated territory occupancy (number of breeding pairs), assessed reproductive rates, and monitored juvenile, sub-adult, and floater[9] range and mortality.

Hunt (2002) examined data collected data over a 7-year period between 1994 and 2002 that included the monitoring of 60 to 70 active territories within 30 km (11.6 miles) of the APWRA. In 2005, these territories were found to still be 100% occupied (Hunt and Hunt 2006). The conclusions of these studies were that the golden eagle population remains stable (Hunt 2002; Hunt and Hunt 2006). In addition, the studies found no increase in the number of actively breeding sub-adults, indicating that there are enough floaters to buffer any loss of breeding adults (Hunt 2002; Hunt and Hunt 2006). The conclusion of a stable golden eagle population in the APWRA vicinity is supported

[9] A juvenile is 3-15 months of age, a sub-adult is 1 to 3 years of age, and a floater is a non-breeding, non-territorial adult individual over 4 years of age (Hunt 2002).

by the results of a population dynamics model that used reproduction rates and fatality rates, among other variables (Hunt 2002). However, the model results also suggested that the number of estimated annual fatalities used in the model, 50 individuals, could not be sustained by the number of breeding adults when considering the loss of reproductive potential incurred by each eagle fatality (Hunt and Hunt 2006). Although the vacant territories are filled by floaters and subadults to stabilize the APWRA population, because the population demands a flow of recruits from outside the area to fill breeding vacancies as they occur, it can be considered a population sink. The researchers conclude, therefore, that turbine-related mortality reduces the resilience of the local golden eagle population.

Table 2 shows an estimated 4 to 5 fatalities per year in a fully repowered Project Area, less than 10 percent of the 50 fatalities estimated for the Hunt (2002) model. This fatality estimate is only based upon monitoring at Diablo Winds turbines, and does not incorporate data from Buena Vista repowering project post-construction monitoring. The Buena Vista repowering project is located to the north of the Project Area and is closer to the watershed lands surrounding Los Vaqueros reservoir (Map 1) where the densest area of golden eagle nests in the APWRA exists (Figure 2). The fatality estimate using Buena Vista data has a wide range based on its 95 percent confidence interval, predicting 4 to 29 golden eagle fatalities per year from a fully repowered project area. These annual fatality estimates, when compared to current conditions, would indicate the repowering the Project Area would reduce golden eagle fatalities and increase the potential for restoring a self-sustaining local breeding population.

3.3.5 Loggerhead Shrike Impact Assessment

Estimate of Fatalities

No documented fatalities of loggerhead shrikes have occurred at Diablo Winds or Buena Vista repowering projects, so it is difficult to predict the annual fatalities that could occur from a fully repowered Project Area; however, the lack of documented fatalities would suggest a reduced level of fatality risk from current conditions, based on the average of 55 estimated fatalities per year in the Project Area from 2005 to 2010 (Table 2).

Potential Impact of Repowering

Grinnell and Wythe (1927) (as cited in Shuford and Gardali 2008) described loggerhead shrike as an "abundant" resident in the San Francisco Bay region. However, birds have been extirpated locally or reduced in numbers by habitat loss (Shuford and Gardali 2008). BBS data for California's shrike population show a negative trend from 1968 to 2010 (Sauer et al. 2011). Due to the lack of documented fatalities at repowered facilities in the Project Area, it is difficult to determine how a fully repowered scenario may impact the regional loggerhead shrike population. Minimizing available perches through conservation measures presented in *5.0 Conservation Measures* and increasing the height of the rotor swept zone of repowered turbines may reduce the risk of turbine collisions for the species, as they mostly take prey on the ground (see Section 2.2.1.5). Careful monitoring of fatalities, ensuring that the protocols implemented are likely to detect loggerhead shrike fatalities, will be important for understanding impacts to this species and implementing adaptive management measures, as appropriate.

3.3.6 Prairie Falcon Impact Assessment

Estimate of Fatalities

No documented fatalities of prairie falcons have occurred at the Diablo Winds project, and only a single fatality over 3 years of post-construction monitoring has occurred at the Buena Vista repowering project, so it is difficult to predict the annual fatalities that may occur from a fully repowered Project Area; however, the lack of documented fatalities would suggest a reduced level of fatality risk from current conditions, based on the average of 5 estimated fatalities per year in the Project Area from 2005 to 2010 (Table 2).

Potential Impact of Repowering

Across North America, the prairie falcon population is stable but experiencing local declines; in California, the species is vulnerable to extirpation (NatureServe 2012). Within the APWRA and its vicinity, the species is somewhat rare, with less than three yearly sightings in the region during summer BBS counts from 2006 to 2010 (Sauer et al. 2011). State-wide, however, BBS trends may indicate an increase in abundance, although the data are of limited credibility due to the small sample size (Sauer et al. 2011). Due to the lack of documented fatalities at repowered facilities in the Project Area, it is difficult to determine how a fully repowered scenario may impact the regional prairie falcon population. The species employs a variety of foraging flight characteristics, including high soaring, making it difficult to hypothesize how repowered turbines may affect its risk of turbine collision. The conservation measures in *5.0 Conservation Measures* that minimize perches will help to discourage prairie falcon use of the Project Area, however. Careful monitoring of fatalities for this species, ensuring that monitoring protocols are likely to detect prairie falcon fatalities, will be important for monitoring impacts to this species and implementing adaptive management measures, as appropriate.

3.3.7 Red-tailed Hawk Impact Assessment

Estimate of Fatalities

As shown in Table 2, a fully repowered Project Area is estimated to result in 122 red-tailed hawk fatalities per year (0.29 fatalities/MW/year) based on Diablo Winds monitoring data (ICF International 2012b), or 42 fatalities per year (0.10 fatalities per MW per year) based on Buena Vista monitoring data (ICF International 2012b). Based on these projections, repowering the Project Area could decrease the average annual fatalities of red-tailed hawks by 34 percent or 78 percent, respectively. Over a 30-year CUP permit term, approximately 4,358 to 6,772 red-tailed hawk fatalities are anticipated, based on the 95 percent confidence interval of the average annual fatality rate at Diablo Winds. The 95 percent confidence interval of the Buena Vista fatality estimate would project 625 to 1,874 red-tailed hawk fatalities per year.

Potential Impact of Repowering

An estimated 89 percent of the global population of red-tailed hawks is found in North America, with approximately 1,960,000 breeding birds (Hawk Mountain 2007). Populations have remained stable or increased throughout most of the western United States since the 1980s, growing 1.5 percent in California between 1983 and 2005 (Hawk Mountain 2007; Sauer et al. 2008).

California foothill populations have remained stable since 1968, while the Central Valley population has significantly increased (Sauer et al. 2008).

Although a substantial number of red-tailed hawk fatalities occur in the APWRA, the annual fatalities have shown a generally decreasing trend since 2005 (ICF International 2012a) and is predicted to continue to decline as repowering proceeds in the APWRA (Smallwood 2010; ICF International 2012a). The yearly fatalities for red-tailed hawks presented in Table 2 coincide with these other studies, suggesting that repowering the Project Area is likely to continue to decrease the amount of red-tailed hawks killed each year. Considering that red-tailed hawk population in California has grown while APWRA has been in operation, continued operation of repowered turbines in the Project Area is unlikely to have any population-level impacts to red-tailed hawks.

3.3.8 Swainson's Hawk Impact Assessment

Estimate of Fatalities

There is only one recorded Swainson's hawk fatality at the APWRA from the 2005 bird year (ICF International 2012a), resulting an annual fatality rate estimate of approximately zero (Table 2). Smallwood (2010) estimated less than one Swainson's hawk fatality per year at the APWRA. Furthermore, no Swainson's hawk fatalities were detected during 3 years of post-construction monitoring at the Buena Vista repowering project, or during 4 years of monitoring at the Diablo Winds repowering project.

Potential Impact of Repowering

Swainson's hawk is one of two (the other is sandhill crane) state-listed species that has a recorded fatality in the APWRA (ICF International 2012a). While the Project Area does not provide prime nesting or foraging habitat for the Swainson's hawk, neighboring agricultural areas in the most northeastern corner of Alameda County and north of the APWRA in Contra Costa County do provide prime foraging habitat, and Swainson's hawk may cross into the Project Area occasionally. The Audubon Society (2007) includes Swainson's hawk on its Watch List as a declining or rare species of national conservation concern. Evidence from egg collections suggests that the California population has been reduced by as much as 90% from its estimated historical levels (Bloom 1980). This severe population decline in the Central Valley of California is corroborated by microsatellite analyses of DNA which suggest that the decline has taken place over 68–75 generations, or about 200 years, which corresponds with the time of European settlement (Hull et al. 2008; Audubon Society 2007). Based upon migration counts in Vera Cruz, Mexico, the present global population may approach 1 million individuals (HawkWatch International 2009). The California population is estimated to be over 1,900 nesting pairs, 95 percent of which are in the Central Valley (Anderson et al. 2007). The BBS reports a rising California population since surveys began in 1968, but also reports that important deficiencies in the underlying data may make these trends inaccurate (Sauer et al. 2011).

The very small number of estimated fatalities at the APWRA compared to the size of the local population east of the Project Area in the Central Valley indicates that turbine-related fatalities in the Project Area are unlikely to have an adverse effect on the local Swainson's hawk population. Subsequent project-level avian use and fatality studies will continue to provide data for assessing the effect of turbine operation on the Swainson's hawk population in the area.

3.4 Cumulative Impacts

*[**Note to Reader:** A cumulative impacts analysis will be completed as part of the EIR. This section will be updated after text is developed and reviewed for the EIR.]*

CEQA requires an evaluation of cumulative impacts that considers the combination of the project evaluated in the EIR together with other projects causing related impacts. Other projects considered should include past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the Lead Agency. The Lead Agency defines the geographic scope of the area within which cumulative effects will be evaluated, but also provides a reasonable explanation for the geographic limitation used. Finally, the cumulative effects analysis must examine reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects.

In addition, the USFWS Land-based Wind Guidelines (U.S. Fish and Wildlife Service 2012a) advise that cumulative impacts should be incorporated into wind energy planning, including a review of the range of development-related impacts and identification of those species of concern or their habitats most at risk.

USFWS consideration of the cumulative impacts of eagle take permits is described in the Draft ECP Guidance. Cumulative impacts are defined as: "the incremental environmental impact or effect of the proposed action, together with impacts of past, present, and reasonably foreseeable future actions" (50 CFR 22.3). Should project proponents pursue eagle take permits, the Draft ECP Guidance notes that a thorough cumulative impact analysis will be conducted under the NEPA process associated with an eagle permit, consistent with the principles of cumulative impacts outlined in the Council on Environmental Quality handbook and compatible with eagle preservation, including indirect impacts. The geographic scale for the analysis of cumulative impacts of wind facility projects and associated permits will be determined by the USFWS and project proponent on a case-by-case basis (U.S. Fish and Wildlife Service 2011).

PART 2
PROJECT-SPECIFIC REQUIREMENTS

Repowering will not eliminate all impacts to birds, and Part 2 of this APP describes measures to avoid or minimize the effects of construction, operation, and decommissioning of wind turbines within the Project Area. Project-level requirements are needed, in addition to the programmatic analysis provided above, to mitigate for impacts identified through the CEQA process, to comply with BGEPA, to adhere to federal and state guidelines, and to develop an avian conservation strategy that is consistent with USFWS guidance. Table 3 outlines where various sections of this APP address the stages of Draft ECP Guidance (U.S. Fish and Wildlife Service 2011).

The following project-level requirements are aimed at avoiding and minimizing impacts to avian species from repowering projects and providing the data necessary to comply with federal, state, and county regulations and guidelines. To that end, the APP establishes the following goals for repowering projects in the Project Area:

Goal 1. Avoid and minimize impacts to bird species. *5.0 Conservation Measures* identifies specific measures to avoid and minimize impacts to birds.

Goal 2. Reduce and document the number of raptor fatalities. *4.4 Preconstruction Fatality Estimate* provides guidance for estimating fatalities for all focal species from proposed repowering projects prior to project construction. *6.0 Monitoring and Adaptive Management* provides a detailed description of the monitoring protocols to be included in the project proponent post-construction monitoring plan to evaluate post-construction fatalities against preconstruction estimated fatalities. The ACAFMT will continue to evaluate raptor fatality reduction for the American kestrel, burrowing owl, golden eagle, and red-tailed hawk according to the 2007 Settlement Agreement.

Goal 3. Mitigate for direct impacts to birds that cannot be avoided. *5.2 Compensatory Mitigation* identifies conservation measures required to provide compensation when significant adverse impacts to species of concern cannot be avoided.

Goal 4. Use post-construction monitoring data to inform adaptive management. *6.0 Monitoring and Adaptive Management* identifies monitoring requirements for risk assessment validation and an adaptive management framework that requires implementation of additional conservation measures according to fatality thresholds.

Implementation Oversight

*[**Note to Reader**: This section provides a framework for technical oversight of the implementation of the APP. The framework described below is only preliminary, meant to serve as an initial basis for discussion with the APWRA Steering Committee.]*

The APP Technical Advisory Committee (TAC) will ensure the proper implementation of the APP to achieve the program's goals. The TAC will have the primary oversight responsibility to ensure that wind-energy project operators are complying with the monitoring and reporting requirements set forth by the APP.

The TAC will have a standing meeting every 6 months to review monitoring reports produced by operators in the Project Area. The TAC will use these meetings to discuss any issues raised by the monitoring reports and determine next steps to address issues, including scheduling additional meetings, if necessary. TAC members will include representatives from the County (including a technical consultant contracted by the County at its discretion), wildlife agencies (CDFW, USFWS), and representatives from repowered wind-energy operators in Alameda County. Additional TAC members may also be considered such as a representative from Audubon or a landowner. The TAC will be a voluntary and advisory group that will support decisions made by the County. As such, the TAC is not a decision-making body and will not be bound to the public noticing requirements of the Brown Act. However, 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 has two primary roles: 1) to review project planning documents to ensure that project-specific AMMs and compensatory mitigation measures described in this APP are appropriately applied, and 2) to review monitoring documents (protocols and reporting) for consistency with this APP. Thorough implementation of monitoring results review requires that the TAC have a direct relationship with the entities conducting field monitoring and developing the monitoring reports (most likely these entities will be third party contractors hired by the County or the wind operators). Upon completion of annual reports, the monitoring entities will provide the reports as well as an oral summary of the results directly to the TAC and will respond to questions raised by the TAC.

Should fatality monitoring reveal that impacts exceed thresholds established in *6.2 Adaptive Management*, the TAC will advise the County on requiring the implementation of adaptive management measures. The TAC, in this instance, also may convene a panel of experts in an advisory role. The expert panel will primarily be responsible for, at the request of the TAC, formulating adaptive management measures to be implemented by wind-energy project operators, as directed by the County, when impact thresholds are exceeded. The expert panel may include experts in the field of wind-wildlife interactions (i.e., scientists), other wildlife agency representatives, or consultants contracted by the County to be determined by the County in consultation with the TAC. The County will have the ultimate decision-making authority, as it is the organization issuing the CUPs. However, the TAC will collaboratively inform the decisions of the County.

The monitoring necessary to implement the project-specific measures of this plan will also require funding from project proponents. Additionally, this APP recommends monetary contributions to fund compensatory mitigation measures. The project-specific measures outlined in this APP, unless otherwise indicated, are required. However, the monetary amounts included in Table 3 are estimates of the costs for implementing project-specific monitoring and compensatory mitigation measures; they are not mandatory fees imposed by the County. Should the County require fees to be paid by proponents for an issuance of a CUP, a nexus study would be performed in accordance with the California Mitigation Fee Act. The monetary values estimated in Table 3 will depend on how project proponents choose to implement the required measures; this information is provided to help project proponents forecast the potential costs of adhering to the requirements of this APP in order to obtain a CUP.

Table 3. Summary of Cost Estimates to Implement Project-Specific Measures

Cost	Logic	Conditional/Required	Variable/Fixed	Location in Document
$2,225 - $3,500	Annual cost per turbine for preconstruction avian use surveys.[1]	Conditional	Variable	4.2 *Avian Behavior and Use Data*.
$14,500 - $19,200	Annual cost per turbine for post-construction monitoring[2]	Required	Variable	*6.1 Post-Construction Monitoring*
$2,000	Cost per fatality in exceedance of thresholds in Table 4 for the second consecutive year to fund research	Conditional	Fixed	*6.2 Adaptive Management*
$225,000	Cost per eagle fatality based on USFWS Resource Equivalency Analysis assuming 30 power pole retrofits per eagle fatality at the cost of $7,500 per pole	Conditional	Variable	*5.2 Compensatory Mitigation*
$580	Average cost to rehabilitee a raptor at the California Raptor Center, to be paid for each estimated raptor fatality.	Conditional	Fixed	*5.2 Compensatory Mitigation*

Note: This table does not include the fee required to fund a golden eagle inventory around the Project Area, as a population study is ongoing and will likely negate the need for further funding for such a study (see *Note to Reader* in *4.3 Golden Eagle Inventory*).

1 Assumes one observation point is needed for every 2 turbines. Per turbine costs based on the scaled costs as follows: 10 observation points costs $70,630 per year; 40 observation points costs $177,880 per year.

2 Scaled based on the following cost framework: 10 Turbines and 4 avian obs points = $114,400 (carcass searches) + $14,300 (avian use) + $63,400 (other administrative costs) = $192,100 total; 20 turbines and 8 avian obs points = $228,800 (carcass searches) + $28,600 (avian use) + $63,400 (other administrative costs) = $320,800 total; 40 turbines and 16 avian obs points =$457,600 (carcass searches) + $57,200 (avian use) + $63,400 (other administrative costs) = $578,200.

Table 4. Eagle Conservation Plan Guidelines as they Apply to the Avian Protection Program

	Objective	Actions	Addressed in APP
Stage 1	Identify potential wind facility locations with manageable risk to eagles at the landscape level.	Broad, landscape-scale evaluation.	Not applicable to repowering the Project Area.
Stage 2	Obtain site-specific data to predict eagle fatality rates and disturbance.	Site-specific surveys to determine eagle exposure rate in project footprint, the location and preconstruction occupancy and productivity of potentially-affected eagle nests, and the location of eagle migration corridors and stopover sites, foraging concentration areas, or communal roosts in the project area.	Program—*2.2 Avian Use* Project—*4.0 Risk Assessment*
Stage 3	Conduct turbine-based risk assessment and estimate the fatality rate of eagles for the facility evaluated in Stage 2, excluding possible advanced conservation practices (ACPs).	Assess risk factors for each turbine, such as nearby cliff rim, migration pass, or prey concentration. Use results of this risk factor assessment along with an estimate of eagle exposure rate derived from Stage 2 data in Service-provided models to predict the annual eagle fatality rate for the project.	Program—*3.0 Impact Assessment* Project—*4.4 Preconstruction Fatality Estimate*, *CM-1: Site Turbines to Avoid High-Risk Landscape Features*
Stage 4	Identify and evaluate ACPs that might avoid or minimize fatalities identified in Stage 3. When required to do so, identify compensatory mitigation necessary to reduce any remaining fatality effect to a no-net-loss standard.	Re-run fatality prediction models with risk adjusted to reflect application of ACPs. Calculate required compensatory mitigation amount and identify the method to accomplish it.	Program—*3.0 Impact Assessment* Project—*4.4 Preconstruction Fatality Estimate*, *5.0 Conservation Measures*, *5.2 Compensatory Mitigation*
Stage 5	Document annual eagle fatality rate and disturbance effects. Identify additional ACPs to reduce observed level of mortality, and determine effectiveness of initial ACPs. When appropriate, monitor effectiveness of compensatory mitigation.	Conduct fatality monitoring in project footprint. Monitor occupancy and productivity of nests of eagle pairs that are likely using the project footprint. Monitor eagle use of communal roosts in the project area.	Program—*3.0 Impact Assessment* Project—*6.0 Monitoring and Adaptive Management*

Note: This APP terms advanced conservation practices (ACPs) as conservation measures.

Source: U.S. Fish and Wildlife Service 2011

4.0 Risk Assessment

The project proponent will conduct a risk assessment to characterize the presence and activity of species of concern in the project site and its vicinity in order to inform turbine siting. The risk assessment will be written up in the project-level BCS developed by the project proponent for each repowering project. The risk assessment will include the following components:

1. Project-Level Site Characterization
2. Avian Behavior and Use Survey
3. Golden Eagle Inventory

4.1 Project-Level Site Characterization

2.0 Existing Conditions of this APP provides a program-level assessment of site conditions based on the most current information available. The project proponent will update this information for their proposed project consistent with site suitability assessment according to the measures described below. These measures incorporate recommendations from the Tier 3 approach in the Land-Based Wind Energy Guidelines (U.S. Fish and Wildlife Service 2012) and Eagle Conservation Plan Guidelines (U.S. Fish and Wildlife Service 2011), and inventory and monitoring recommendations in the *Interim Golden Eagle Inventory and Monitoring Protocols; and Other Recommendations* (Pagel et al. 2010), or as updated.

4.2 Avian Behavior and Use Data

Avian use and behavior surveys have been conducted by the ACAFMT since 2005. The protocol has been changed several times since the inception of the program. Use data (i.e., presence of birds) have been collected using modified point counts at approximately 77 point count stations distributed throughout the APWRA. Behavior data is currently being used to develop models of avian collision risk. Information on relative abundance of birds in the APWRA over time has been summarized by the ACAFMT in the context of interpreting changes in fatality rates.

Currently, the ongoing avian fatality-monitoring program collects information on relative abundance at non-repowered sites distributed throughout the APWRA. This information can be used to provide a baseline of avian abundance at specific project sites prior to re-powering, information which can be used to assess potential changes in avian abundance after repowering if avian use data is collected post-construction.

4.3 Golden Eagle Inventory

*[**Note to Reader**: This draft APP provides measures to streamline compliance with BGEPA including a golden eagle inventory as part of the Risk Assessment in accordance with the ECP Guidance (U.S. Fish and Wildlife Service 2011). This type of study has been completed for the APWRA (Hunt and Hunt 2006, Hunt 2002, Hunt et al. 1995) but these data are not sufficient to characterize the current status of the population per Draft ECP Guidance. Hunt and Hunt (2006) recommended that an inventory of the APWRA's golden eagle population be conducted every 5 years. It is the County's understanding that an effort is ongoing to resurvey eagle territories around the APWRA to update previous studies. If the USFWS judges this effort satisfy the recommendations of the Draft ECP Guidance, the fee proposed in the section below may not be necessary. Project proponents are recommended to consult with the USFWS to determine if any additional surveys are necessary.*

Golden eagle abundance is well documented within the APWRA (Hunt 2002; Hunt and Hunt 2006); however, studies of the golden eagle population in the APWRA vicinity are now out of date (Hunt and Hunt 2006). ECP Guidance requires project proponents to conduct a golden eagle inventory by surveying the eagle nesting population (eagle territories), concentration areas (communal roosts and foraging concentrations), and migration stopovers within a distance of the project site equal to the average inter-nest distance within the APWRA at the time of the survey (U.S. Fish and Wildlife Service 2011). Surveying eagle territories within the average APWRA inter-nest distance of the project site will allow the permitting agencies to determine the number of breeding and juvenile eagles likely to be affected by the proposed project and to better understand potential population-level effects of repowering the Project Area. Therefore, all proponents will pay a one-time fee of $X,XXX to fund a comprehensive study of golden eagle population in the APWRA vicinity.

The project proponent will also evaluate the available fatality and avian use data to identify high-risk areas for golden eagles. Risk factors that contribute to eagle collisions will be discussed and quantified based on available information. There are numerous factors that contribute to collision risk. Fatality data at a project site (prior to repowering) is often the best index of collision risk, especially if used in conjunction with relative abundance. However, to assess collision risk for a proposed repowering site, other factors such as proximity to nest and roost sites, turbine height, type, rotor speed, perch availability, rotor-swept area, topography, wind speed, and the interaction of flight behavior with topographic features should also be considered. The project proponent will evaluate site-specific risk factors for turbine collision to inform micro-siting of turbines (see *CM-1: Site Turbines to Minimize Potential Impacts*).

The golden eagle inventory and behavior analysis provides context for eagle effects and application of conservation measures. Risk-factor documentation will inform micro-siting of turbines. The analysis of existing use and behavior data will help identify the most frequently used areas by eagles so that the project proponent can avoid siting turbines in these areas.

4.4 Preconstruction Fatality Estimates

Pre-construction fatality estimates at the project-level are helpful in characterizing the expected loss of bird species. These estimates also define a threshold against which post-construction fatality estimates will be evaluated to determine if impacts are in line with pre-construction predictions and thus if adaptive management actions are necessary to mitigate unforeseen adverse impacts to bird species.

Each project proponent will estimate fatalities for each focal species as part of the project-specific BCS. The fatality estimates will be based on the approach described in this section and in coordination with the TAC. The project proponent will utilize best available data at the time of BCS development by compiling the most applicable post-construction fatality and use monitoring data from repowered projects in the APWRA. The project proponent will assess comparable bird use and fatality rates at existing repowered turbines and note any additional conservation measures and compensatory mitigation at the proposed project, in addition to those at existing repowered projects from which fatality data are compiled, that may further reduce avian mortality. (Currently only Diablo Winds and Buena Vista repowering projects have post-repowering monitoring data but the Vasco Winds repowering project is expected to have data beginning in late 2012 and Tres Vaqueros repowering project the following year. As more monitoring at repowering projects continues to generate more data, subsequent projects can use these data to provide better-informed pre-construction fatality estimates.) If comparable use and fatality data from existing repowered turbines does not exist, then the proponent will perform a collision risk assessment to estimate fatalities by using appropriate avian use and exposure data for the project site. Project proponents will determine per MW and project-wide annual fatality estimates for each of the eight focal species, for all raptors combined, and for all other bird species combined. The County will approve of pre-construction fatality estimates prior to construction.

The TAC will also compare preconstruction fatality estimates to those presented in Table 5. If per MW fatality estimates are predicted to exceed those in Table 5, the TAC may recommend to the County that Tier 1 AMMs to be implemented by the project proponent to appropriately address the risk. Other measures not contemplated by this APP that would reduce the level of risk may also be developed in coordination with the TAC.

5.0 Conservation Measures

The measures described in this chapter would be implemented to avoid and minimize potential impacts to birds and their habitat, as well as to mitigate impacts where they persist. This section includes measures to be implemented before construction, during construction, and after construction (including decommissioning) and will be based on existing data as summarized above, as well as additional data from newly repowered projects.

The conservation measures are based on guidance from the following documents:

- USFWS-sponsored Wind Turbine Guidelines Advisory Committee, including the *Land-Based Wind Energy Guidelines* (U.S. Fish and Wildlife Service 2012a)
- Draft Eagle Conservation Plan Guidance (U.S. Fish and Wildlife Service 2011)
- Alameda County 2005 CUP as amended in 2007
- 2010 Settlement Agreement between the State of California Attorney General, NextEra, Audubon, and CARE
- 1998 Repowering EIR (County of Alameda Community Development Department 1998)
- Vasco Winds Repowering Project EIR (Contra Costa County Department of Conservation and Development 2011)
- Recommendations of the APWRA SRC
- *California Guidelines for Reducing Impacts to Birds and Bats from Windplant Development* (CEC Guidelines; California Energy Commission and California Department of Fish and Game 2007)
- Other relevant wind-energy planning documents. Additional conservation measures were developed specifically for this APP.

5.1 Avoidance and Minimization

CM-1: Site Turbines to Minimize Potential Impacts

The Land-based Wind Energy Guidelines, Draft Eagle Conservation Plan Guidance, and CEC Guidelines all direct project proponents to conduct landscape-level analyses to identify suitable areas for wind-energy development that avoid and minimize impacts to species of concern. However, these guidelines are largely focused on wind-energy development proposals for sites without existing wind turbines, as opposed to repowering projects as is the case in the APWRA. Because projects implementing this APP are repowering projects, there is considerably less flexibility for general siting. However, micro-siting (analyses based on landscape features and location-specific bird use and behavior data) and project-level preconstruction surveys are believed to be successful at identifying the least risky layout for repower turbines in the APWRA (Smallwood et al. 2009).

The project proponent will use best available science to develop a turbine layout that reduces risk to avian species to the greatest extent feasible. Such data may include monitoring data from previous

APWRA repowering projects; ACAFMT data; field data on behavior, utilization, and distribution patterns; preconstruction geographical and topographical map-based predictive models based on raptor use and behavior studies (e.g., Smallwood and Neher 2010, 2011; Smallwood et al. 2009); and any additional studies published in peer-reviewed scientific journals that are available at the time of project design.

The project proponent will also implement the following actions when siting turbines:

- Use existing roads and transmission corridors to the extent possible while developing site plans.
- Identify, using the best available data including micro-siting analyses that incorporate bird flight behavior, movement pathways (including migration flyways), high-density foraging areas, and known frequent fatality areas and site turbines away from these high-use areas.
- Compile results of the micro-siting analyses for each turbine and document in the project-level APP, along with the specific location of each turbine.
- Site turbines at least 100 yards away from features of the landscape known to attract raptors and migrant birds whenever feasible (e.g., water sources, riparian vegetation).
- Site turbines a minimum of 100 yards from defined canyon edges or “breaks” which routinely serve as flight paths for raptors.
- Site turbines to avoid dips or notches along ridges, particularly in areas where the dip is less than 100 yards across, as well as saddles in between ridges.
- Site turbines 100 yards away from natural rock outcrops whenever feasible.

The County may require additional conservation measures based on best available science and data at the time of project permitting.

CM-2: 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 following measures:

- The distance of the lowest point of the turbine rotor (i.e., the tip of any blade at the 6:00 position), will be no less than 29 meters (95 feet) from the ground surface. This design characteristic addresses the finding that roughly 74% of all bird observations (54% of raptor observations) occurred at heights less than 30 meters (Curry and Kerlinger 2009).
- Turbine design will limit or eliminate perching opportunities. Designs will include a tubular tower with no perchable surfaces (e.g., no external catwalks, railings, or ladders).
- 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.
- Install lighting on the fewest number of turbines as allowed by the Federal Aviation Administration (FAA), and all pilot warning lights should fire synchronously.
- Turbine lighting will employ only red, or dual red and white strobe, strobe-like, or flashing lights.
- All lighting on turbines will be operated at the minimum allowable intensity, flashing frequency, and quantity allowed by the FAA (Gehring et al. 2009; U.S. Fish and Wildlife Service 2012a). Duration between flashes shall be the longest allowable by the FAA.

CM-3: Incorporate Avian-Safe Practices into Design of Turbine-Related Infrastructure

Project proponents will apply the following measures when designing and siting turbine-related infrastructure. These measures will reduce the electrocution and collision risk of birds with turbine-related infrastructure.

- 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 be fitted with bird deterrent devices.
- All permanent meteorological towers will be unlit unless lighting is required by the FAA. If lighting is required, it will be operated at the minimum allowable intensity, flashing frequency, and quantity allowed by the FAA.
- All new collection lines will be placed underground whenever feasible. All above ground lines will be fitted with bird flight diverters or visibility enhancement devices (e.g., spiral damping devices). Lines may be placed above ground immediately prior to entering the substation.
- When lines cannot be placed underground, appropriate avian protection designs must be employed. As a minimum requirement, the collection system will utilize the most current edition of the Avian Power Line Interaction Committee guidelines to prevent electrocutions.
    - Energized conductors, hardware, and grounded conductors will be placed a minimum of 60 inches apart to ensure adequate separation to avoid electrocution of golden eagles.
    - If adequate separation is not possible, energized parts and/or grounded parts will be covered with wildlife boots or other insulating materials to avoid contact with birds.
    - Install perch and nest deterrents on crossarms and poles.
- 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., lay-down 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, 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.

CM-4: Retrofit Existing Infrastructure to Minimize Risk to Raptors

Any existing power lines on the project site 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 (Avian Power Line Interaction Committee 2006). All other existing structures to remain on the project site during repowering will be retrofitted, as feasible, according to specifications of CM-3 prior to repowered turbine operation.

CM-5: Discourage Prey for Raptors

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.

Rodenticide will not be utilized due to the risk of raptors scavenging the remains of poisoned animals.

- Boulders (rocks greater than 12 inches in diameter) excavated during project construction may be placed in above-ground piles within the project site so long as they are more than 200 yards (656 feet) from any turbine. Existing rock piles created during construction of first- and second-generation turbines will also be moved at least 200 yards away from turbines.
- Gravel shall be placed at least 3 feet deep and 5 feet wide around each tower foundation to discourage small mammals from burrowing near turbines.
- At the completion of project construction, the project proponent will prepare road edges such that agricultural activities, including grazing, can be conducted immediately adjacent to the road surface. This preparation will entail clearing excess gravel and soil from the shoulder, feathering road edges for runoff control, and replacing topsoil to support native revegetation. In areas where topography precludes this approach, the road edges will be smoothed and compacted.

CM-6: Minimize Potential Nest Disturbance During Construction, Operation, and Decommissioning

As described in Section 1.3.1.2 Migratory Bird Treaty Act and Section 1.3.1.5 California Fish and Game Code, all birds and bird nests are protected by federal and state regulations. The following CMs will be implemented during construction to avoid disturbance of active nests:

- The area and intensity of disturbance will be minimized to the extent possible during construction and decommissioning.
- Existing roads will be used for access during construction, operation, and decommissioning to the extent possible.
- A transportation plan will be implemented during construction, operation, and decommissioning that includes road design, locations, and speed limits to minimize habitat fragmentation, wildlife collisions, and noise effects.
- A qualified biologist will conduct preconstruction surveys of all potential avian nesting habitat within 0.25 mile of construction areas no more than 30 days prior to construction (any groundbreaking activities as well as establishment of staging and laydown areas).
- As a minimum, a qualified biologist will conduct burrowing owl surveys in accordance with guidelines set forth in CDFW's *Staff Report on Burrowing Owl Mitigation* (California Department of Fish and Game 2012), which specifies preconstruction surveys and standard measures to avoid or relocate owls as well as guidance for compensatory mitigation for loss of habitat, or based on other CDFW guidance current at the time of construction. A qualified biologist will also conduct preconstruction surveys for other ground-nesting birds covered by the MBTA.
- If nesting raptors are identified in areas susceptible to disturbance from construction or decommissioning activities, the project proponent will establish a no-disturbance buffer zone. The size of the zone will be determined in consultation with relevant jurisdictional agencies (e.g., CDFW). Factors to be considered include intervening topography, roads, development, type of work, visual screening, and nearby noise sources. Buffers will not apply to construction-related traffic using existing roads that are not limited to project-specific use (e.g., county roads, highways, farm roads). If no nests are observed during the preconstruction survey, but nesting

occurs following the start of construction, it will be assumed that the individuals are acclimated to the level of ongoing disturbance.

CM-7: Provide Training for Project Personnel

A qualified biologist will conduct a preconstruction education session at the project site prior to construction or decommissioning activities. Specific information will focus on the distribution, general behavior, and ecology of special-status species that could occur at the project; the protection afforded to such species by the MBTA, BGEPA, ESA, and CESA; the procedures for reporting interactions with listed and proposed species; and the importance of following all the conservation measures. The education session will include discussion and overview of the general constraints associated with biological resources in the project site and the timing and processes required for project implementation. Construction staff will be informed that they are not authorized to handle or otherwise move any special-status species that they may encounter. Onsite staff will participate in the education program prior to engaging in fieldwork. The project proponent will maintain appropriate records to ensure that employees have attended the education program prior to working at the project site.

5.2 Compensatory Mitigation

*[**Note to Reader:** The mitigation options presented below are taken from USFWS guidance documents and other California APPs, BCSs, or ECPs. We have considered but not yet formulated a good approach for incorporating mitigation along the lines of what NextEra worked out in their AG agreement. Retrofitting high-risk electrical poles is the only eagle compensatory mitigation measure for which the USFWS provides detailed draft guidance, describing a quantitative example methodology to offset take of eagles (USFWS 2012b). CM-8 below follows this USFWS example. Further analysis, employing local golden eagle population parameters, if available (e.g., Hunt and Hunt 2006) may be incorporated into the methodology provided by the USFWS to make compensatory mitigation requirements more site-specific to the Project Area. According to the most recent draft technical guidance (USFWS 2012b), mitigating for the loss of every golden eagle (via retrofitting power poles) may cost companies approximately five times more than what NextEra agreed to in their AG agreement, based on the USFWS's cost estimate (average $7,500 per pole) and the 30 retrofits required to compensate for each fatality. However, the costs of retrofitting is highly variable and proponents may be able to substantially lower costs through direct contracts with utilities. These contracts between proponents and utilities would be documented and reviewed by the TAC.]*

CM-8: Mitigate for Loss of Individual Golden Eagles by Contributing Funds to Retrofit Offsite Electrical Facilities to Raptor-Safe Standards

In order to comply with CEQA as it applies to the local golden eagle population in the APWRA (see *1.3.1.4 California Environmental Quality Act*) and to streamline adherence to the *Draft Bald and Golden Eagle Protection Act Standards for Review of Wind Energy Projects* (U.S. Fish and Wildlife Service 2010) and the Draft ECP Guidance, the project proponent will retrofit high risk power poles to mitigate for every eagle fatality estimated by the project-level post-construction monitoring. The U.S. Fish and Wildlife Service's Resource Equivalency Analysis template (2012b) estimates 30 power pole retrofits are required to compensate for the lost productivity of an eagle fatality. At the estimated cost of $7,500 per pole (U.S. Fish and Wildlife Service 2012b), the project proponent may contribute $225,000 to a third party mitigation account for each estimated eagle fatality, or contract the retrofits directly with appropriate utility owners/operators in order to potentially reduce costs. Total costs may be reduced by reducing the cost per pole retrofit, or, if approved by the County in consultation with the TAC, documentation of the need for fewer power pole retrofits to compensate per eagle fatality. 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 utility owner/operator to retrofit the required number of power poles and maintain the retrofits for 10 years[10]. Should post-construction monitoring stop, the proponent will retrofit annually a number of poles according to the average eagle fatalities determined over the course of post-construction monitoring. The number of retrofits may be reduced with ongoing retrofit maintenance over the life of the project or if subsequent monitoring indicates fewer golden eagle fatalities upon approval from the County in coordination with the TAC.

CM-9: Mitigate for Loss of Individual Raptors by Contributing to the California Raptor Center

The California Raptor Center (Center) is affiliated with the UC Davis School of Veterinary Medicine. The Center's programs focus on raptor education, raptor health care and rehabilitation, and raptor research. The Center receives more than 200 injured or ill raptors annually. Approximately 60 to 65 percent are rehabilitated and returned to the wild. In a typical year, the four raptor species most commonly brought in for care are barn owl (96 admissions in 2006), American kestrel (20 admissions), red-tailed hawk (19 admissions), and Swainson's hawk (15 admissions; California Raptor Center 2011). The Center relies on donations of time and resources to provide resident raptor care and feeding, underwrite education programs, provide rehabilitation medical supplies and medication, and maintain the Center and facilities.

Project proponents may offset raptor fatalities by contributing $580 (the average cost to rehabilitate one raptor; B. Stedman pers. comm.) per estimated raptor fatality to the Center each year. A portion of the total predicted raptor fatalities may be contributed, in concert with other compensatory mitigation to be approved by the County in consultation with the TAC.

[10] The USFWS uses a period of 10 years for crediting a project proponent for the avoided loss of eagles from power pole retrofits. However, project developers or operators should consider entering into agreements with utility companies or contractors for the long-term maintenance of retrofits. Evidence of this type of agreement could increase the amount of credit received by the project developer or operator and, as a result, decrease the amount of compensatory mitigation required (U.S. Fish and Wildlife Service 2012b).

6.0 Monitoring and Adaptive Management

6.1 Post-Construction Monitoring

*[**Note to Reader:** The goals of the APP fatality monitoring program are to 1) establish a consistent monitoring protocol for proponents that will provide accurate and comparable data across projects 2) determine if post-construction impacts are in line with pre-construction estimates of impacts to avian resources; and 3) to ensure that data and fatality estimates are comparable to data collected at old-generation turbines by the Alameda County Avian Fatality Monitoring Program.]*

ICF has supplied a "straw man" of a proposed monitoring protocol based on concerning biases inherent in the various estimators of fatality rates and total fatalities and development of new estimators and measures of variance. Biases in the estimators have implications for how both carcass surveys and detection probability trials are conducted. The proposed protocol outlined below is designed to address the issues currently being raised and provide the basis for a discussion with experts and agency personnel so that refinements can be made and the trade-offs between objectives and costs can be evaluated in a collaborative process.

Project proponents will estimate fatality rates and total fatalities by implementing the fatality monitoring protocol proposed in this APP. Proponents will estimate both fatalities per MW per year and fatalities per turbine per year for all focal species, all raptors, and all native birds. Estimated fatality rates and total fatalities will be compared to pre-project fatality rate and total fatality estimates (see *4.4 Preconstruction Fatality Estimates*), and to fatality rates from older generation turbines estimated by the ACAFMT.

6.1.1 Monitoring Requirements

Project proponents will use the results of post-construction monitoring to validate the preconstruction risk assessment and inform adaptive management, if necessary, by addressing the following uncertainties.

- The number of birds of each species killed annually
- Which power structure (e.g., wind turbines or meteorological towers) is responsible
- How post-construction fatality rates compare to pre-repowering fatality estimates in general and for each of the focal species
- Whether unusually high fatality rates are associated with particular structures
- Whether new species not previously considered to be high risk are now at greater risk from repowered turbine operation
- Any patterns in fatality data that could lead to more effective design (e.g., turbine siting) and mitigation measures at repowering projects in the future

Post-construction monitoring procedures will include documentation of compliance with the above permitting requirements.

6.1.2 Monitoring Protocols

Post-construction monitoring will be conducted for 3 years at the project site beginning within 3 months of the commercial operation date (COD). Monitoring may continue beyond 3 years if construction is completed in phases or if results of fatality monitoring and/or adaptive management measures warrant the collection of additional data (see *6.2 Adaptive Management*). Monitoring will be conducted for two additional 2-year periods, beginning at the 10th and 20th anniversary of the initial COD, assuming a 30-year operating life of the project. Project proponents will also agree to provide access to qualified third parties to conduct any additional monitoring after the initial 3-year monitoring period has expired and before and after the additional 2-year monitoring periods, provided that such additional monitoring utilizes scientifically valid monitoring protocols that yield results that are reasonably comparable to other efforts to monitor repowered turbines in the Project Area.

There are three major field components of the monitoring protocol for projects subject to this APP.

1. Avian use surveys to determine the seasonal and annual variations in relative abundance and species use patterns.
2. Carcass surveys to estimate fatality rates and total number of fatalities.
3. Detection probability surveys (to account for changes and differences in detection probability between locations, seasons, years, surveys crews, etc., that have historically involved separate trials to estimate scavenger removal and searcher efficiency rates).

6.1.2.1 Avian Use Surveys

Post-construction monitoring will include avian use surveys in the project site to estimate relative abundance and use of the project site. Information describing the relative abundance of raptor species at the project site is crucial to interpreting changes in estimates of avian fatality rates and total fatalities over time and to guide adaptive management of the facility. Observation points will be established based on topography, visibility, and the distribution of habitats and habitat features across the project area. The objective is to sample enough observation points to provide sample coverage of all habitats and habitat elements in the project area, in accordance with the CEC Guidelines (California Energy Commission and California Department of Fish and Game 2007). The number of observation points required to meet the objective will be determined in coordination with the TAC.

Surveys will consist of one 30-minute session at each observation point once per week for a minimum of 3 years. The maximum search radius will be 600 meters. A qualified observer will record the number of individuals of each species, noting behavior, location, and other attributes as time allows. Observers will also make note of raptor prey species detected during the observation period. The order in which observation points are surveyed will be selected to ensure no systematic bias in the distribution of daylight hours surveyed or each observation point.

6.1.2.2 Carcass Surveys

Number of Turbines Monitored and Search Interval

The CEC Guidelines suggest searching 30% of the turbines within a project site in most cases (California Energy Commission and California Department of Fish and Game 2007). In the case of projects with fewer turbines, the 30% criterion may not be appropriate; the USFWS (2012) recommends that all turbines be searched if there are fewer than 10 turbines.

The CEC Guidelines (California Energy Commission and California Department of Fish and Game 2007) also recommend a search interval of approximately 14 days. The recent 2010 Settlement Agreement between the State Attorney General and NextEra (Settlement Agreement 2010) requires a 30-day search for all repowered turbines and a twice-per-month search interval for 30% of repowered turbines.

Projects subject to this APP will survey all repowered turbines to ensure that golden eagle fatalities are documented to the maximum extent practicable. However, the search interval may be extended to a maximum of 45 days at a subset of turbines to reduce the cost of covering all turbines each year. This will achieves the objective for golden eagles because the carcass removal rate for golden eagles is low and searcher efficiency (the probability of detecting a carcass given that it is still in the search plot at the time of the search) is high. The remaining turbines should be searched at an interval of 7 to 14 days, or a combination of some turbines being searched at 7 and some at 14-day intervals, depending on the size of the project and the species determined to be at greatest risk during the pre-construction assessment. During the first 3 years of monitoring, the individual turbines searched at the various intervals should be rotated so that coverage of each turbine is distributed roughly equally, unless the TAX concurs that there are compelling reasons to allocated search effort disproportionately.

Searches

The CEC Guidelines (California Energy Commission and California Department of Fish and Game 2007) recommend that the width of the search area should equal the maximum rotor tip height (i.e., the height of the blade tip when positioned at 12 o'clock), to be specified in the project-specific monitoring plan.

Clean sweep surveys will be conducted to remove any carcasses from the search plots that have accumulated prior to the onset of fatality monitoring and at any turbine that has a lapse in search effort of more than 60 days. Surveyors will walk transects regularly spaced a maximum of 10 meters apart from the base of the turbine out to the total search radius distance using a belt-transect technique, visually searching the ground for any evidence of a fatality out to 5 meters on either side. Transect spacing should be adjusted to accommodate reduced visibility due to topography, grass height or other factors limiting visibility. Searchers will verify the accuracy of their transect spacing through periodic confirmation with a rangefinder or a GPS unit with sub-meter accuracy in combination with aerial photographs with the search plot overlaid.

The order in which turbines are searched on a given day will be scheduled to ensure that each turbine is searched at varying times of day throughout each season to avoid time-of-day biases.

Fatalities

Fatalities comprise partial or intact carcasses and collections of feathers that meet the diagnostic criteria of a fatality. To be considered a fatality, each find must include body parts and/or feathers. In the case of feathers, at least five tail feathers, two primaries from the same wing within 5 meters of each other, or a total of 10 feathers must be found. Whenever partial remains are found, the data must be cross-referenced with finds from previous searches and adjacent turbines to avoid double-counting. Data will be collected describing the condition and location of the find, and the identity of the nearest structure will be recorded. Locations will be documented using global positioning system (GPS) units. Photographs will be taken of the carcass as it was found and to indicate its location relative to nearby turbines or other structures. All carcass remnants will be collected and placed in sealable plastic bags (e.g., Ziploc) and frozen for future use during detection probability surveys, release to USFWS, research use, or donation to the USFWS National Eagle Repository, as appropriate.

Any avian carcasses found on site incidentally by surveyors or onsite staff will be recorded as incidental finds and handled in the same manner as the regular search carcasses. Injured birds will be reported as fatalities. All bird deaths will be reported to the project's Wildlife Response and Reporting System[11] database.

Each time an area is searched, data will be recorded regarding weather conditions; groundcover classification by height and type; turbine functionality (e.g., whether it is operational or shut down for maintenance); search area access issues; and presence of raptor prey species.

6.1.2.3 Detection Probability Surveys

The number of fatalities detected during the carcass surveys is not equal to the actual number of fatalities at a turbine or project. Carcasses can be missed by surveyors (searcher efficiency) or can be removed from the search area during the interval between deposition and the survey (carcass removal), resulting in an underestimate of fatalities. Detection probability estimates are used to correct raw counts and thus provide an accurate estimate of total fatalities. Detection probability surveys will be implemented using the integrated detection probability protocol described below.

Integrated Detection Probability Trial Protocol

*[**Note to Reader**: This is new information that has not yet been widely adopted and for which there are no firm results from actual fatality studies at operational wind farms. Also, the availability of carcasses for use in trials may be limiting if multiple projects become operational at the same time. Therefore, specific aspects of this protocol should be reviewed with other experts and the wildlife agencies so that appropriate and necessary modifications can be made if necessary.*

Detection probability trials should be conducted once per season using 20 birds—10 small birds and 10 medium to large birds. Carcasses will be placed across the project site at randomly selected bearings and distances from turbines within the search area, and stratified by land cover type and visibility category. Each carcass will be marked with green electrical tape on one leg to distinguish it from actual turbine fatalities. Upon placement in the field, the carcasses will be checked daily for 7 days, every 2 days through day 14, and then weekly for a duration of three times the maximum

[11] The Wildlife Response and Reporting System (WRRS) is a specific set of processes, procedures and training for monitoring, responding to, and reporting bird or bat injuries and fatalities specific to each project proponent.

search interval (exclusive of the 45 day interval that may be used at a subset of turbines for the purpose of documenting all golden eagle fatalities described above).

During each check, the carcass will be classified into one of the following categories:

- Intact (whole, unscavenged).
- Scavenged (signs of scavenging present, dismemberment, or feather spot remaining).
- Feather spot (the carcass was scavenged and mostly removed, but more than 10 feathers remained).
- Removed (not enough remains of carcass to be considered a fatality, hereby defined as at least five tail feathers or two primaries within at least 5 meters of each other, or a total of 10 feathers in standardized carcass search).

Searchers should be blind to the presence and timing of detection probability trials until the carcass is detected or removed (or the trial ends at 3 times the maximum search interval).

6.1.3 Fatality Estimates

The project proponent will calculate estimates of fatality rates and total fatalities using the newly developed partially periodic estimator (Warren-Hicks et al. 2012). As additional, more refined estimators become available, they can be used to provide a more accurate estimate of fatalities, but the Warren-Hicks et al. (2012) estimator should be reported in all cases to facilitate comparison among projects.

6.1.4 Reporting, Collaboration, and Information Sharing

The project proponent or its contractor will prepare an annual report documenting the results of each year's monitoring efforts. The report will be submitted to the TAC and the California Public Utilities Commission (CPUC) within 90 days of the end of each complete year of monitoring. If additional monitoring is conducted outside of the monitoring prescribed in this program, the reporting schedule will be determined in coordination with the TAC.

As part of the reporting process, all mortalities will be reported to the USFWS Law Enforcement Branch Bird Injury and Mortality Reporting System database and all eagle injuries or fatalities will be reported to USFWS, BLM, and CDFW within 24 hours of discovery for their direction on collection and/or sending carcasses to the national eagle repository. The project proponent will also report incidental discoveries of injured or dead golden eagles for the life of the project.

The project-specific avian protection plan will include a list of primary contacts for agency personnel at USFWS, CDFW, and the County.

6.1.5 Data Application

Results will be used by the project proponent, the County, USFWS, CDFW, and the CPUC to determine the effectiveness of mitigation measures, and to determine which, if any, turbines produce a disproportionately high number of fatalities. The results will validate turbine micro-siting and inform the appropriateness of mitigation measures implemented by the project proponent for the benefit of future wind-energy projects.

6.1.6 Monitoring Permitting Requirements

A Special Purpose Permit under 50 CFR 21.27 (special use permit) is required prior to implementing activities that may affect migratory birds, their parts, nests, or eggs. Such a permit is required before any person may lawfully take, salvage, or otherwise acquire, transport, or possess migratory birds, their parts, nests, or eggs for any purpose. The project proponent, its contractors, or the County will obtain a special use permit to perform the monitoring requirements described above.

6.2 Adaptive Management

The body of knowledge for the interaction of wind-energy generation with birds is continually growing. Accordingly, pursuing an adaptive management strategy to adjust operation and mitigation to the results of monitoring, new technology, and new behavioral information is crucial to ensuring that impacts are minimized to the greatest extent feasible. The AMMs presented in Sections 6.2.1 to 6.2.3 are suggestions based upon current knowledge and practices to reduce or mitigate impacts from turbine-related fatalities to bird species. Other AMMs that more appropriately address project-specific impacts may be required by the County in consultation with the TAC.

Prior to construction the TAC will compare project-specific preconstruction fatality estimates from project-level environmental compliance documents (see *4.4 Preconstruction Fatality Estimates*) to the fatality rate thresholds in Table 4. If per MW fatality estimates are predicted to exceed those in Table 5, the TAC may recommend to the County that Tier 1 AMMs be implemented by the project proponent to appropriately address the risk. Other measures not contemplated by this APP that would reduce the level of risk may also be developed in coordination with the TAC.

The TAC will also review results of project-specific monitoring reports prepared by each project proponent. Should fatality estimates resulting from post-construction monitoring exceed preconstruction fatality estimates, the County, in consultation with the TAC, may require project proponents to implement AMMs outlined in the following sections according to Tiers 1, 2, and 3. Project proponents will conduct fatality monitoring for at least 2 years subsequent to implementation of any adaptive management measures in order to ensure that measures effectively reduce fatality rates below preconstruction estimate levels. Note that additional adaptive management thresholds may be established outside of this APP between project proponents and the USFWS if project proponents apply for an eagle take permit (74 FR 46836, 2009).

Table 5. Fatality Thresholds for Tier 1 Adaptive Management Measures Based on Project-Specific Preconstruction Fatality Estimates

Species	Fatalities/MW (95% CI)
American Kestrel	0.54 (0.37-0.71)
Barn Owl	0.26 (0.21-0.31)
Burrowing Owl	0.79 (0.53-1.05)
Golden Eagle	0.09 (0.08-0.10)
Loggerhead Shrike	0.16 (0.07-0.25)
Prairie Falcon	0.00 (0.00-0.00)
Red-tailed Hawk	0.52 (0.43-0.61)
Swainson's Hawk	0.00 (0.00-0.00)
All raptors	2.30 (1.70-2.90)
All native non-raptors	3.57 (1.94-5.20)

CI 95 percent confidence interval

Exceeding the preconstruction fatality estimates, to be considered baseline fatality thresholds in the adaptive management framework context, will require implementation of AMMs according to the following tiers:

- Tier One is defined as preconstruction fatality estimates of focal species, all raptors, or all other birds combined exceeding the amounts established in Table 5, or post-construction fatality estimates of focal species, all raptors, or all other birds combined exceeding preconstruction baseline estimates for 1 year.
- Tier Two is defined as fatality of focal species, all raptors, or all other birds combined exceeding preconstruction baseline estimates for 2 consecutive years.
- Tier Three is defined as fatality of focal species, all raptors, or all other birds combined exceeding preconstruction baseline estimates for 3 consecutive years.

6.2.1 Tier One Adaptive Management Measures

- **Visual Modifications.** If Tier One is exceeded then the project proponent will paint 25 percent of the turbine blades in a pattern to 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 shall conduct fatality studies on a controlled number of painted and non-painted turbines. The project proponent will coordinate with the TAC to determine the location of the painted turbines, but the intent is to install in areas that might have a higher potential for avian impacts.
- **Electric Pole Retrofit:** The proponent will pay to retrofit 11 utility poles every year for each focal species exceeding the baseline fatality thresholds determined by preconstruction estimates.

6.2.2 Tier Two Adaptive Management Measures

In addition to implementing Tier One AMMs, the proponent will implement the following:

- **Anti-perching Measures:** Anti-perching devices will be installed on all man-made structures within 1 mile of project facilities (with landowner permission) to discourage bird use of the area.
- **Contribution to Research:** The project proponent will contribute $2,000 for each fatality exceeding thresholds (Table 4) in support of research of new technologies to help reduce turbine-related fatalities. Similarly, the project proponent could deploy experimental technologies at a comparable cost (if appropriate innovations become available) at its facilities to test their efficacy in reducing turbine-related fatalities through before-after-control-impact (BACI) methods. Research could also investigate bird-turbine interactions, including population-level effects. The last golden eagle inventory of the APWRA vicinity was conducted in 2005 (Hunt and Hunt 2006). The researchers suggested that an inventory of the APWRA golden eagle population be conducted every 5 years to track population trends and the impacts of turbine-related fatalities in the APWRA.

6.2.3 Tier Three Adaptive Management Measures

In addition to implementing Tier One and Two AMMs, the proponent will implement the following:

- **Turbine Curtailment:** If the post-construction monitoring indicates patterns of turbine-caused fatalities, such as time of day, avian usage, topographic circumstances of the turbine location, or other data which would substantiate that a specific curtailment of a turbine's operation would result in reducing future avian fatalities, the project operator would curtail the offending turbine or turbines. Curtailment restrictions would be developed in coordination with the TAC and based on current avian use data at the project site.
- **Cut-in Speed Study:** A statistically valid (e.g., BACI) 6 month cut-in-speed study will be conducted to see if changing cut-in speeds from 3 meters per second to 5 meters per second will significantly reduce avian fatalities. The proponent will coordinate with the TAC in designing the study. Should increasing the cut-in speed be shown to have positive results but bird fatalities continue, cut-in speed restrictions will be implemented.
- **Real-time Turbine Curtailment (only if threshold for raptors is exceeded):** This monitoring approach involves a multiple step process based on radar, video, and visual observations to employ real-time turbine curtailment. In effect, an onsite biologist will monitor raptors from a control room in an observation tower with a 360-degree view in the project site. The biologist will make observations during daylight hours, initially locating and tracking raptors by way of radar technology, then identifying and observing flight direction of the raptors using video cameras and binoculars. Once visually located, the biologist will use video tracking software to maintain a lock on the raptor until it has moved away from the site and is no longer in view. If the target is projected to intersect a turbine string, the biologist will provide a curtailment command to the operations center for the appropriate turbines.

7.0 Summary

Each project proponent will formulate a project-specific BCS based upon the framework provided in this program APP. The siting, design, and construction measures are expected to help avoid direct effects during construction and long-term operations. Operations monitoring will determine the magnitude of the actual effects on birds. Offsite mitigation will compensate for the take of focal species, including golden eagles. The adaptive management program will help to ensure that the project operates within the impact levels anticipated and will provide a framework for additional management actions should such actions prove necessary. With implementation of these measures—particularly the offsite mitigation—mortality of avian species in the APWRA would be avoided, minimized, and mitigated to the extent feasible.

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8.2 Personal Communications

Bob Power. Executive Director. Santa Clara Valley Audubon Society. October 30, 2009—Email correspondence with Kathryn Gaffney, ICF International, Oakland, CA.

Doug Leslie. Altamont Pass Wind Resource Area Avian Monitoring Team. January 17, 2012—Email correspondence with Lucas Bare, ICF International, Englewood, CO.

Jesse Schwartz. Altamont Pass Wind Resource Area Avian Monitoring Team. November 7, 2011—Telephone call with Lucas Bare, ICF International, Englewood, CO.

Levin Nason. Altamont Pass Wind Resource Area Avian Monitoring Team. November 14, 2012—Email correspondence with Douglas Leslie, ICF International, Sacramento, CA.

Bret Stedman. Manager. California Raptor Center, UC Davis. December 13, 2012—Email correspondence with Lucas Bare, ICF International, Englewood, CO.

9.0 Figures

Figure 1a. Annual Adjusted Fatality Rates for Non-repowered and Repowered APWRA Turbines

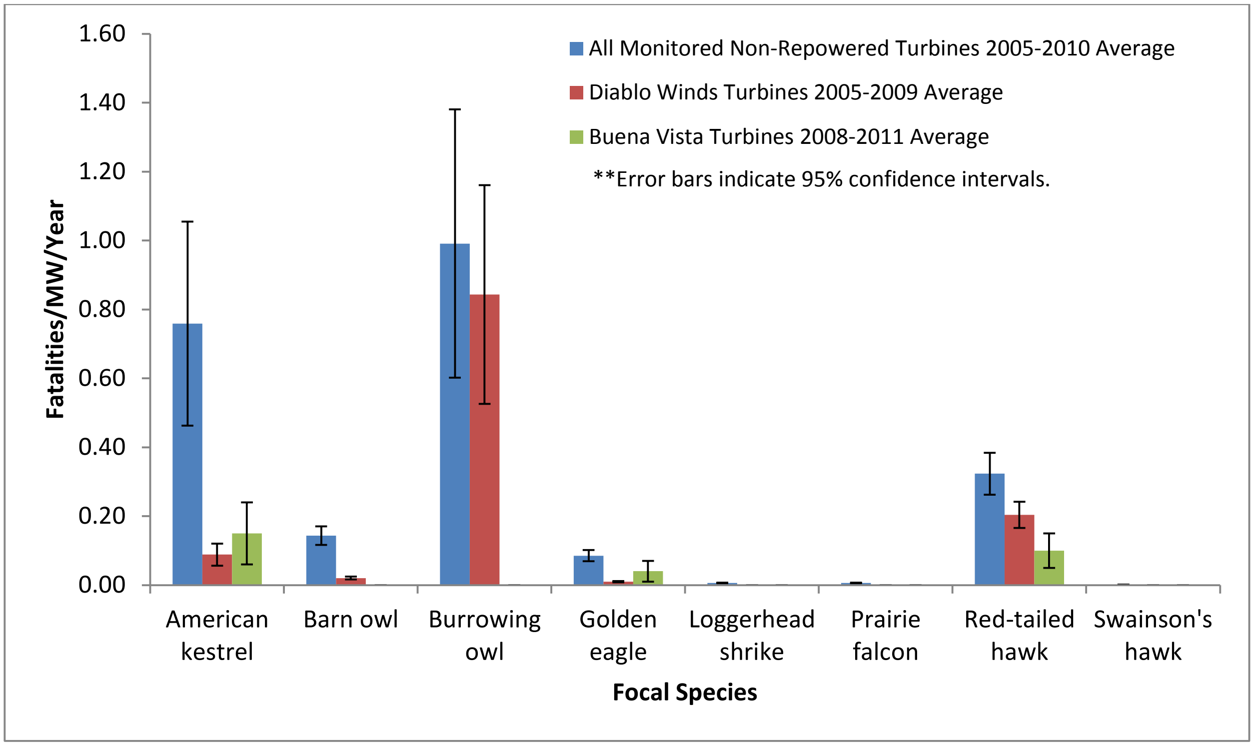

Figure 1b. Annual Adjusted Fatality Rates for Non-repowered and Repowered APWRA Turbines

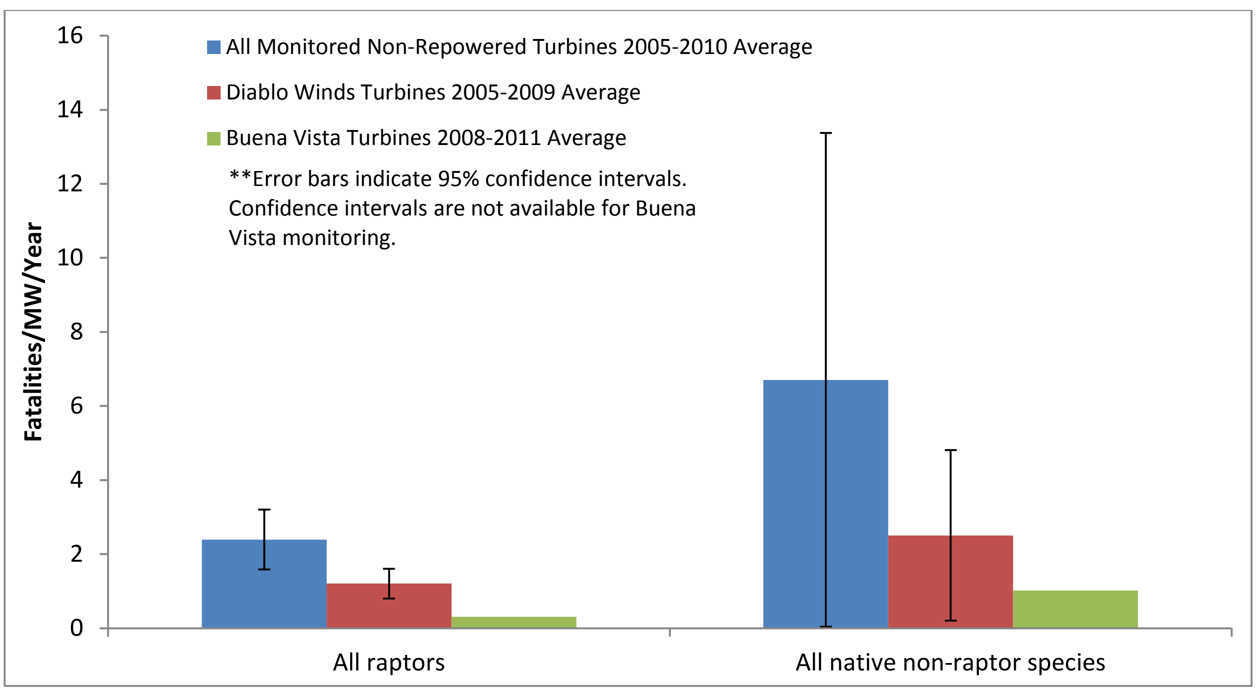

Figure 1 Notes

- Source: ICF International (2012a, 2012b) and Insignia Environmental (2012).
- One barn owl fatality and one prairie falcon fatality were documented at Buena Vista (Insignia Environmental 2012). Adjusted fatality rates are not available.
- For **All Monitored Non-Repowered Turbines 2005-2010 Average**, fatality rates were averaged across monitored turbine operating groups that do not contain repowered turbines for the bird years 2005 through 2010 (October 1 through September 30) based on modified Smallwood (2007) detection probabilities (ICF International 2012a).
- For **Diablo Winds Turbines 2005-2009 Average**, fatality rates were calculated using Diablo Winds turbines only for the 2005 through 2009 bird years based on modified Smallwood (2007) detection probabilities (ICF International 2012b).
- For **Buena Vista Turbines 2008-2011 Average**, fatality rates based on monitoring conducted from February 2008 through January 2011 based on modified Smallwood (2007) detection probabilities (ICF International 2012a).

Figure 2a. Annual Fatalities per Year for Existing and Repowered Project Area

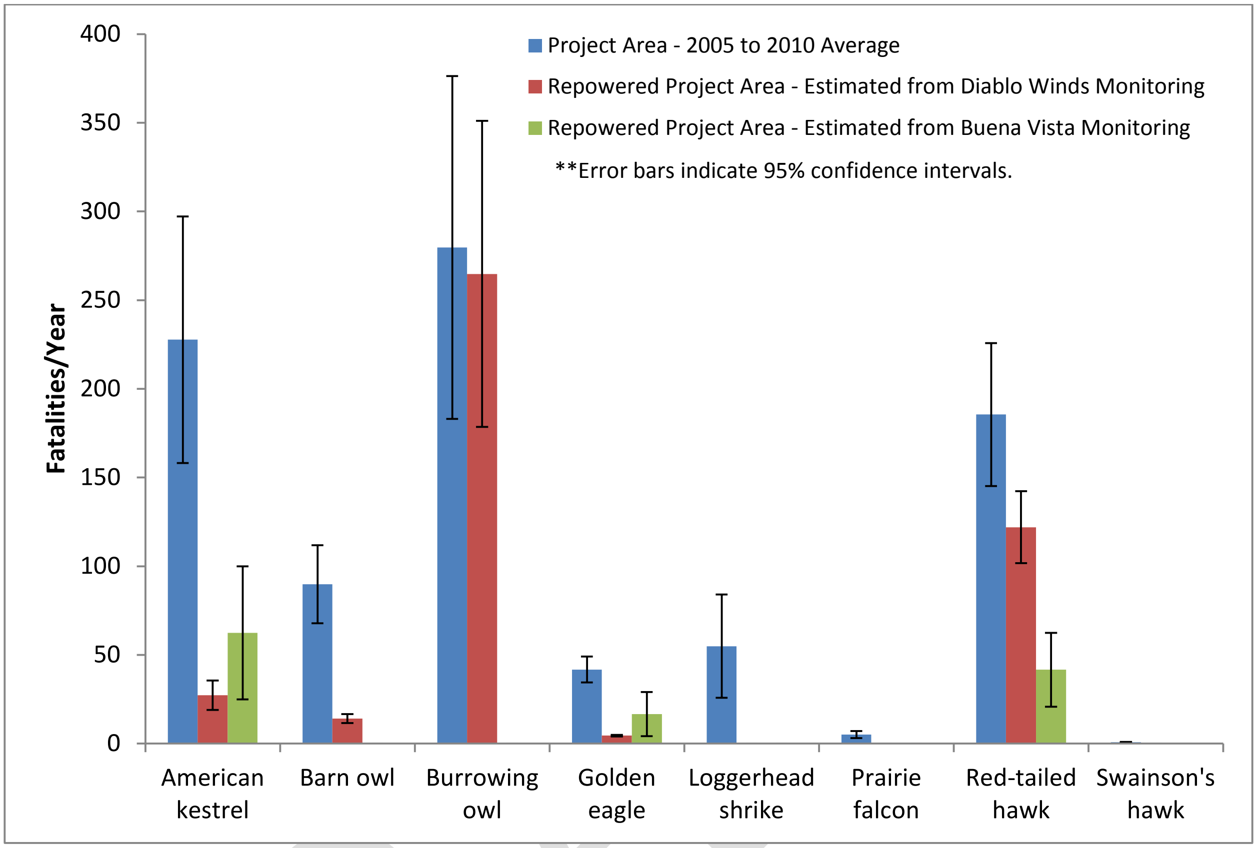

Figure 2b. Annual Fatalities per Year for Existing and Repowered Project Area

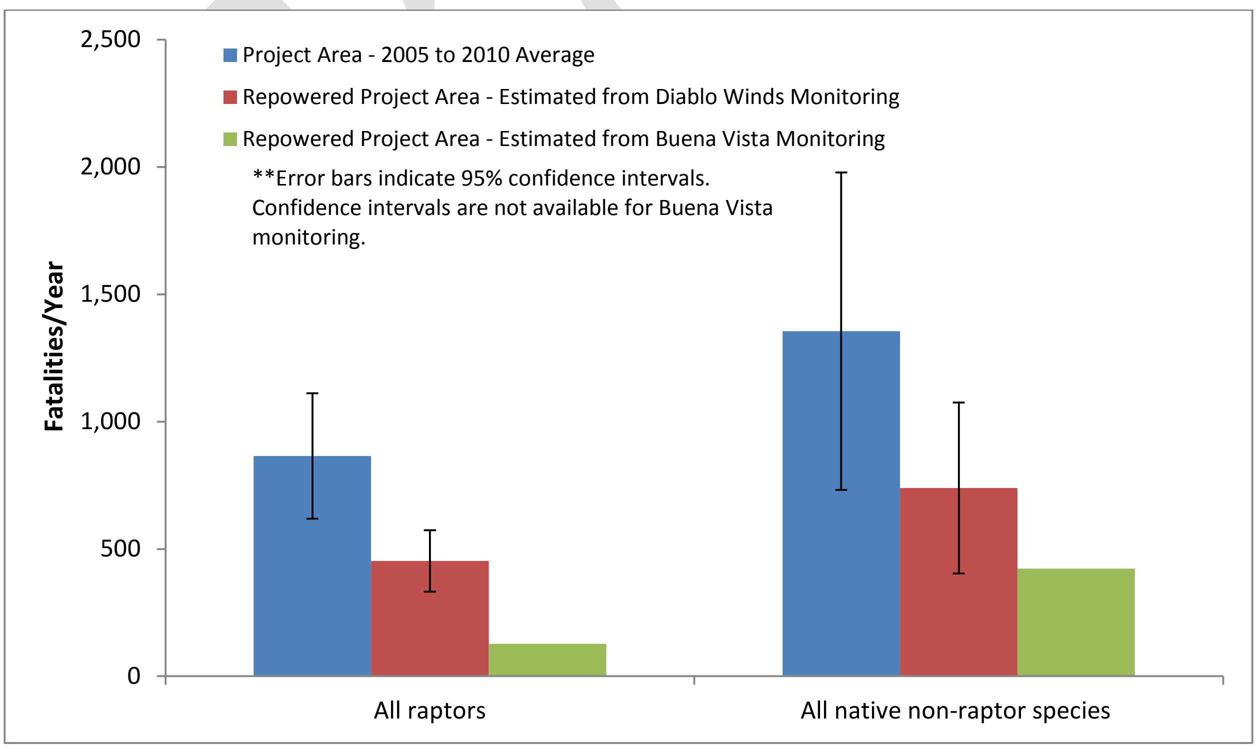

Figure 2 Notes

- Source: ICF International (2012a), ICF International (2012b), Insignia Environmental (2012).
- One barn owl fatality and one prairie falcon fatality were documented at Buena Vista (Insignia Environmental 2012). Adjusted fatality rates are not available.
- For **Project Area – 2005 to 2010 Average**, annual fatalities were averaged across all monitored turbine operating groups in the Project Area, including Diablo Winds turbines, for the 2005 through 2010 bird years (October 1 through September 30) using the Quality Assurance/Quality Control (QAQC) detection probabilities (ICF International 2012a).
- For **Repowered Project Area – Estimated from Diablo Winds Monitoring**, average annual fatalities for the 2005 through 2009 bird years using the QAQC detection probabilities (ICF International 2012a) were multiplied by the maximum allowed installed capacity of the Project Area, 416.4 megawatts, as documented in County of Alameda Community Development Department (1998).
- For **Repowered Project Area – Estimated from Buena Vista Monitoring**, average annual fatalities from 2008 through 2011 based on modified Smallwood (2007) detection probabilities (ICF International 2012a) were multiplied by the maximum allowed installed capacity of the Project Area, 416.4 megawatts, as documented in County of Alameda Community Development Department (1998).

Appendix A
Bird Species Documented at the Altamont Pass Wind Resource Area from 2005 to 2010

[Note to Reader]*: Fatality data in this appendix will be quantified pending its update with ICF International (2012b) and Insignia Environmental (2012) monitoring data.*

Species	Listing Status[1]		Live Observation[2]	Fatality[3] at Non-Repowered Turbines	Fatality[3] at Repowered Turbines
	State	Federal			
American avocet			X		X
American coot			X		X
American crow			X	X	
American kestrel			X	X	X
American pipit				X	
American white pelican			X		
Barn owl			X	X	X
Barn swallow				X	
Black-necked stilt			X		
Black-throated gray warbler					X
Bonaparte's gull				X	
Brewer's blackbird			X	X	
Brown-headed cowbird				X	
Brown Pelican				X	
Burrowing Owl	CSC		X	X	X
California gull			X		X
Canada Goose			X		
Cliff swallow				X	X
Common goldeneye				X	
Common poorwill				X	
Common raven			X	X	X
Cooper's hawk			X		
Dark-eyed junco, slate				X	
Double-crested cormorant			X		
European starling				X	X
Ferruginous hawk			X	X	X
Golden-crowned sparrow				X	
Golden eagle	FP	BGEPA	X	X	X
Great blue heron			X	X	
Great egret				X	
Great-horned owl				X	

Species	Listing Status[1]		Live Observation[2]	Fatality[3] at Non-Repowered Turbines	Fatality[3] at Repowered Turbines
	State	Federal			
Greater sandhill crane	FP			X	
Hammond's flycatcher				X	X
Horned lark			X	X	X
House finch					X
House sparrow				X	
House wren				X	
Killdeer				X	
Lesser goldfinch					X
Lincoln sparrow				X	
Loggerhead shrike			X		
Mallard			X	X	X
Mourning dove			X	X	X
Northern flicker				X	
Northern harrier			X	X	
Northern mockingbird				X	
Orange-crowned warbler				X	
Peregrine falcon	FP			X	
Pied-billed grebe					X
Prairie falcon			X	X	X
Red-shouldered hawk			X	X	
Red-tailed hawk			X	X	X
Red-winged blackbird			X	X	
Ring-billed gull			X	X	
Rock pigeon				X	X
Rock wren				X	
Ruby-crowned kinglet					X
Sandhill crane				X	
Savannah sparrow				X	
Say's phoebe				X	
Sharp-shinned hawk			X		
Snow goose			X		X
Spotted towhee					X
Swainson's hawk	ST		X	X	
Swainson's thrush				X	X
Townsend's warbler				X	
Tricolored blackbird	CSC			X	
Turkey vulture			X	X	
Violet-green swallow				X	
Warbling vireo				X	
Western gull				X	
Western meadowlark			X	X	X

Species	Listing Status[1] State	Listing Status[1] Federal	Live Observation[2]	Fatality[3] at Non-Repowered Turbines	Fatality[3] at Repowered Turbines
Western tanager				X	X
White-tailed kite			X	X	
White-throated swift				X	
Wild turkey				X	
Wilson's warbler				X	
Yellow warbler	CSC				X
Yellow-billed magpie			X		
Unidentified blackbird				X	
Unidentified duck				X	
Unidentified *Empidonax* spp.				X	

Sources:

ICF International. 2012b. Altamont Pass Wind Resource Area Alameda County Avian Fatality Monitoring Team data. October. (ICF #00904.08). Sacramento, CA. Prepared for Alameda County Community Development Agency, Hayward, CA.

Insignia Environmental. 2012. *Final Report for the Buena Vista Avian and Bat Monitoring Project: February 2008 to January 2011.* September. Palo Alto, CA. Prepared for Contra Costa County, Martinez, CA.

Western EcoSystems Technology, Inc. 2008. Diablo Winds Wildlife Monitoring Progress Report, March 2005 – February 2007. August. Cheyenne, WY.

[1] Status:

State

FP Fully protected

SE State listed as endangered

ST State listed as threatened

CSC California species of special concern

Federal

BGEPA Bald Eagle and Golden Eagle Protection Act

FE Federally endangered

FT Federally threatened

Note that most birds are listed under MBTA so MBTA status was not recorded.

[2] An “observation” is a monitored occurrence of a live bird or bat. Observation data are compiled from the Buena Vista Avian and Bat Monitoring Project (Insignia Environmental 2012), the Diablo Winds Wildlife Monitoring Progress Report (Western EcoSystems Technology 2008)and the Alameda County Avian Fatality Monitoring Team (ICF International 2912b).

[3] A “fatality” is a monitored occurrence of a dead bird the death of which is attributed to turbine facilities. Fatality data are compiled from the Avian Monitoring Team (ICF 2011b) and the Buena Vista Avian and Bat Monitoring Project (Insignia Environmental 2012).

Appendix F2

2007 Settlement Agreement

SETTLEMENT AGREEMENT

THIS AGREEMENT (the "Agreement") is entered into as of this ___th day of January 2007 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 together with Audubon, "Audubon/CARE"), and **ESI Bay Area GP, Inc., ESI Altamont Acquisitions, Inc. on behalf of Green Ridge Power, LLC, and ESI Tehachapi Acquisitions on behalf of Altamont Power, LLC.** (collectively, "ESI"), **enXco, Inc.**, and **SeaWest Power Resources, LLC** (collectively, along with ESI, the "Wind Power Companies"), and the **Alameda County Board of Supervisors, County of Alameda** (the "County"). Audubon, CARE, the Wind Power Companies and the County are referred to individually as a "Party" and collectively as the "Parties."

R E C I T A L S

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

1. On September 22, 2005, the Alameda County Board of Supervisors approved conditional use permits ("CUPs") for the operation of wind turbines by the Wind Power Companies, among other entities, at the Altamont Pass Wind Resources Area ("APWRA"). The Alameda County Board of Supervisors concluded that its decision to issue the CUPs was categorically exempt from the California Environmental Quality Act ("CEQA").

2. On or about October 31, 2005 and as amended on or about November 29, 2005, Audubon/CARE petitioned the Alameda County Superior Court for a writ of mandate (Case Nos. RG05239552 & RG05239790) to set aside the Alameda County Board of Supervisors' issuance of the CUPs on various grounds, including that such action violated the County's General Code and CEQA. The Audubon/CARE writ petitions are collectively referred to as the "Action." The Wind Power Companies are Real Parties in Interest in the Action.

3. Beginning in January, 2006, the parties to the Action engaged in a series of discussions in an attempt to resolve their disputes prior to the parties briefing the action on its merits. The discussions included the Parties, represented by legal counsel and their principals, and, after the proposed settlement agreement included consideration of a conservation planning component, representatives of the California Department of Fish and Game. After extensive discussion among and between the various parties, on or about November 6, 2006, Audubon/CARE and the Wind Power Companies agreed to a framework for settling the entire Action. That agreement is embodied in the November 6, 2006 Settlement Framework (the "Settlement Framework"), attached hereto as **Exhibit 1**.

4. The County wishes to enter into this Agreement with the Parties, based on the Settlement Framework, in order to resolve the Action and accordingly modify its existing conditional use permits for wind turbine operations at the AWPRA, in order to continue producing wind energy while further reducing raptor mortality in the APWRA.

5. The Parties desire to enter into this Agreement in order to execute a final settlement of the Action. The terms and conditions of this Agreement are set forth below.

TERMS AND CONDITIONS

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

1. **County Approval Process.** This Agreement modifies the CUPs with regard to various measures to reduce raptor mortality at the APWRA, as reflected in the modified permit conditions approved by the County concurrently with the County's approval of this Agreement.

2. **Relationship to existing CUPs.**

   (a) The Wind Power Companies hold CUPs with the County through various legal entities. Within each CUP, some turbines are owned beneficially only by Wind Power Companies and some are owned by a Wind Power Company and a non-settling party. Only the turbines owned beneficially solely by Wind Power Companies, with no non-settling party beneficial interest, are affected by this Agreement (the "Applicable Turbines"). The modification of the CUPs is intended to accomplish this objective.

3. **Reduction in raptor mortality.** The Wind Power Companies shall achieve a 50% reduction in raptor mortality within three (3) years of the effective date of this Agreement.

   (a) The baseline for determining the percentage reduction in raptor mortality at the APWRA is thirteen hundred (1300).

      (i) The raptor species that shall be evaluated to determine the percentage reduction in raptor mortality are Golden Eagle, Burrowing Owl, American Kestrel, and Red-Tailed Hawk.

      (ii) The percentage reduction in raptor mortality shall be determined using field monitoring data collected in accordance with the CUPs and scaling factors for searcher efficiency and scavenging as approved by the Scientific Review Committee ("SRC").

      (iii) In the event the above-referenced scaling factors exceed 2.5, the Wind Power Companies, Audubon, and the County, in consultation with the SRC, along with any other individuals or entities that both the Wind Power Companies, Audubon and the County agree to, shall meet and confer to re-determine a mutually acceptable baseline for determining raptor mortality and/or reduction percentage in raptor mortality that triggers adaptive management measures as specified in section 3(c) of this Agreement.

(b) The Wind Power Companies, Audubon, and the County, in consultation with the SRC, shall meet and confer at least annually to determine if mutually acceptable mid-course corrections in measures to reduce raptor mortality are appropriate after the SRC evaluates the prior year's monitoring data. Agreed upon mid-course corrections for the Applicable Turbines shall be forwarded to the County for consideration pursuant to Condition 5 of the CUPs if the measures require permit modifications.

(c) Adaptive management measures will be implemented if a 50% reduction in raptor mortality is not achieved by November 1, 2009.

(i) The SRC will prioritize management measures, including an evaluation of management measures that have not reduced raptor mortality at the expense of energy production, after analyzing field monitoring data. The SRC shall use its best efforts to achieve its prioritization of management efforts by June 1, 2009.

(ii) By August 1, 2009, Wind Power Companies and Audubon will propose an adaptive management plan to the SRC/County for review pursuant to Condition 5 of the CUP if a 50% reduction in raptor mortality has not previously been achieved and is not projected to be achieved by November 1, 2009. The adaptive management plan will be designed to achieve a 50% reduction in raptor mortality with the least impact on energy production, and may include the elimination or reduction of seasonal shutdowns. The SRC shall act (pursuant to Condition 5 of the CUPs, as necessary) on the adaptive management plan for the Applicable Turbines by November 1, 2009.

(iii) Nothing in this Agreement shall preclude the Wind Power Companies from implementing other measures, such as rodent trapping, reasonably designed to reduce raptor fatalities and help achieve the objective of a 50% reduction in raptor mortality, provided the measures are consistent with the objectives of this Agreement and not outside the terms of the CUPs.

4. **Seasonal shutdown.** Wind Power Companies shall cease operations for approximately ½ of existing (non-repowered) operating Applicable Turbines between November 1, 2007 and December 31, 2007 and the remaining ½ of existing (non-repowered) operating Applicable Turbines between January 1, 2008 and February 28, 2008.

5. **Turbine removal or relocation.**

(a) Wind Power Companies shall shut down Tiers 1 and 2 Applicable Turbines within 30 days of the effective date of this Agreement or, in the event an alternative list of Applicable Turbines is presented to the SRC, as specified in section 5(a)(ii), within 15 days of SRC approval of such list, whichever is later.

(i) Tiers 1 and 2 Applicable Turbines means those turbines identified as Tiers 1 or 2 per Smallwood-Spiegel June 2005 report Group C ranking, confirmed by WEST July 2005 (currently 131 turbines unless the remaining 24 turbines are specifically identified by the SRC prior to the implementation date set forth in (a) above) and as therein allocated per each Wind Power Company and per each Wind Power Company's individual projects.

(ii) Any time after the execution of this Agreement, each Wind Power Company may submit to Audubon and the SRC a list and description of high risk Applicable Turbines already shut down and ask for credit against this Tier 1 and 2 shut down requirement. The SRC will grant credit for such Applicable Turbines reasonably determined on a scientific and technical basis to be high risk, provided such Applicable Turbines were shut down on or after May, 2002, and the fact that the Applicable Turbines were not listed as Tier 1 or 2 will not prejudice this evaluation.

(b) Wind Power Companies shall shut down Tier 3 Applicable Turbines or Applicable Turbines identified pursuant to section 5(b)(ii) by October 31, 2008.

(i) Tier 3 Applicable Turbines consist of no more than 152 turbines in total, and no more for each Wind Power Company and each Wind Power Company's individual project than the number allocated to each Wind Power Company and each Wind Power Company's individual project for Tier 3 turbines in the Smallwood-Spiegel June 2005 report, confirmed by WEST in July 2005.

(ii) By July 1, 2007, each Wind Power Company may present to the SRC an alternative list of Applicable Turbines for shutdown and ask for credit against this Tier 3 shutdown requirement. Applicable Turbines for consideration may include previously removed Applicable Turbines that were among those considered in the Smallwood-Spiegel June 2005 report provided such Applicable Turbines were non-derelict when removed. The SRC shall select for shutdown, on a scientific and technical basis, the highest risk Applicable Turbines of those presented to it by each Wind Power Company (Tier 3 list vs. proposed alternatives).

(c) Wind Power Companies shall remove each Applicable Turbine that is subject to a shutdown requirement as specified in this Agreement unless the SRC, on a scientific and technical basis, approves of its continued existence (e.g., end-row turbine that serves as a flight diverter) or renewed operation (e.g., middle of a string with low risk). Any Applicable Turbine may be relocated to a non-Tier 1, 2, or 3 existing turbine site, provided it is relocated in accordance with the criteria specified in Exhibit A attached to the Settlement Framework (Exhibit 1).

6. **Blade painting study.** Wind Power Companies may participate in a SRC approved study to determine whether blade painting reduces raptor mortality. Up to 450

Applicable Turbines may be painted as part of this study, with a corresponding number of Applicable Turbines included as a control group. Turbines shall be painted by December 31, 2007, or as soon thereafter as reasonably possible, depending on the timing of SRC approval of the study design.

(a) Wind Power Companies shall present a proposed before/after control/impact ("BACI") design study to the SRC for review and approval to evaluate the effectiveness of the blade painting program in reducing raptor mortality. The SRC must also approve the blade painting design.

(b) The SRC shall either approve the BACI design study within 30 days from submittal, or respond within 30 days from submittal with changes necessary for approval, so that the BACI design study can be incorporated into the ongoing monitoring program as soon as possible.

(c) Painted blade turbines and control group turbines included in the approved BACI design study shall be exempted from all permanent and/or seasonal shutdown requirements for the period of the study.

(d) Blade painting initial allocations subject to the further provisions of section 6(e) below are as follows:

(i) ESI – up to 285 Applicable Turbines (plus 285 control group Applicable Turbines);

(ii) enXco – up to 108 Applicable Turbines (plus 108 control group Applicable Turbines); and

(iii) SeaWest – up to 57 Applicable Turbines (plus 57 control group Applicable Turbines).

(e) Nothing in subsection (d) shall prevent one Wind Power Company from assuming by mutual agreement all or part of another Wind Power Company's initial allocation for blade-painting. The final allocations of Applicable Turbines beyond the allocations stated in subsection (d), and up to 450 painted Applicable Turbines, shall be by the agreement of the Wind Power Companies and subject to an SRC approved BACI design.

7. **Natural Communities Conservation Plan – Applicable to Activities of Wind Turbine Owners and Operators.**

(a) It is the intent of the Parties to develop a Natural Communities Conservation Plan ("NCCP") pursuant to section 2801 et seq. of the California Fish and Game Code or similar agreement approved by the California Department of Fish and Game ("CDFG") to address the long-term operation of wind turbines at the APWRA and the conservation of impacted species of concern and their natural communities. The NCCP or similar agreement shall only apply to the operation, construction, maintenance and repowering of wind turbines and will not apply to land use development or farming, ranching, or other agricultural activities except with the express consent of the applicable property owners.

(b) The County will be the local sponsor of the NCCP or similar agreement. The Wind Power Companies shall be responsible for funding the County's expenses in serving as local sponsor for the NCCP or similar agreement, including, but not limited to, funding consultants and/or employees necessary to fill this role. This expense shall be divided among the Wind Power Companies as set forth in the CUPs.

(c) The NCCP or similar agreement may lead to modifications to the terms of the CUPs. The Parties acknowledge that future repowering of the Altamont, which plays a central role in the context of the current County CUPs, will also play an important role in the adoption of adaptive management measures as provided for in Section 3 of this agreement and/or in the development of the NCCP or similar agreement. The repowering and shutdown provisions (beginning September 2009, and thereafter) in the CUPs concerning Applicable Turbines have been amended to delete those provisions that are no longer effective for the Wind Power Companies because it is expected that the adaptive management plan and NCCP will supersede those provisions. Future repowering requirements will be governed by the adaptive management plan, the NCCP, or any similar agreement approved by both the County and CDFG. If no modifying documents are agreed to, the existing permit conditions in the CUPs, relating to repowering of Applicable Turbines, will not remain in effect, but the Parties agree that the County may amend the permits in light of then current conditions to address repowering obligations.

(d) The Parties have prepared and executed a draft Planning Agreement for the development of a NCCP, which is attached hereto as **Exhibit 2**. Notwithstanding the foregoing, the terms of this Agreement and the CUPs, as modified by this Agreement, shall remain in full force and effect if the Parties and/or CDFG do not agree to a NCCP or similar agreement.

8. **Release.** Audubon and CARE shall release the County, the Alameda County Board of Supervisors, the Alameda County Planning Department, the East County Board of Zoning Adjustments, and Wind Power Companies from the claims asserted in the Action. Notwithstanding the foregoing, Audubon and CARE shall have the right to enforce the terms of this Agreement. Audubon and CARE shall dismiss with prejudice the Action upon execution and adoption of this Agreement by the Parties.

9. **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.

10. **Enforcement of agreement.** The Parties agree that any and all disputes, claims or controversies arising out of or relating to this Agreement shall be submitted to mediation before any Party files a lawsuit. Any Party may commence mediation by providing to the

Parties a written request for mediation, setting forth the subject of the dispute and the relief requested. The Parties will cooperate with one another in selecting a mutually agreeable mediator, and in scheduling the mediation proceedings. The Parties covenant that they will participate in the mediation in good faith, and that they will share equally in its costs. The provisions of this mediation clause may be enforced by any Court of competent jurisdiction, and the party seeking enforcement shall be entitled to an award of all costs, fees and expenses, including attorneys' fees, to be paid by the party against whom enforcement is ordered.

11. **Amendments.** Unless expressly permitted by this Agreement, no supplement, modification or amendment of any term, provision or condition of this Agreement (including this paragraph) shall be binding or enforceable unless evidenced in a writing executed by all of the Parties to this Agreement. Notwithstanding the foregoing, this provision does not restrict the role of the SRC pursuant to the terms of the CUPs.

12. **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.

13. **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 to sign this Agreement on their behalf.

14. **Counterparts.** The 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.

15. **Effective date.** The effective date of this Agreement shall be January __, 2007.

Dated: January ___, 2007 GOLDEN GATE AUDUBON SOCIETY

____
Name: ________________________________
Title: ________________________________

Dated January ____, 2007 OHLONE AUDUBON SOCIETY

____
Name: ________________________________
Title: ________________________________

Dated: January ____, 2007 MOUNT DIABLO AUDUBON SOCIETY

____
Name: __________________________________
Title: __________________________________

Dated: January ____, 2007 SANTA CLARA VALLEY AUDUBON SOCIETY

____
Name: __________________________________
Title: __________________________________

Dated: January ____, 2007 MARIN AUDUBON SOCIETY

____
Name: __________________________________
Title: __________________________________

Dated: January ____, 2007 CALIFORNIANS FOR RENEWABLE ENERGY

____
Name: __________________________________
Title: __________________________________

Dated: January ____, 2007 SEAWEST POWER RESOURCES, LLC

____
Name: __________________________________
Title: __________________________________

Dated: January ____, 2007 enXco, INC.

____
Name: __________________________________
Title: __________________________________

Dated: January ____, 2007 ESI Bay Area GP, Inc.

____
Name: ________________________________
Title: ________________________________

Dated: January ____, 2007 ESI Altamont Acquisitions, Inc. on behalf of Green Ridge Power LLC.

____
Name: ________________________________
Title: ________________________________

Dated: January ____, 2007 ESI Tehachapi Acquisitions, Inc. on behalf of Altamont Power, LLC

____
Name: ________________________________
Title: ________________________________

Dated: January ____, 2007 ALAMEDA COUNTY

____
Name: ________________________________
Title: ________________________________

Dated: January ____, 2007
Approved as to form:

LAW OFFICE OF J. WILLIAM YEATES

____
J. William Yeates
Attorney for Golden Gate Audubon Society, Ohlone Audubon Society, Mount Diablo Audubon Society, Santa Clara Valley Audubon Society, and Marin Audubon Society

Dated: January ____, 2007
Approved as to form:

LAW OFFICE OF JOHN C. GABRIELLI

____

John C. Gabrielli
Attorney for CAlifornians for Renewable Energy

Dated: January ____, 2007
Approved as to form:

PAUL, HASTINGS, JANOFSKY & WALKER LLP

____

Peter H. Weiner
Attorney for ESI Bay Area GP, Inc., ESI Altamont Acquisitions, Inc. on behalf of Green Ridge Power, LLC., and ESI Tehachapi Acquisitions, Inc., on behalf of Altamont Power, LLC

Dated: January ____, 2007
Approved as to form:

KAYE SCHOLER LLP

____

George T. Caplan
Attorney for SeaWest Power Resources, LLC and enXco, Inc.

Dated: January ____, 2007
Approved as to form:

ALAMEDA COUNTY

____

Appendix F3

2010 Settlement Agreement

AGREEMENT TO REPOWER TURBINES AT THE ALTAMONT PASS WIND RESOURCES AREA

THIS AGREEMENT (the "Agreement") is entered into as of this 3rd 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

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 3, 2010 GREEN RIDGE POWER LLC

BY: ______________________

ITS: President

TJ Tuscai
President

Dated: December 3, 2010 WINDPOWER PARTNERS 1990, L.P.

BY: ESI BAY AREA GP, INC

ITS: General Partner

BY: ______________________

ITS: President

TJ Tuscai
President

Dated: December 3, 2010

WINDPOWER PARTNERS 1991, L.P.

BY: ESI BAY AREA GP, INC

ITS: General Partner

BY: ____________________

ITS: President

TJ Tuscal
President

Dated: December 3, 2010

WINDPOWER PARTNERS 1991-2, L.P.

BY: ESI BAY AREA GP, INC

ITS: General Partner

BY: ____________________

ITS: President

TJ Tuscal
President

Dated: December 3, 2010

WINDPOWER PARTNERS 1992, L.P.

BY: ESI BAY AREA GP, INC

ITS: General Partner

BY: ____________________

ITS: President

TJ Tuscal
President

Dated: December 3, 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

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

Michael E. Boyd
____

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

Dated: December ___, 2010

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

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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 3, 2010

PEOPLE OF THE STATE OF CALIFORNIA
EX REL. ATTORNEY GENERAL

[signature]

Name: Ken Alex
Title: Senior Assistant Attorney General

Appendix F4

SRC Guidelines for Siting Wind Turbines

GUIDELINES FOR SITING WIND TURBINES RECOMMENDED FOR RELOCATION TO MINIMIZE POTENTIAL COLLISION-RELATED MORTALITY OF FOUR FOCAL RAPTOR SPECIES IN THE ALTAMONT PASS WIND RESOURCE AREA

Draft of 23 May 2010

Alameda County SRC

SECTION 1. INTRODUCTION

The Scientific Review Committee (SRC) for Alameda County's Altamont Pass Wind Resource Area (APWRA) avian mortality monitoring program has prepared the following guidelines to assist the wind power companies in the APWRA with re-siting of wind turbines recommended by the SRC for removal or relocation. Relocation or removal recommendations were made for the purpose of minimizing the potential for collision-related mortality of four focal raptor species in the APWRA.

As a result of the SRC's process of identifying hazardous turbines and exploring and evaluating the topographic, wind pattern, bird behavior, and turbine siting variables related to hazardous conditions, the SRC was also able to provide guidance on relocation of hazardous turbines to sites that pose lower hazard to the four focal species.

These guidelines are intended to provide the wind companies with basic information regarding avian collision hazards associated with turbine siting in the APWRA that can be used to evaluate the risk of potential relocation sites as well as the possible increased risk created by non-operational turbines and removal of turbines. Initially released in August 2008, the guidelines were updated following the ratings of additional wind turbines by an SRC subcommittee composed of Jim Estep and Shawn Smallwood during March 2010.

Background

The Altamont Pass Wind Resource Area (APWRA) is known to cause hundreds of raptor fatalities per year due to wind turbine collisions alone (Howell and DiDonato 1991, Orloff and Flannery 1992, Smallwood and Thelander 2004, 2005, 2008, WEST, Inc. 2007). Because collision-related mortality of long-lived, protected species has continued largely unabated since the initial development of the APWRA, the recent renewal of the conditional use permits (CUPs) for the continued operation of existing, old-generation wind turbines proved controversial. To alleviate concerns expressed by members of the public and the resource agencies about the APWRA's impacts on raptors and other birds, the Alameda County Board of Supervisors introduced new requirements along with the renewal of the CUPs.

The Alameda County Board of Supervisors issued a resolution on 22 September 2005, which required the shutdown or relocation of Tier 1 and 2 turbines[1] according to a schedule (Exhibit G-2), as well as the removal of all derelict and non-operating turbines[2] by 22 September 2006. Following a settlement agreement between the County of Alameda and the plaintiffs in a legal challenge of the CUP renewals under the California Environmental Quality Act, the Board of Supervisors amended the resolution and associated CUPs on 11 January 2007. This amendment applied to the wind companies agreeing to the settlement. It maintained the shutdown and relocation requirements, but expanded them to the removal of all Tier 3 turbines by 31 October 2008. It also maintained the requirement that all derelict and non-operating turbines be removed by 22 September 2006. The original and amended resolution included additional requirements, but the most relevant requirements for the foregoing document were the shutdowns and relocations of the most hazardous wind turbines and the removal of derelict and non-operating wind turbines.

The resolution by the Board of Supervisors also required the formation of a scientific review committee (SRC), which was to "investigate, monitor and evaluate the effectiveness of the [Avian Wildlife Protection] Program" (Exhibits G-1 and G-2). After receiving input from the Permittees, the monitoring team, and state-sponsored research, the SRC was also to "recommend adjustments [to the Program], and design and implementation of alternative strategies" (Exhibits G-1 and G-2). The original resolution (Exhibit G-2) charged the SRC with recommending management actions aimed at achieving "progressive and substantial reductions in avian mortality and injuries," whereas the amended resolution (Exhibit G-1) charged the SRC with recommending management actions aimed at achieving a 50% reduction in wind turbine-related mortality of golden eagles, red-tailed hawks, American kestrels and burrowing owls, while also minimizing losses to wind power generation. Thus, the goals were not exactly the same for settling and non-settling companies, but the SRC's role was consistent in terms of recommending management actions to reduce bird mortality.

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[1] Most hazardous wind turbines, based on a classification of hazard level developed by Smallwood and Spiegel (2005a,b,c).

[2] The CUPs did not explicitly define the term "derelict," but its use followed from language used in Smallwood and Thelander (2004), who intended it to mean towers lacking turbines or supporting non-functional turbines. Indeed, the CUPs address derelict and "non-operational turbines" in the same phrase. Confusion over the term emerged when the companies said that many of the towers without turbines or with non-functional turbines are simply "vacant," which means they are awaiting repair or new turbines to be mounted on them and placed back into service. Regardless of whether a tower is *vacant* or *derelict*, it poses an increased hazard to raptors, and is essentially the same thing until either the tower is removed or it supports a functional turbine.

As part of the SRC's investigation directed toward management recommendations, the full SRC visited the APWRA on 29 November – 1 December and on 10 December 2007. An SRC subcommittee consisting of Jim Estep and Shawn Smallwood visited the APWRA to rate more wind turbines during March 2010. The SRC relied on available research reports and their combined expertise to review the configuration and environmental setting of wind turbines at sites associated with large numbers of fatalities relative to the majority of the APWRA, and they identified candidate wind turbines that could be deemed relatively more hazardous to raptors (see SRC documents P67, P68, and P69). The SRC evaluated and ranked wind turbines according to their hazard to raptors, with the intent to consider mitigation actions involving permanent shut down and removal of the most dangerous turbines. The SRC ultimately recommended removal of high-ranking wind turbines, as well as removals of additional wind turbines if the wind companies' decided to shutdown all old-generation wind turbines for only part of the winter instead of the SRC's recommended four months over the winter. The SRC specifically recommended the following:

- Remove all towers and turbines rated 8 through 10 (SRC document P69);
- If the winter shutdown is not extended to at least 3 full search rotations (anticipated to be about 3 months), then remove towers and turbines rated 7 and 7.5; and,
- The SRC evaluates turbines and towers not previously evaluated for hazard and removal.

These recommendations were revised slightly based on the March 2010 visit by the subcommittee (see below). The SRC's rankings were later assessed by comparing mortality estimates from recent fatality monitoring data, and were found to contribute disproportionately to the mortality of golden eagles, red-tailed hawks and American kestrels (Smallwood 2008, 2010).

During the field trip, the SRC noticed many derelict or vacant wind towers which sometimes create vertical or lateral gaps[3] that raptors may incorrectly perceive as safer to fly through (SRC document P67). Also, raptors perch disproportionately more often on derelict or vacant towers, or on towers of non-operating turbines (Smallwood and Thelander 2004, 2005; Smallwood et al. 2009), which often places these raptors in close proximity to adjacent, functional turbines. Whenever derelict or vacant towers lure raptors closer to functional wind turbines, whether for

[3] Gaps refer to spacing between functional turbines that are wider than the average spacing along the row of turbines as originally sited or as has emerged due to one or more turbines being removed or becoming non-functional.

crossing perceived gaps or for perching, there is the chance of conspecific[4] or inter-specific interactions that could distract the raptors, leading to collisions.[5]

During the field trips, the SRC observed multiple opportunities for relocating wind turbines from relatively hazardous to safer locations, or to locations where overall safety to birds could be increased. The SRC concluded that the companies could likely relocate at least some of the wind turbines the SRC recommended for removal, with relocation sites subject to SRC approval. In order to provide a common understanding of the safest relocation sites and to facilitate the identification of these sites by wind energy companies, the SRC developed guidelines characterizing preferred relocation sites as well as sites to be avoided (see Section 3). In addition to the need for developing written guidelines, the SRC recognized that consultation with the companies' engineers may be needed to identify opportunities for relocation, as well as technical restrictions.

The primary goal of these guidelines and of subsequent deliberations between the companies and the SRC is to relocate turbines from more hazardous to less hazardous sites and remedy existing hazardous conditions due to vacant or derelict sites, ultimately contributing to a 50% reduction in raptor mortality in the APWRA.

SECTION 2. DESCRIPTION OF SITING FACTORS

The SRC's guidelines are based largely on published and unpublished results of research in the APWRA and personal observations and experience of SRC members. Some of the most influential experience was obtained during the SRC's four-day field trip, when the SRC was able to view the cumulative distribution of fatalities recorded by the Wildlife Reporting and Response system (WRRS)[6] and scientific research studies (Orloff and Flannery 1992, Smallwood and Thelander 2004, and unpublished, on-going monitoring data). The SRC related the distribution of these fatalities to topography and wind patterns, as well as to the arrangement of wind turbines. Research reports that identified factors associated with fatalities included Orloff and

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[4] "Conspecific" refers to individual(s) of the same species.

[5] Smaller birds often harass raptors while they are flying, causing them to defend themselves while fleeing the harassment. Larger-bodied raptors sometimes attack smaller-bodied raptors, in predatory-prey relationships. Also, raptors often chase individuals of the same species to defend territories or foraging space. While raptors are flying they often flush perched raptors, because the perched bird is at a strategic disadvantage. Flying raptors also sometimes change their flight direction to avoid another perched raptor, and if close by, the flying raptor will keep watch of the perched raptor. All of these types of interactions are distracting to a flying bird, and can lead to collisions.

[6] WRRS is the self-monitoring program used by the wind companies.

Flannery (1992, 1996), Smallwood and Neher (2004), Smallwood and Thelander (2004, 2005), Smallwood et al. (2007), and Smallwood et al. (2009). The biological resources section of the repowering EIR (Alameda County 1998) also contributed to the SRC's knowledge of factors associated with raptor fatalities.

The causal factors of raptor collisions with wind turbines appear to be interaction effects of raptor flight patterns with topography, wind patterns, and the arrangement of functional and non-functional wind turbines/towers. Flight patterns associated with foraging, e.g., hovering and kiting, have been most often linked to collisions, largely because most of the eye-witness accounts of red-tailed hawk and American kestrel collisions involved these behaviors. Raptors often forage where they can utilize slope-accelerated winds[7] to power their flights and to hold their positions while scanning for prey items. The spatial patterns of golden eagle fatalities among wind turbines also appear consistent with contour hunting by golden eagles.[8] Clusters of fatalities also occur where raptors have often been viewed foraging and crossing the terrain, including relatively low-lying areas, such as through canyons, ravines, saddles in and between ridges, and at the base of shoulders of hills or ridges. Steeper slopes are also associated with more fatalities.

Raptor fatalities at wind turbines have also been associated with wind turbines at the ends of turbine rows. Behavior data suggest at least some raptor species may perceive both the individual wind turbine and the row of wind turbines as units to be avoided, prompting raptors to more often attempt to fly around the entire turbine row. More frequent flights by the end-of-row turbine may be one reason why these turbines are often associated with more fatalities. Another reason for the association would be the frequent occurrence of end-of-row turbines at locations lower on the slopes, or on steeper slopes, where raptors often fly or where they may have less control of their flights. More recently, the wind companies have left derelict towers at the ends of rows as an alternative to perch-free flight diverters recommended by Richard Curry Associates (1997) and Smallwood and Thelander (2005a,b), and these derelict towers may have increased fatalities at the last functional turbine in the row, next to the derelict tower, because the end-of-row derelict towers likely attract raptors looking for perch sites. Wind turbines next to gaps in turbine strings have also sometimes been associated with fatalities, perhaps because raptors misperceive gaps created by vacant tower pads[9] or derelict or vacant towers as safe

[7] Slope-accelerated winds are winds that are accelerated due to being pushed up the slope or through a ravine or canyon. Typically, winds are strongest at the top of the slope facing the wind, or where the slope facing the wind breaks over to a gentler gradient.

[8] Contour hunting is flying relatively close to the terrain, quickly adjusting flight surfaces in complex winds to maintain a similar distance from the ground while traversing multiple slopes. The strategy is intended to surprise prey items by suddenly appearing from over a narrow ridgeline or from around the corner.

[9] "Vacant tower pads" are turbine addresses lacking turbines or towers.

crossing points through the turbine row. Also, raptor behavior and fatality data have indicated an avoidance of denser turbine fields[10] (Smallwood and Thelander 2004, 2005; Smallwood, Lee Neher, Doug Bell, Joe DiDonato, Brian Karas, Sara Snyder, and Sal Lopez, unpublished data in submitted final report to Public Interest Energy Research Program), and greater mortality at more isolated turbines and at turbines at the edges of the wind farm or local turbine fields (Smallwood and Thelander 2004, 2005).

Additional fatality associations have been documented or suspected, including at wind turbines nearby rock piles, trees, ponds, transmission towers, litter control fences outside the perimeter of the landfill, and electric distribution poles. Some of these features might attract perching raptors, thereby placing perched raptors near functional wind turbines. As suggested earlier, perched raptors can interact with other animals. They can attack prey items from the perch, they can change flight paths of conspecifics or other smaller-bodied raptor species, and they can be flushed by other raptors. These types of interactions can distract birds, leading to collisions with wind turbines.

SECTION 3. SITING GUIDELINES

The siting guidelines apply primarily to wind turbine relocations. *Relocation* refers to turbines that have been recommended for removal due to hazardous conditions for which these guidelines can assist the wind companies in selecting a less hazardous relocation site. The guidelines may also apply to turbines that are removed or become derelict in the future, causing hazardous conditions that can be created by newly vacant or derelict sites. The guidelines may also be useful for siting new wind turbines as part of repowering.[11] However, these guidelines apply specifically to wind turbine 'addresses,' which are the locations permitted for wind turbine operations.

These guidelines, which are not intended for any other locations that were not permitted with an existing wind turbine address as of January 2006, list the features of preferred sites or settings into which wind turbines can be relocated. The guidelines also list features of sites or settings into which wind turbine relocations are discouraged. The guidelines are deliberately not ranked, because the SRC recognizes that each of the thousands of wind turbine addresses in the APWRA have unique combinations of conditions that can mitigate or enhance the hazard associated with individual factors. As the SRC continues its efforts to understand the conditions under which a turbine location presents excessive hazards to birds, then there may be additional settings or

[10] A turbine field is a group of turbines, sometimes but not always of the same model, that are relatively separated from other groups of turbines. An example would be the AES-owned Micon 65-KW turbines near Mountain House.

[11] Repowering is the replacement of existing, old-generation wind turbines with new, modern turbines.

situations not covered in these guidelines that the SRC later determines to be too hazardous for a wind turbine relocation.

Preferred Relocation Sites or Settings

a. Hill peaks, ridge crests, and relatively even terrain to fill gaps due to presently derelict or vacant towers, or empty pads (Photos 1 and 2);

b. Wind walls[12] where vacant or derelict towers create vertical or lateral gaps between functional turbines (Photo 3);

c. Into turbine rows that already occur in high density, i.e., to increase the density of an already dense turbine field (Photo 4);

d. Interior to the turbine row to fill small gaps created by the removal of a turbine or where vacant towers occur as potential perch sites, except in cases where a gap in the interior of a turbine row is large enough to provide a safe flight path, and where relocating a turbine into that gap would result in a smaller unsafe gap (Photos 5 and 6);

e. Slopes that are leeward to one or two prevailing wind directions or that are set back from slopes facing prevailing wind directions (Photo 7); and,

f. Interior to a turbine field, unless the location is within a ridge saddle or on a steep slope, or unless other factors about the site outweigh the hazard reduction that may be achieved by the site's interior location.

Discouraged Relocation Sites or Settings

a. Sites classified as Tier 1, Tier 2, or Tier 3 according to any of the Tier classifications developed by Smallwood and Spiegel (2005a,b,c), unless the proposed new turbine arrangement creates a situation where a relocation to one of these addresses would improve safety to birds;

b. Ends of turbine rows, especially where the end of the row is at the edge of a steep slope, on a steep slope, or in a saddle, ravine, or canyon (Photo 8);

[12] Wind walls are rows of wind turbines mounted on towers at two heights above the ground, so that turbines on shorter towers are immediately in front of turbines on taller towers.

c. Where raptor fatalities have been reported previously, or potential flight paths have been identified such as through excessively long rows, unless the conditions associated with greater hazard have since changed so that the particular locations are no longer as hazardous;

d. Saddles of ridges or saddles between ridges, and especially where saddles form the apex of ravines that face a prevailing wind direction (Photos 9 through 13) or especially where these types of slope conditions occur in combination with nearby electric distribution lines (Photo 14) or other tall structures;

e. On benches of hill slopes or ridges, or just at the base of shoulders of hills, i.e., in locations of sudden elevation changes, where a raptor more often decides to fly while contouring around the slope (Photos 15, 16, and 20);

f. On or immediately adjacent to steep slopes (Photo 17);

g. At the edges of turbine fields or at the edge of the wind farm, unless the relocation somehow reduces the hazard posed by other nearby wind turbines occurring at the edge;

h. Next to artificial rock piles or natural rock formations, so long as addresses of equal or lesser hazard are available where there are no rock piles or rock formations within 100 meters (Photo 18);

i. Next to streams or ponds (Photo 13);

j. Next to transmission towers, electric distribution poles, or litter control fence around the landfill (Photos 19 and 20);

k. Where slope-accelerated winds would likely position a raptor at the height domain of the rotor plain of functional turbines (Photo 21), including where lips in the slope can locally accelerate winds used by hovering or kiting American kestrels (Photo 22);

l. Gaps in strings that are large enough for birds to safely cross (Photo 223);

m. Locations remote from other functional wind turbines, or more isolated locations; and,
n. Where turbine rows suddenly change directions (Photo 24).

Photo 1. The two derelict towers to either side of this functional turbine on the ridge crest should either be removed or put back into service. If the derelict towers are removed, then the interior functional turbine should also be removed.

Photo 2. A derelict tower interior to the turbine row and at the top of the hill would be a relatively safer relocation site.

Photo 3. Turbines missing from tall towers in wind walls (e.g., red highlight at left) can create vertical and lateral gaps in turbine operations, which might be misperceived by raptors as safe perches or fly-through locations. Turbines removed from shorter towers, such as the functional one highlighted on the right, can also create vertical and lateral gaps.

Photo 4. Where possible, turbine relocations should be directed to the interior aspect of relatively denser turbine fields.

Photo 5. Turbine relocations would be relatively safer at towers interior to the turbine rows and atop a hill or ridge.

Photo 6. Turbine relocations would be relatively safer at towers interior to the turbine rows and atop a hill or ridge.

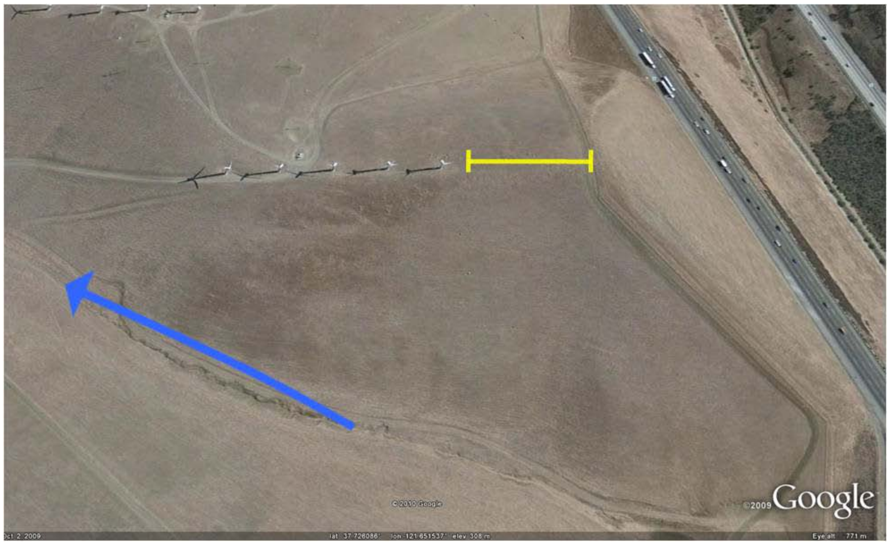

Photo 7. Turbine relocations would be relatively safer where they are set back (see yellow bar) from steep slopes facing prevailing wind directions (blue arrow).

Photo 8. Turbines should not be relocated to ends of turbine rows, especially where the towers are next to steep slopes or ravines, such as the derelict tower on the right side of the turbine row in the foreground.

Photo 9. Turbines should be relocated to hill peaks or ridge crests (e.g., green highlight), but not to saddles in the ridge (red highlight).

Photo 10. Turbines should not be relocated to ridge saddles, especially in a situation like above, where trees and rock formations occur nearby.

Photo 11. Turbines should not be relocated to ridge saddles, especially where declivity winds from a prevailing wind direction funnel into the saddle, as in the red zone at the right side of this photo.

Photo 12. Wind turbines should not be relocated to saddles formed by the meeting of two ridges.

Photo 13. Wind turbines should not be relocated to saddles or to the lower aspects of a ravine or canyon, especially not next to a pond or stream.

Photo 14. Slope-accelerated winds can be hazardous where wind turbines are sited, and especially if electric distribution lines or other tall structure provide American kestrels or other raptors additional perching opportunities near the wind turbines.

Photo 15. Wind turbines should not be relocated to shoulders of the ridge or hill, or where the slope suddenly changes, such as seen in this photo.

Photo 16. Wind turbines should not be relocated to shoulders of the ridge or hill, or where the slope suddenly changes, such as seen in this photo. This is especially true for long turbine rows like this one, where opportunities for raptors to fly through gaps are absent.

Photo 17. Derelict towers should not be put back into service where they abut steep slopes or ravines.

Photo 18. Derelict towers should not be put back into service where they occur near rock piles or trees or other structures that may be attractive for perching or hunting. In the photo above, rock piles appear just this side of the derelict tower, which should be removed. Note, however, that removing the derelict tower would result in a potentially hazardous gap in the turbine string, suggesting the importance of fully evaluating all hazardous conditions before a relocation or removal decision is made.

Photo 19. Avoid relocating wind turbines next to transmission towers or other perch sites.

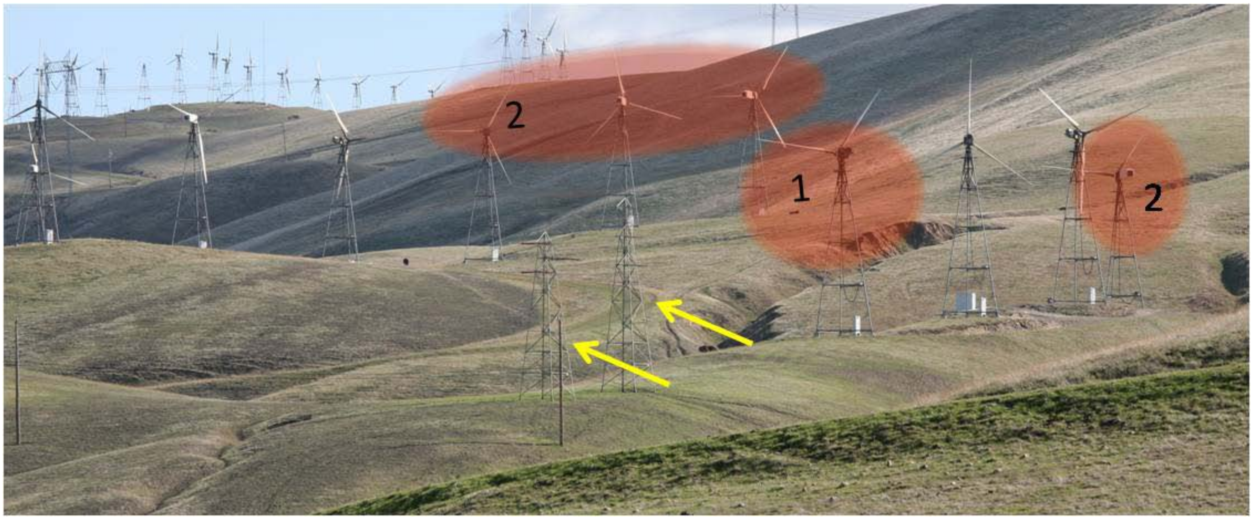

Photo 20. Avoid relocating wind turbines near transmission towers (1) or other perch sites, or to shoulders of the hill (2).

Photo 21. Wind turbines should not be relocated to locations on the slope where downslope hill morphology pushes the wind toward these locations from two different prevailing wind directions. In this photo, the red highlight identifies a portion of the air space where winds will be pushed to greater speeds by winds blowing from the northwest, west, southwest, and south.

Photo 22. Lips formed in the slope either naturally or due to grading for roads or wind turbine laydown areas might also encourage American kestrels to hover or kite in moderate and strong winds in front of wind turbines.

Photo 23. Wind turbines should not be relocated to towers within otherwise wide gaps between other turbines, such as seen above.

Photo 24. Wind turbines can be more hazardous where turbine rows zig-zag in direction (yellow arrow), especially where slope-accelerated winds (blue arrows) intersect the change in direction of the turbine row.

SECTION 4. IMMEDIATE NEXT STEPS

The SRC proposes the following steps for developing a near-term relocation plan:

1. The companies decide how many and which of the wind turbines they wish to relocate rather than remove, following the SRC's recommended removals of identified wind turbines;

2. The companies decide where they would prefer to relocate the removed turbines, and then provide a map of these locations to the SRC, as well as all current locations of potential other relocation addresses (empty pads, and derelict or vacant towers);

3. The SRC reviews the proposed relocation sites and considers other identified addresses, if needed;

4. The companies' engineers inform the SRC of which of their suggested alternative relocation addresses are infeasible and why; and

5. The SRC recommends a final relocation plan following steps 1-4, and which is directed toward immediate implementation.

The final relocation plan would be intended for immediate implementation for the purpose of achieving a 50% mortality reduction of raptors during the interim period preceding repowering of the Altamont Pass Wind Resource Area. Following the final relocation plan, the SRC recommends a relocation program for the future, during which the companies take the lead on using the SRC's relocation guidelines to evaluate the hazards associated with candidate relocations.

SECTION 5. RELOCATION PROGRAM FOR THE FUTURE

Given that wind turbine removal and relocations will continue throughout the time when wind turbines are operating in the Altamont Pass, and given that these removals and relocations will change the arrangement of wind turbines, there is a need to initiate a program to assess the collision hazards of wind turbines as they are removed or relocated. As wind turbines are removed or relocated, not only will the hazard status of the relocated turbines change, but so will the adjacent turbines from where the turbine was removed and to where the turbine will be relocated. The SRC recommends that the companies regularly update the SRC or a subcommittee of the SRC on planned or recent turbine removals and relocations. Alternatively, the companies could work with the SRC to train a company employee to assess the hazard status of turbines as removals and relocations are planned. These steps are necessary to ensure sustained confidence by the SRC in effectiveness of the turbine relocation management strategy outlined in these guidelines.

The final near-term relocation plan recommended by the SRC (see step 5 in Section 4) could identify turbine addresses to where the SRC feels it would be safer to relocate turbines during the subsequent relocation program. The SRC should meet and confer annually to identify new candidate relocation sites in order to remain current with changes in the APWRA. These new candidate addresses could be put into map form for implementation by the designated company employee or the SRC subcommittee.

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