Draft Environmental Assessment

for

the Proposed Issuance of an Eagle Incidental Take Permit

for Red Horse Wind 2 Energy Facility

Prepared by

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for

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List of Acronyms

AGFD	Arizona Game and Fish Department
Applicant	Red Horse Wind 2, LLC
CFR	Code of Federal Regulations
EA	Environmental Assessment
Eagle Act	Bald and Golden Eagle Protection Act
Eagle ITP	Eagle Incidental Take Permit
ECP	Eagle Conservation Plan
ECPG	Eagle Conservation Plan Guidance
EMU	Eagle Management Unit
LAP	Local Area Population
MBTA	Migratory Bird Treaty Act
MW	Megawatts
NEPA	National Environmental Policy Act
PEIS	Service's Programmatic Environmental Impact Statement for the Eagle Rule Revision, December 2016
PCMM	Post-Construction Mortality Monitoring
Project	Red Horse 2 Wind Facility
RHW2	Red Horse Wind 2, LLC
Service	U.S. Fish and Wildlife Service

Chapter 1: Introduction

This Draft Environmental Assessment (DEA) has been prepared to analyze the environmental consequences of the U.S. Fish and Wildlife Service (Service) issuing an Eagle Incidental Take Permit (ITP) for the incidental take of golden eagles (*Aquila chrysaetos*) associated with the operation of the Red Horse Wind 2 Energy Facility (Project), pursuant to the National Environmental Policy Act (NEPA) (42 USC §§ 4321–4347). Issuance of an Eagle ITP by the Service for take that is incidental to otherwise lawful activities under the Bald and Golden Eagle Protection Act (Eagle Act) (16 USC §§ 668–668d and 50 CFR § 22.26) constitutes a discretionary Federal action that is subject to NEPA. This EA assists the Service in ensuring compliance with NEPA, and in making a determination as to whether any "significant" impacts could result from the analyzed actions that would require preparation of an Environmental Impact Statement. This EA evaluates the effects of alternative actions for our decision whether to issue an Eagle ITP.

The Eagle Act authorizes the Service to issue Eagle ITPs only when the take is compatible with the preservation of each eagle species, defined (in USFWS 2016a) as "consistent with the goals of maintaining stable or increasing breeding populations in all eagle management units (EMUs) and the persistence of local populations throughout the geographic range of each species."

The Applicant, Red Horse Wind 2, LLC (RHW2), is requesting Eagle Act take coverage for continued operation of the Project. This company is an affiliate of D.E. Shaw Renewable Investments. The Applicant has requested a 17-year Eagle ITP for golden eagles under the Eagle Act at the Project. The Applicant's Eagle Conservation Plan (ECP; Appendix A) is the foundation of the permit application for the Project. The Applicant is requesting an Eagle ITP for the take of up to 13 golden eagles over the first 2 years and 110 golden eagles over the 17-year term of the Eagle ITP. This DEA evaluates whether issuance of the Eagle ITP will have significant impacts on the existing human environment. "Significance" under NEPA is defined by regulation at 40 Code of Federal Regulations (CFR) 1508.27, and requires short- and long-term consideration of both the context of a proposal and its intensity.

This proposal conforms with, and carries out, the management approach analyzed in, and adopted subsequent to, the Service's Programmatic Environmental Impact Statement for the Eagle Rule Revision, December 2016 (PEIS; Service 2016). Accordingly, this EA tiers from the 2016 PEIS. Project-specific information not considered in the PEIS (USFWS 2016a) will be considered in this EA, as described below.

1.1 Purpose and Need

The need for this action is a decision on a 17-year Eagle ITP application received from RHW2. The decision must comply with all applicable regulatory requirements and be compatible with the preservation of eagles.

1.2 Authorities

Service authorities are codified under multiple statutes that address management and conservation of natural resources from many perspectives, including, but not limited to the effects of land, water, and energy development on fish, wildlife, plants, and their habitats. This analysis is based on the Eagle Act (16 USC 668–668e) and its regulations (50 CFR Part 22). The PEIS has a full list of authorities that apply to this action (USFWS 2016a; PEIS Section 1.6, pages 7-12), which are incorporated by reference here.

1.3 Background

The Project is a wind energy generating facility that began commercial operation in September 2015. The Project has a nameplate capacity of 30 megawatts (MW), and is located approximately 15 miles west of the city of Willcox, Arizona (Figure 1). Project infrastructure includes two meteorological towers, 15 Vestas 2.0-MW wind turbines, buried electrical collection lines, access roads, an operations and maintenance building, a switchyard at the point of interconnection, and an overhead transmission line. The maximum blade tip height of the turbines is 443 feet (135 meters), measured from the ground to the top of the turbine blade; each turbine has an 262-foot (80-meter) hub height, a 361-foot (110-meter) rotor diameter, a cut-in speed of 9.8 feet per second (3 meters per second), and a cut-out speed of 82 feet per second (25 meters per second). The Project Area and a transmission line are located on state lands.

As part of RHW2's efforts to reduce eagle take to the extent practicable (USFWS 2016a) the initial Project design was evaluated and then modified to minimize the risk of eagle take. A suite of pre-construction and post-construction surveys were conducted at the Project. Further discussion on those surveys is provided in Sections 2.2.4 and 4 of Appendix A. The Project footprint was reduced in size from an initial Project Area of 5,798 acres to the current Project Area of 2,765 acres, based on the results of pre-construction studies.

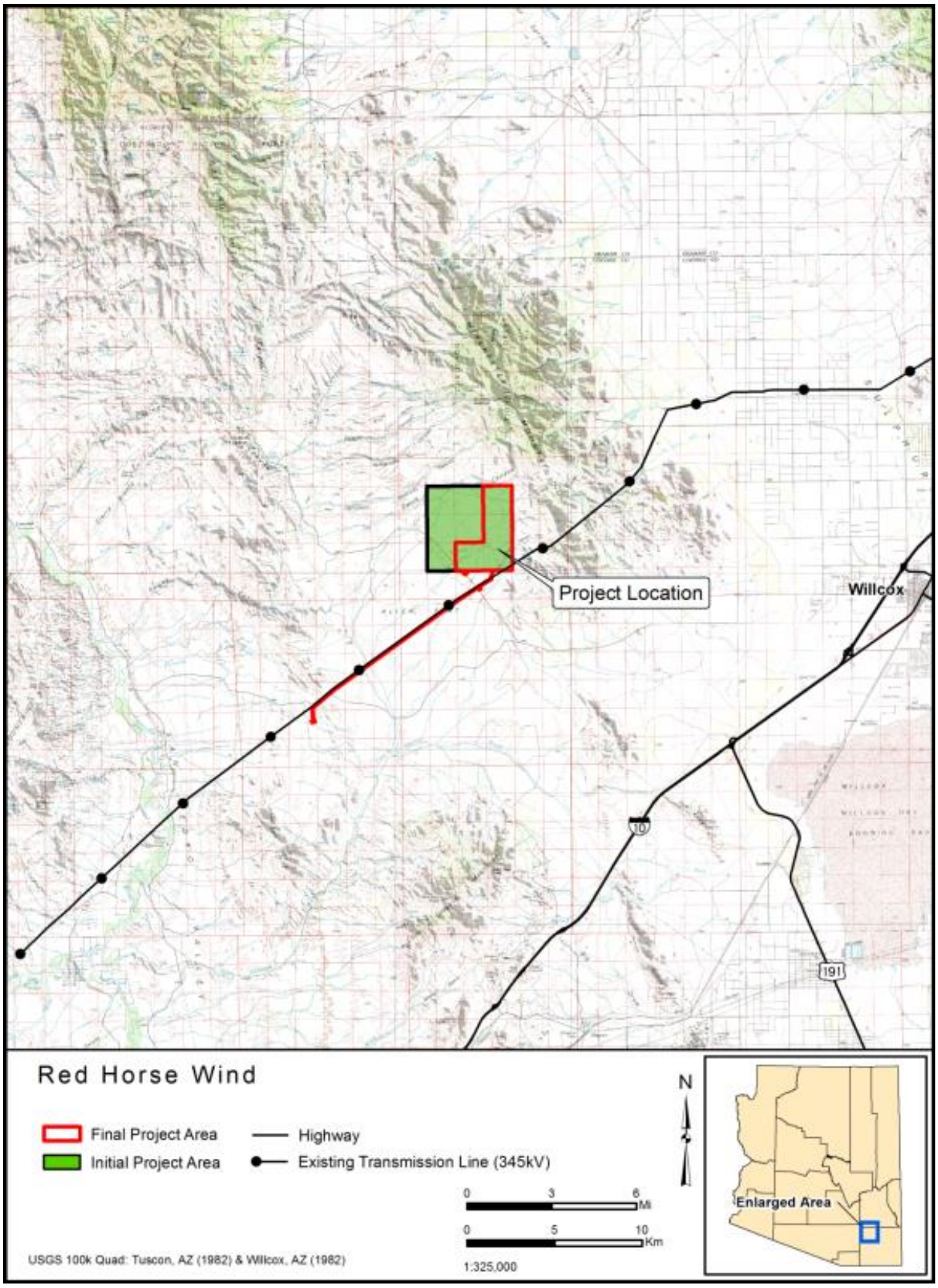

Figure 1. Project Location

Pre-construction eagle use surveys were conducted from December 2012 through November 2013 and documented golden eagles within point-count areas for a total of 65 eagle minutes. Raptor nest surveys conducted within 10 miles of the Project Area in 2012 and 2013 documented eight golden eagle nesting territories, five of which were occupied; although these were outside of the Project Area (see Section 2.2.6 of Appendix A). In the final Project design, the number of turbines was reduced by 19, and the turbines were placed away from eagle nests and RHW2-anticipated high use areas based on one year of data. This change also decreased the amount of ground disturbance and infrastructure needed.

Post-construction mortality monitoring (PCMM) was initiated in 2015 to evaluate mortality levels from the operation of the Project. The first year of PCMM occurred for 1 year following construction from July 2015 – July 2016 (SWCA 2016). Two additional years of PCMM were implemented consecutively beginning on August 28, 2017 and were completed on August 31, 2019.

The Applicant began preparing an ECP in April 2014, submitted initial drafts to the Service in 2014 and 2015, and submitted a further refined draft to the Service in May 2016, prior to the finalization of the 2016 Eagle Rule Revisions (USFWS 2016a). On June 13, 2016, a golden eagle fatality was discovered at the Project during PCMM studies. To gain a better understanding of the risks to eagles at the Project, RHW2 initiated a second year of monitoring in August 2017. Subsequently, three more golden eagle fatalities were discovered, one each on September 6, 2017, May 28, 2018, and September 11, 2018. In 2017, RHW2 proactively mitigated for two eagle fatalities through power pole retrofitting, in accordance with the 2016 draft ECP. The Applicant submitted an application for an Eagle ITP to USFWS on May 23, 2018. The Applicant submitted revised draft ECPs in August and December 2019, to reflect the 2016 Eagle Rule Revisions and an updated eagle take estimate reflecting the eagle fatalities documented at the Project (Appendix A).

1.4 Scoping, Consultation, and Coordination

This EA incorporates by reference the scoping performed for the PEIS (Chapter 6, page 175). This Draft EA will be available for a 60-day public comment period prior to being finalized. The Applicant worked closely with the Service to develop the ECP in support of its application to avoid, minimize, and mitigate adverse effects on eagles (Appendix A).

1.5 Tribal Coordination

As required by the Advisory Council on Historic Preservation Regulations' Protection of Historic Properties (36 CFR 800) for implementing Section 106 of the National Historic Preservation Act, the Service conducted consultation with tribes in 2013 and 2014 regarding national eagle management and permitting actions, including revising eagle rule regulations. The results of this consultation are summarized in the PEIS (Section 6.22) and are incorporated by reference.

On March 26, 2020, the Service sent a letter to all Region 2 Tribes informing them of our review of the permit application and requesting any views, comments, or concerns regarding the proposed permit authorizing incidental take of eagles at the Project. This letter was accompanied by a handout providing

additional information on the Project, history, mitigation, and eagle take permit rules. Consultation between the Service and the Tribes is an ongoing process and will proceed in parallel with the completion of this document.

Chapter 2: Proposed Action and Alternatives

2.1 Proposed Action

We propose to issue a 17-year Eagle ITP to take up to 13 golden eagles in the first 2-year review period (110 golden eagles over the permit term) with associated conditions, as allowed by regulation. The 17-year permit term was requested by RHW2 and corresponds to the expected remaining life of the Project. RHW2 will implement all measures required by other agencies and jurisdictions to conduct the activity at this site, and the conservation commitments described in the Applicant's ECP (Appendix A). The Project is subject to monitoring and reporting reviews conducted by the Service throughout the Eagle ITP term. The first review period will be at 2 years post-permit issuance, and the following reviews will occur every 5 years thereafter. As described in more detail in the Applicant's ECP (Appendix A), RHW2 would implement Conservation Measures (Section 3); Adaptive Management (Section 6); and Compliance Monitoring (Section 5) commitments.

2.2 Alternative 1: No Action

Under the No-Action Alternative, the Service would take no further action on RHW2's permit application. In reality, the Service must take action on the permit application, determining whether to deny or issue the Eagle ITP. We consider this alternative because Service policy requires evaluation of a No-Action Alternative and it provides a clear comparison of any potential effects to the human environment from the Proposed Action.

The No-Action alternative in this context analyzes predictable outcomes of the Service not issuing an Eagle ITP. Under the No-Action Alternative, the Project would likely continue to operate without an Eagle ITP being issued. Thus, for purposes of analyzing the No-Action Alternative, we assume that the Applicant will implement all measures required by other agencies and jurisdictions to conduct the activity at this site, but the conservation measures proposed in the Eagle ITP application package would not be required. The Applicant may choose to implement some, none, or all of those conservation measures. Under this alternative, we assume that the Applicant will take some reasonable steps to avoid taking eagles, but the Applicant will not be protected from enforcement for violating the Eagle Act should take of an eagle occur.

2.3 Alternative 2: 5-Year Permit

Under this alternative, the Service would issue a 5-year Eagle ITP authorizing the incidental take of eagles associated with the Project, pursuant to 50 CFR 22.26(f). The Eagle ITP would be for the incidental take of up to 33 golden eagles during the 5-year permit term. This alternative incorporates the same

annual rate of eagle fatalities predicted for the Project as was used in the Proposed Action, but applies these rates to a 5-year permit duration instead of 17. The 5-year Eagle ITP would incorporate as permit conditions the adaptive management, mitigation, monitoring, and avoidance and minimization measures, as appropriate, described for the Proposed Action; however, these commitments would be limited to 5 years.

2.4 Other Alternatives Considered but Not Evaluated in this Environmental Assessment

The Service considered one other alternative based on communication with RHW2, but concluded that this alternative did not meet the purpose and need underlying the action because it was not consistent with the Eagle Act and its regulations or was impracticable for the Applicant to carry out. Therefore, the Service did not assess the potential environmental impacts of this alternative. Below is a summary of the alternative considered but eliminated from further review.

2.4.1 Alternative: Deny Permit Application

Under this alternative, the Service would deny the permit application because the Applicant falls under one of the disqualifying factors and circumstances denoted in 50 CFR 13.21, the application fails to meet all regulatory permit issuance criteria and required determinations listed in 50 CFR 22.26.

Our permit issuance regulations at 50 CFR 13.21(b) set forth a variety of circumstances that disqualify an applicant from obtaining an Eagle ITP. None of the disqualifying factors or circumstances denoted in 50 CFR 13.21 apply to RHW2. We next considered whether the Applicant meets all issuance criteria for the type of permit being issued. For Eagle ITPs, those issuance criteria are found in § 22.26(f). RHW2's application meets all the regulatory issuance criteria and required determinations (50 CFR 22.26) for Eagle ITPs (Appendix A).

When an applicant for an Eagle ITP is not disqualified under 50 CFR 13.21 and meets all the issuance criteria of 50 CFR 22.26, denial of the Eagle ITP is not a reasonable option. Therefore, this alternative—denial of the Eagle ITP—was eliminated from further consideration.

Chapter 3: Affected Environment

This section describes the current status of the environmental resources and values that are affected by the Proposed Action and the Alternatives. Specifically, this chapter describes golden and bald eagles (*Haliaeetus leucocephalus*), migratory birds, threatened and endangered species, cultural and socio-economic interests, and climate change.

3.1 Golden Eagle

Breeding and non-breeding, resident golden eagles have been recorded throughout southeastern Arizona, with core breeding areas occurring throughout mountainous areas of the region (Corman and

Wise-Gervais 2005). Because golden eagles breed and winter as far south as northern Mexico (Kochert et al. 2002), the region is used by breeding, migrant, and wintering individuals, with migrants likely using north-south-trending mountains and ridgelines during migration, while wintering individuals use the extensive grasslands and rolling hills abutting the mountains.

Pre-construction eagle use surveys conducted from December 2012 to November 2013 documented golden eagles for a total of 65 eagle minutes. During the survey period, there was no indication that eagles concentrated within the initial Project Area during any season. Winter had the highest number of observations (10), with spring (5), summer (0), and fall (6) having fewer observations (Appendix A).

Aerial golden eagle nest inventory surveys were conducted within 10 miles of the Project Area in 2012 and 2013 to determine nest occupancy and activity. In 2013, 22 golden eagle nests were positively identified, representing eight golden eagle territories, of which five were active. All golden eagle nests (occupied, unoccupied, and potential nests) and territories were located outside of the Project Area. One occupied, and four unoccupied nests were identified within a 2-mile buffer of the Project Area. There was no suitable golden eagle nesting habitat identified within the Project Area, with the exception of structures supporting the transmission line that runs southwest to northeast within the southeastern corner of the Project Area; although no nests were identified in that area (see Appendix A, Figure 6). Nearby suitable nesting habitat is primarily located in the Winchester Mountains, approximately 2 to 6 miles north and east of the Project, and in canyons (e.g., Kelsey Canyon, Bass Canyon), approximately 9 miles northwest and west of the Project (Appendix A, Section 2.2.5).

During the first 2 years of Project operation (2016 and 2017), RHW2 provided funding to the Arizona Game and Fish Department (AGFD) to conduct golden eagle nest occupancy studies. Occupancy studies included aerial or ground-based nest revisits, which were conducted at all nests located within 5 miles of the Project. AGFD revisited 16 golden eagle and possible golden eagle nests within 5 miles of the Project during the 2016 eagle breeding season. Among the 16 nests, two active golden eagle nests were observed. Both nests were successful, fledging young on approximately May 29 and June 6, 2016 (Appendix A, Section 4.1). AGFD is collecting additional occupancy and productivity data on golden eagle nests in this area in 2020 and is expected to perform periodic monitoring in future years as part of their golden eagle management program.

Incidental observations of potential eagle prey were noted during field surveys, though focused surveys for eagle prey were not conducted. Potential raptor prey such as rabbits (cottontails [*Sylvilagus* spp.] and jackrabbits [*Lepus* spp.]) were observed frequently outside of the initial Project Area to the south and southeast, most frequently in areas with larger stands of mesquite (*Prosopis* spp.) and other woody plants/cover (SWCA 2013a). However, during avian field surveys within the Project Area, cottontails and jackrabbits were observed less than five times from early December 2012 to November 2013. The ecological reasons for the observed low abundance of rabbits within the Project Area has not been determined, but it appears it may be attributable to the lack of woody or shrub cover or drought conditions during these years. Several possible ground squirrel (*Spermophilus* spp.) groups (dirt mounds with scattered holes present) were located on the southern boundary of the initial Project Area, at the

bases of mesquite trees that are adjacent to washes; however, no ground squirrels were observed (SWCA 2013b). Pronghorn (*Antilocapra americana*) were frequently observed within and near the initial Project Area, but because the Allen Flat population is small and fragmented (personal communication, AGFD, January 24, 2012) this species does not likely comprise a substantial portion of local eagle prey. Because cattle are grazed within and adjacent to the Project Area, cattle carcasses may provide food for eagles, especially during winter. Carcasses and offal piles left by hunters may also provide some food for eagles.

Some data suggest that golden eagle collisions with wind turbines are more likely when golden eagles are hunting (Hunt 2002, National Wind Coordinating Collaborative 2010). Because golden eagles often search for prey by soaring, this hunting strategy puts them at heights similar to wind turbines. Golden eagles also use low contour flying/contouring along hills, bluffs, and washes to ambush prey, and when caught in strong updrafts, individuals can suddenly and quickly rise into the rotor-swept area of turbines (Hunt 2002). Both of these hunting strategies have been observed and mapped at the Project (see Appendix A, Figure 5).

Spring and fall raptor migration studies conducted in the initial Project Area did not identify any concentration of raptors or eagles within the Project Area during spring or fall migration (Appendix A, Section 2.2.4.1). The Project does not contain the specific habitat features that are known to concentrate raptors during migration (e.g., north-south-trending ridgelines, slopes and headwalls; Barrios and Rodriguez 2004, Service 2013). However, a potential migration flyway may be located less than 2 miles to the north and east of the Project along the Winchester Mountains, as these mountains comprise north-south-trending ridgelines and some headwalls. Given that the prevailing winds in the Project are from the west throughout the year, the Winchester Mountains do provide orographic lift conditions, which can facilitate raptor migration. As related to both fall and spring raptor migration near the Project, raptor migration concentration areas have yet to be identified in southeastern Arizona (personal communication, Tice Supplee, Director of Bird Conservation, Audubon Arizona, June 11, 2013). Based on coarse and unpublished information on exploratory spring migration surveys in southeastern Arizona conducted by Hawk Watch International in 1980, potential for raptor concentrations in spring does exist (personal communication, Kenneth Jacobson, Eagle Coordinator, AGFD, June 2014); however, pre-construction surveys did not detect any spring or fall raptor migration concentrations within the Project Area.

Four golden eagle fatalities were discovered during the operation of RHW2; one on June 13, 2016, one on September 6, 2017, one on May 28, 2018, and one on September 11, 2018. Recent population modeling for golden eagles in the United States suggested that populations are stable to slightly declining (USFWS 2016b). They are susceptible to power line electrocution, poison intended for other species, occasional shootings, and habitat loss to agriculture and suburban land uses (USFWS 2016b). Golden eagles are extremely sensitive to human disturbance during the nesting period (AGFD 2002).

3.2 Bald Eagle

Breeding, resident bald eagles have not been recorded in southeastern Arizona (Corman and Wise-Gervais 2005), as the region is largely devoid of water bodies that support fish. Bald eagles can occur throughout Arizona in winter, and the species does winter in southeastern Arizona. Confirmed wintering individuals have been recorded in the Sulphur Springs Valley, which lies approximately 12 miles to the east of the Project Area (AGFD 2012).

Bald eagles primarily hunt from a perch or by soaring high over foraging areas, with fish composing more than 90 percent of their diet (Buehler 2000). Although bald eagles can occur anywhere in Arizona in winter, large, fish-bearing waters are not present near the Project Area. Bald eagle fatalities have increasingly occurred at wind facilities in recent years, even at projects for which bald eagle use was low (personal communication, Corrie Borgman, U.S. Fish and Wildlife Service, January 2018). Nonetheless, the threat to bald eagles at the Project from collision with wind turbines is likely minimal, given the lack of foraging and nesting habitat. General threats to bald eagles are described in detail in the PEIS (USFWS 2016a).

Although this document addresses both bald and golden eagles, the Project and surrounding vicinity do not contain suitable bald eagle nesting or foraging habitat, and none were observed during pre-construction surveys. Therefore, because bald eagle presence in the Project Area is minimal, the Applicant did not request bald eagle authorization under the proposed Eagle ITP.

3.3 Migratory Birds

Birds protected by the MBTA occur year-round in the Project region, including migrating birds (spring and fall), summer resident breeding birds, and wintering birds. The Project is located in the Pacific Flyway, which is a major migration corridor for birds. The Project is also located within Bird Conservation Region (BCR) 34. BCRs are ecologically distinct regions with similar bird communities and habitats (NABCI 2000). The Service's Birds of Conservation Concern (BCC) 2008 report identifies species, subspecies, and populations of migratory nongame birds that could become candidates for listing under the Endangered Species Act without additional conservation actions (USFWS 2008). A total of 37 BCC species have been identified within BCR 34. A search of eBird indicated that up to 36 BCC species have been sighted in Cochise County within the past 5 years (eBird 2017, accessed February 11, 2020; Table 1).

The PCMM conducted in 2016 estimated that 6.3 birds/MW/year had been killed at the Project (SWCA 2016). PCMM monitoring in 2017-2018 estimated that 5.31 small birds/MW/year and 0.92 large birds/MW/year were killed at the Project (Tetra Tech 2018). Horned lark (*Eremophila alpestris*) and white-throated swift (*Aeronautes saxatalis*) were the most common bird species recorded in the 2016 study, with 2 individuals of each species being found during surveys. More passerines and swifts were recorded than other bird species groups, and more were found in spring than during other seasons (SWCA 2016). Red-tailed hawk (*Buteo jamaicensis*) and horned lark were the most common bird species recorded in the 2017-2018 study with three individuals of each species being found. Overall, songbirds

were the most commonly found species during the 2017-2018 surveys (Tetra Tech 2018). Results from both studies showed that avian species composition and seasonal distribution patterns were generally consistent with those observed at other facilities in the region (SWCA 2016, Tetra Tech 2018). Four BCC species were documented during PCMM surveys (Table 1).

Table 1. Birds of Conservation Concern in the Project Vicinity Based on eBird and PCMM Studies

Common name	Scientific name	Recorded in Cochise County (eBird)	Found during PCMM
Bald eagle	*Haliaeetus leucocephalus*	X	-
Common black-hawk	*Buteogallus anthracinus*	X	-
Peregrine falcon	*Falco peregrinus*	X	-
Mountain plover	*Charadrius montanus*	X	-
Yellow-billed cuckoo	*Coccyzus americanus*	X	-
Flammulated owl	*Psiloscops flammeolus*	X	-
Elf owl	*Micrathene whitneyi*	X	-
Blue-throated hummingbird	*Lampornis clemenciae*	X	-
Elegant trogon	*Trogon elegans*	X	-
Lewis's woodpecker	*Melanerpes lewis*	X	-
Arizona woodpecker	*Dryobates arizonae*	X	-
Northern beardless-tyrannulet	*Camptostoma imberbe*	X	-
Buff-breasted flycatcher	*Empidonax fulvifrons*	X	-
Rose-throated becard	*Pachyramphus aglaiae*	X	-
Bell's vireo	*Vireo bellii*	X	-
Gray vireo	*Vireo vicinior*	X	-
Pinyon jay	*Gymnorhinus cyanocephalus*	X	-
Bendire's thrasher	*Toxostoma bendirei*	X	-
Sprague's pipit	*Anthus spragueii*	X	-
Phainopepla	*Phainopepla nitens*	X	-
Olive warbler	*Peucedramus taeniatus*	X	-
Lucy's warbler	*Leiothlypis luciae*	X	-
Yellow warbler	*Setophaga petechia*	X	X
Black-throated gray warbler	*Setophaga nigrescens*	X	X
Grace's warbler	*Setophaga graciae*	X	-
Red-faced warbler	*Cardellina rubrifrons*	X	-
Canyon towhee	*Melozone fusca*	X	-
Rufous-winged sparrow	*Peucaea carpalis*	X	-

Common name	Scientific name	Recorded in Cochise County (eBird)	Found during PCMM
Botteri's sparrow	*Peucaea botterii*	X	X
Five-striped sparrow	*Amphispiza quinquestriata*	X	-
Black-chinned sparrow	*Spizella atrogularis*	X	-
Lark bunting	*Calamospiza melanocorys*	X	-
Grasshopper sparrow	*Ammodramus savannarum*	X	-
Grasshopper sparrow (ammolegus ssp.)	*Ammodramus savannarum ammolegus*	-	-
Baird's sparrow	*Centronyx bairdii*	X	-
Chestnut-collared longspur	*Calcarius ornatus*	X	X
Varied bunting	*Passerina versicolor*	X	-

3.4 Species Listed under the Endangered Species Act

On December 21, 2018, an Intra-Service Section 7 Biological Evaluation was completed to fulfill the requirements of the Endangered Species Act to ensure that the proposed issuance of an Eagle ITP would not likely jeopardize the existence of any listed species or result in the destruction or adverse modification of designated critical habitat.

A number of species listed under the Endangered Species Act have the potential to occur within the Project Area. These include, the endangered jaguar (*Panthera onca)*, the threatened Mexican spotted owl *(Strix occidentalis lucida),* yellow-billed cuckoo *(Coccyzus americanus*), northern Mexican gartersnake (*Thamnophis eques megalops*), Chiricahua leopard frog (*Rana chiricahuensis*), and the candidate Wright's marsh thistle (*Cirsium wrightii*). No critical habitat for these species intersects the Project Area. None of these species have been documented within the Project Area during pre- or post-construction surveys. As a result, the Service determined that the Project would have no effect on yellow-billed cuckoo, northern Mexican gartersnake, Chiricahua leopard frog, and Wright's marsh thistle and would not likely adversely affect jaguar and Mexican spotted owl and no further consultation for listed species would be required (Appendix B).

3.5 Cultural and Socio-economic Interests

Cultural and socio-economic interests are considered in the PEIS (USFWS 2016a) and are incorporated by reference here. Since the Project is already operational, no additional ground disturbance or other impacts will occur. Thus, no cultural and socio-economic interests outside of those addressed in the PEIS are expected to occur with the issuance of the Eagle ITP associated with the Project.

As noted in Section 3.7 of the PEIS (USFWS 2016a) eagle take can have spiritual or emotional impacts to Tribes. Although the PEIS notes that the issuance of any Eagle ITP seeks to reduce eagle take through

Applicant-committed avoidance, minimization, or mitigation, individual tribal consultation is required for all Projects that seek an Eagle ITP. Tribal consultation is ongoing.

3.6 Climate Change

Climate change was considered in the PEIS (USFWS 2016a; PEIS Section 3.9, page 144) and is incorporated by reference here. Additionally, Arizona has a renewable portfolio standard of 15% renewable energy by 2025. The operation of this Project would contribute to enabling Arizona to meet that goal.

Chapter 4: Environmental Consequences

This section summarizes the effects on the environment of implementing the Proposed Action or No Action alternative. The discussion of overall effects of the Eagle ITP program is provided in the PEIS (USFWS 2016a) and is incorporated by reference here. This section of this EA analyzes only the effects that were not analyzed in the PEIS and that may result from the issuance of an Eagle ITP for this specific project.

4.1 Golden Eagle

Potential direct and indirect effects of continued operation of the Project on golden eagles include the risk of collision, electrocution, and disturbance/displacement. The level of direct mortality in the Local Area Population (LAP) that is caused by the Project and other reasonably foreseeable projects in relation to annual allowable take for golden eagles are provided below under cumulative effects. As this document was developed after construction was completed, impacts from the construction of the Project are not relevant to this analysis.

In determining the significance of effects of the Project on eagles, we screened the Proposed Action against the analysis provided in the PEIS (USFWS 2016a) and the Service's 2016 report, "Bald and Golden Eagles: Status, trends, and estimation of sustainable take rates in the United States." We also used our eagle-risk analysis (Appendix D in USFWS 2013) and Cumulative Effects Analysis (Appendix F in USFWS 2013) to quantify eagle fatality risk and cumulative local population level effects.

4.1.1 Proposed Action

Under the Proposed Action, we estimate that up to 13 golden eagles may be taken in the first 2-year period, or 110 golden eagles over the 17-year life of the Eagle ITP. This prediction is based on an approach that incorporated the results of 2 years of post-construction monitoring into the predictive model. We believe this prediction reflects the likely take at the Project. The proposed conservation measures include adaptive management that could result in additional monitoring and operational adjustments (Table 2). Additionally, under the Proposed Action and previous commitments, a number of avoidance and minimization measures would be implemented. These include, but are not limited to, a

Carcass Removal Program and a Worker Education Awareness Program (see Section 4.7 and Appendix A, Section 3.2). These avoidance and minimization measures are expected to minimize risk to eagles.

RHW2 has developed an adaptive management framework in cooperation with the Service that will be applied over the course of the 17-year permit term. The adaptive management framework establishes trigger levels over a specified number of years of monitoring effort which will result in implementation of a combination of enhanced monitoring and specific conservation measures (Table 2; see Appendix A, Section 6.0). Each subsequent trigger level will result in more extensive or focused conservation measures. RHW2 will use this framework to adaptively manage Project-related golden eagle fatalities and address the underlying uncertainty in collision risk to golden eagles posed by the Project. RHW2, in coordination with the Service, may adjust adaptive management triggers and implementation of corresponding conservation measures based on the results of permit reviews. More detail on triggers and conservation measures can be found in Appendix A, Section 6.0.

Table 2. Adaptive Management Trigger Levels

Trigger Levels	Standard Fatality Monitoring	Years of Enhanced Monitoring[1]	
		5	≥10
1	≥4 GOEA remains found in first 2 years	Not applicable	Not applicable
2	≥12 GOEA remains found in first 7 years	≥17 GOEA remains found in first 7 years	Not applicable
3	≥21 GOEA remains found in first 12 years	≥26 GOEA remains found in first 12 years	≥32 GOEA remains found in first 12 years
4	The minimum average g-value is not achieved in any review period during the permit tenure, as determined by the Service. OR Enhanced monitoring, if required through this adaptive management table, does not achieve a minimum average g-value during the required review period, as determined by the Service.		

1. Upon achievement of any trigger, enhanced monitoring will only be required for the subsequent review period, at which point Standard Monitoring can resume as initially prescribed, unless another trigger is achieved.

Conservation measures will be selected at the discretion of RHW2 in coordination with the Service, will be based on best available science and practicability, and could include the following examples:

- Examine monitoring data to identify when and where take is occurring and perform updraft modeling to identify specific turbines with the highest collision risk under a suite of wind conditions.
- Test a conservation measure designed to reduce the number of eagles exposed to collision risk (i.e., test a deterrent). This measure could involve an automated video camera-based detection system coupled with an audible deterrent system such as those developed by DT Bird or BirdsVision to minimize the likelihood of future take. Modules would be installed at a subset of

turbines using results of a desktop analysis of collision risk (e.g., spatial pattern of documented fatalities among turbines, updraft modelling) to prioritize those turbines of highest collision risk. Turbines with documented fatalities will be prioritized. Implementation of the conservation measure would incorporate a study designed to evaluate the effectiveness of the conservation measure.

- Test a conservation measure designed to reduce the source of collision risk (i.e., curtailment of turbines). This measure would involve an informed curtailment program wherein turbines would be feathered when eagles approach a turbine or group of turbines. The program would be implemented during specific seasons and times of day as informed from the results of previous studies. Triggering of curtailment could occur using either 1) biomonitors, or 2) an automated video camera-based detection system such as Identiflight. Implementation of the measure would incorporate a study designed to evaluate the effectiveness of the conservation measure.

As mitigation to offset the initial take prediction for the first 2 years, RHW2 will commit to 288 power pole retrofits, mitigating the loss of up to 13 eagles in the first 2 years of the Eagle ITP term. In September 2016, RHW2 provided funding to Tucson Electric Power Company (TEP) to complete the retrofitting of 26 poles as part of the mitigation commitments included in the original ECP. The Service agreed that these retrofits could be credited toward the number of retrofitted poles needed for the first 2 years of the permit term. Therefore, 262 additional pole retrofits will be completed according to the permit conditions. The number of power pole retrofits was identified using the Service's resource equivalency analysis model for calculating appropriate eagle compensatory mitigation values for power pole retrofits (USFWS 2013). More detail on this calculation is provided in the Draft Mitigation Program (Appendix C of Appendix A). Mitigation to offset take over the duration of the Eagle ITP will be determined based on estimated past take and predicted future take.

Should an Eagle ITP be issued, eagle-focused compliance monitoring will be conducted using a study design consistent with the Eagle Conservation Plan Guidance (ECPG; Service 2013) and approved by the Service. Monitoring is a critical component of adaptive management. Together, these conservation measures ensure there will be no significant impacts to golden eagles. The take that would be authorized by this Eagle ITP for the Project would be offset by the compensatory mitigation that would be provided by the Applicant, so would not significantly impact local area eagle populations.

4.1.2 Alternative 1 – No Action

Under the no action alternative, the Service would not issue an Eagle ITP, as described in Section 2.2. As with all alternatives, golden eagles are expected to be directly impacted through fatalities from collisions with turbines. Even though the Service would take no action on the permit application under the No-Action Alternative, the Project would likely continue to operate without authorization for the take of eagles. Should take of eagles occur under the No-Action Alternative, the Applicant would be in violation of the Eagle Act. Because no measures would be required to avoid or minimize risk to eagles under this No-Action Alternative, the risk to eagles is expected to be higher under this alternative as

compared to the other alternatives. Under this alternative, direct impacts of the Project on the eagle population are anticipated to be up to 6.47 eagles per year over the remaining 17-year life of the Project. No adaptive management measures would be triggered should take exceed that level. None of the impacts to golden eagles would be offset by compensatory mitigation.

This alternative does not meet the purpose and need for the action because, by regulation (50 CFR 13.21), when in receipt of a completed application, the Service must either issue or deny an Eagle ITP to the Applicant. The No-Action Alternative also does not meet the purpose of and need for the action because it would result in the adverse, unmitigated effects to golden eagles described above; effects that are not compatible with the preservation of golden eagles.

4.1.3 Alternative 2 – 5-Year Permit

Under this alternative, the Service would issue a 5-year Eagle ITP for 33 golden eagles over the 5-year period as described in Section 2.3. The Eagle ITP would need to be renewed after 5 years for the Project to have take coverage for the entire 17-year life of the Project. The direct effect of this alternative on golden eagles is expected take of up to 33 golden eagles over the 5 years of the permit. The impacts of direct take on golden eagles are the same as the Proposed Action. In addition, all adaptive management, mitigation, monitoring, and avoidance and minimization measures would be implemented for a duration of 5 years, as appropriate, for this alternative. Specific to adaptive management, only Trigger Level 1 would apply (Appendix A Section 6.0) to this alternative, with enhanced monitoring triggering for the remainder of the permit term. Together, these commitments ensure there will be no significant impacts to golden eagles. This alternative meets the purpose and need for the action, but provides the Applicant and the Service less long-term certainty.

4.2 Bald Eagle

Given the lack of foraging and nesting habitat in the Project Area for bald eagles, they are expected to have a low likelihood of occurrence. The Proposed Action as well as the other action alternative would be granting an Eagle ITP for golden eagles and would not affect bald eagles; however, implementation of avoidance and minimization measures outlined in the ECP may benefit bald eagles if they were to occur in the area (Appendix A). The No Action Alternative would not affect bald eagles. Therefore, none of the alternatives are expected to have a significant effect on bald eagles.

4.3 Migratory Birds

The Proposed Action and other action alternative would be granting an Eagle ITP for golden eagles and would not affect other migratory birds; however, implementation of avoidance and minimization measures outlined in the ECP may benefit other migratory birds to a certain extent (Appendix A). The No Action Alternative would not affect migratory birds. Therefore, none of the alternatives are expected to have a significant effect on migratory birds.

4.4 Species Listed under the Endangered Species Act

No species listed under the Endangered Species Act would be expected to be affected by issuance of the Eagle ITP and the associated conservation and compensatory mitigation measures.

4.5 Cultural and Socio-economic Interests

There are no cultural and socioeconomic interests that may be affected by issuance of the Eagle ITP and the associated conservation and compensatory mitigation measures.

4.6 Climate Change

Climate change was considered in the PEIS (USFWS 2016a; PEIS Section 3.9, page 144) and is incorporated by reference here. There are no climate change impacts that would be expected by issuance of the Eagle ITP. As noted above, the continued operation of this Project contributes to Arizona's renewable portfolio standard of 15 percent by 2025.

4.7 Comparison of Effects of Alternatives

Table 3 compares the effects of the Proposed Action and alternatives.

Table 3. Comparison of Effects of the Proposed Action and Alternatives

Eagle Take Levels	Proposed Action – Issue 17-Year Permit 13 Eagles over 2 Years and 110 Eagles over 17 Years	Alternative 1 – No Action 110 Eagles over 17 years	Alternative 2 – 5-Year Permit 33 Eagles over 5 Years
Avoidance and Minimization	Limit vehicle movement to the Project boundary, pre-designated access, and public roads	Same as Proposed Action with exception of eagle-specific Worker Education Awareness Program which would not be implemented	Same as Proposed Action
	Implement site controls to reduce wildlife collisions		
	Implement a wildlife and livestock carcass removal program		
	Implement a Worker Education Awareness Program addressing eagle-specific educational needs		
	Employ existing fencing wherever possible. Use wildlife-compliant fencing wherever new fence is installed		
	Follow handling guidelines for toxic substances. Maintain Hazardous Materials Spill Kits on-site and train personnel in the use of these		
	Limit wildfire hazards from vehicles and human activities by implementing appropriate best management practices		
Fatality Monitoring	Monitoring over the 17-year permit term as described in the ECP (Appendix A, Section 5.0), plus additional monitoring as triggered under adaptive management (see Table 2)	None	Monitoring during the 5-year permit term as described in the ECP (Appendix A, Section 5.0), plus additional monitoring as triggered under adaptive management (see Table 2)

Eagle Take Levels	Proposed Action – Issue 17-Year Permit 13 Eagles over 2 Years and 110 Eagles over 17 Years	Alternative 1 – No Action 110 Eagles over 17 years	Alternative 2 – 5-Year Permit 33 Eagles over 5 Years
Compensatory Mitigation	262 additional pole retrofits (total of 288; 26 have already been completed), mitigating take of 13 eagles for first 2 years. Mitigation required over the life of the Eagle ITP to be determined based on estimated past take and predicted future take	26 power pole retrofits already completed	Same as Proposed Action
Unmitigated Eagle Take	None	110 golden eagles over 17 years	None
Adaptive Management	See Table 2. Adaptive Management Trigger Values	None	See Table 2. Adaptive Management Trigger Values
Data Collected by the Service	Annual monitoring report of fatalities; reporting of injured eagles; information on the effects of specific, applied, conservation measures; report on completion of pole retrofits	None. 3 years of PCMM have been completed	Same as Proposed Action
Company Liability for Eagle Take	None (if in compliance with permit conditions)	Company liable	None (if in compliance with permit conditions)

4.8 Cumulative Effects

Cumulative effects have been discussed in Chapter 4 of the PEIS (USFWS 2016a). For the discussion in this EA, cumulative effects will be assessed relative to the issuance of an Eagle ITP for the area corresponding to the LAP of golden eagles, rather than using EMUs or Bird Conservation Regions.

4.8.1 Golden Eagle

Take of eagles has the potential to affect the larger eagle population. Accordingly, the 2016 PEIS analyzed the cumulative effects of permitting take of golden eagles in combination with ongoing unauthorized sources of human-caused eagle mortality and other present or foreseeable future actions affecting golden eagle populations. As part of the analysis, the Service determined sustainable limits to permitted take within each EMU.

Using the Service's Bayesian Model (USFWS 2013), the predicted number of eagles killed at the Project annually will be 6.47 golden eagles (prediction at the 80th quantile). The take that would be authorized by this permit will be offset by the compensatory mitigation that will be provided by the Applicant, so will not significantly impact the EMU eagle population. The avoidance and minimization measures that would be required under the permit, along with the additional adaptive management measures, are designed to further ensure that the permit is compatible with the preservation of the golden eagle at the regional EMU population scale.

Additionally, to ensure that eagle populations at the local scale are not depleted by cumulative take in the local area, the Service analyzed in the PEIS (USFWS 2016a) the amount of take that can be authorized while still maintaining local area populations (LAP) of eagles. In order to issue a permit, cumulative authorized take must not exceed 5% of a LAP unless the Service can demonstrate why allowing take to exceed that limit is still compatible with the preservation of eagles. The Eagle ITP regulations require the Service to conduct an individual LAP analysis for each permit application as part of our application review.

This analysis, therefore, considers cumulative effects to the LAP surrounding the Project to evaluate whether the take to be authorized under this Eagle ITP, together with other sources of permitted take and unpermitted eagle mortality, may be incompatible with the persistence of the Project LAP. Data provided by the Applicant, Service data on other eagle take authorized and permitted by the Service, and other reliably documented unauthorized eagle fatalities are all evaluated to estimate cumulative impacts to the LAP. The scale of our analysis is a 109-mile radius around the Project site. We conducted our cumulative effects analysis as described in the Service's ECPG (Appendix F in USFWS 2013).

4.8.1.1 Local Area Population Analysis

The Service's cumulative effects tool (CET) was used to complete the LAP analysis, which is described in detail below. This analysis incorporates both records of federal eagle take permits issued (i.e., authorized take) and unpermitted eagle mortality records that are available to the Service. Eagle

mortality records from state wildlife agencies within the LAP are entered in the federal database and included in the analysis.

4.8.1.2 Authorized Take

Based on our analysis using the Service's CET, the Project LAP was estimated to be approximately 176 golden eagles (USFWS Cumulative Effects Tool, run July 12, 2019). Using this estimate, the 5 percent annual take threshold for the Project's LAP is 8.79 golden eagles (i.e., 9 individual eagles). There are currently no permitted projects that overlap this LAP; therefore, the Project's estimated annual take alone of 6.47 golden eagles would be approximately 3.68 percent of the LAP, which is below the 5 percent threshold.

The Eagle ITP regulations require that compensatory mitigation is sited within the same EMU where the permitted take will occur. However, if cumulative authorized take exceeds 5 percent in the LAP, compensatory mitigation sited within the LAP may be required in order for the Service to determine that a project still meets the Eagle Act preservation standard. Even though the take that would be authorized by this permit does not exceed the 5 percent threshold, the initial take prediction for the first 2 years of the permit term will be offset by compensatory mitigation within the Project LAP.

4.8.1.3 Unauthorized Take

An important caveat that comes with the Service's unauthorized take analysis is that it only includes records of take that have been incidentally discovered and reported. Therefore, they represent the minimum number of unpermitted eagle fatalities, and there are likely more fatalities that were not discovered and/or reported. Also, some industries have self-reported incidental eagle fatalities at a higher rate than others, and some types of eagle fatalities (e.g., road kill) can lend themselves better to incidental discovery and reporting while fatalities in remote locations are not likely to be discovered. Thus, some causes of mortality, such as poisoning for example, may be under-represented in our database. However, this analysis uses the best information available to us regarding eagle fatalities within and around the LAP.

We examined the Service's eagle mortality database for known unpermitted take within a distance of two times the Project LAP to include records from all LAPs that overlap the Project. There were 23 reported golden eagle fatalities within 218 miles of the Project between 2001 and 2019. Of the total reported golden eagle fatalities in this time period, 3 (13 percent) were due to natural causes, 16 (70 percent) were due to anthropogenic causes, and the mortality of the remaining 4 (17 percent) individuals was undetermined. Of the anthropogenic causes of mortality, 7 (44 percent) were due to electrocution, 4 (25 percent) were due to collision with wind turbines, 3 (19 percent) were due to poisoning by pesticide and other sources, 1 (6 percent) was due to trauma, and 1 (6 percent) was due to vehicle collision. All of these fatalities are considered to be unpermitted take.

4.8.1.4 General Potential Impacts

We examined the general impacts within a distance of two times the Project LAP to include information from all LAPs that overlap the Project. In terms of general growth, Arizona was identified as the third fastest-growing state in the U.S. from July 2018 to July 2019 (USCB 2019); presumably this increase in population has increased overall development in the state as well. New Mexico appears to be growing at a much slower rate, identified as the 32nd fastest-growing state in the U.S. for the same dates (USCB 2019). Cochise County identifies a growing wine industry in the area (County of Cochise 2019). Long-term, the Project Area is planned for moderate residential development and open space recreation opportunities. As a result, some habitat loss and fragmentation over the next 17 years may occur due to development, though this will likely be balanced with open space areas. There is another wind energy project planned for development within the Project LAP (Hoen et al. 2019). Within 218 miles of the Project (i.e., a distance that would capture overlapping LAPs), there are currently an additional 3 operational wind energy facilities and 2 projects planned for development (Hoen et al. 2019). The potential impacts from other operational and planned facilities are unknown.

Drought associated with climate change could affect golden eagle populations in this region by reducing availability of prey, although it is unlikely that the effects will be evident in the next 17 years. Precipitation in this part of the desert is not consistent and short-term drought periods are common.

4.8.1.5 Conclusion

Authorizing the take of golden eagles at this Project would lead to a cumulative permitted take less than 5 percent of the LAP. In our review of known golden eagle take within the LAP, we did not identify evidence to conclude local sources of eagle take are different from those discussed in the PEIS for the entire nation (USFWS 2016a, PEIS Section 4.1). Further, as described in this Draft EA, should an Eagle ITP be issued, the take that would be authorized by this Eagle ITP would be offset by the compensatory mitigation that will be provided by the Applicant, so would not significantly impact the EMU eagle population. The avoidance and minimization measures that would be required under the Eagle ITP, along with the additional adaptive management measures, are designed to further ensure that the Eagle ITP is compatible with the preservation of the golden eagle at the regional EMU population scale.

4.8.2 Bald Eagle

Bald eagles were dismissed from the cumulative effects analysis due to their rare occurrence in the Project Area.

4.8.3 Migratory Birds

The analysis of cumulative effects on migratory birds is similar to that for golden eagles. The potential increase in development in the area over the next 17 years could cause habitat loss and fragmentation which could contribute to a cumulative impact on migratory bird populations. Drought associated with climate change could affect migratory bird populations in this region by reducing availability of prey and foraging habitat, although it is unlikely that the effects will be evident in the next 17 years. Precipitation

in this part of the desert is not consistent and short-term drought periods are common. Retrofits associated with additional Eagle ITP may have a cumulative beneficial impact on migratory birds by reducing risk of mortality from electrocutions.

4.8.4 Species Listed under the Endangered Species Act

Federally-listed species were dismissed from the cumulative effects analysis due to their rare occurrence in the Project Area (Appendix B).

4.8.5 Cultural and Socio-economic Interests

No concentrations of minority or low-income populations are present in the Project Area. The permit's issuance combined with known future development actions is not likely to have a cumulative impact on human health and environmental conditions relative to minority or low-income communities.

The issuance of future eagle take permits could have a positive cumulative impact by generating revenue from the retrofitting of power pole and transformers. In addition, future development projects could result in more revenue to local utilities to support employee salaries. This assumes these projects apply for permits and are required to perform comparable compensatory mitigation.

4.8.6 Climate Change

In general, the issuance of permits relative to wind projects and other renewable energy development in the Project Area and nationwide would reduce or offset the need for fossil fuels and have a cumulative positive impact on reducing the effects of climate change.

Chapter 5: Mitigation and Monitoring

The Proposed Action incorporates measures to minimize and avoid take to the maximum degree practicable, as required by regulation. To ensure that regional eagle populations are maintained consistent with the preservation standard, regulations require that any golden eagle take that cannot practicably be avoided and is above EMU take limits must be offset by compensatory mitigation at a 1.2 to 1 ratio. As golden eagle take limits for all EMUs were determined to be zero (USFWS 2016a), compensatory mitigation is necessary to offset any authorized take of golden eagles. The compensatory mitigation of power pole retrofits has been described above in Section 4.1.1.

Should an Eagle ITP be issued, eagle-focused compliance monitoring will be conducted using a study design consistent with the ECPG and 2016 Eagle Rule revisions, and approved by the Service. RHW2 will work with the Service to determine the level of uncertainty acceptable to the Service and RHW2 and perform appropriate analyses to determine sufficient levels of effort to inform permit compliance. The compliance monitoring and other requirements will be included in the ITP conditions. Additionally, a Worker Search Program has been developed and will be implemented for the lifetime of the Project.

The Applicant will monitor eagle fatalities during compliance monitoring using independent, third party monitors that report the monitoring results directly to the Service according to the methods described in the ECP (Appendix A). After the first 2 years (and thereafter, every 5 years), the Service will review the eagle fatality data and other pertinent information, as well as information provided by RHW2 and independent third-party monitors, assessing whether RHW2 is in compliance with the terms and conditions of the Eagle ITP and has implemented all applicable adaptive management measures specified in the Eagle ITP, and ensuring eagle take has not exceeded the amount authorized within that time frame. Fatality predictions, authorized take levels and compensatory mitigation will be updated, as needed, for future years of the Eagle ITP.

If authorized take levels for the period of review are exceeded in a manner or to a degree not addressed in the adaptive management conditions of the Eagle ITP, based on the observed levels of take using approved protocols for monitoring and estimating total take, the Service may require additional actions including, but not limited to: adding, removing, or adjusting avoidance, minimization, or compensatory mitigation measures; modifying adaptive management conditions; modifying monitoring requirements; and suspending or revoking the Eagle ITP.

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APPENDIX A. EAGLE CONSERVATION PLAN FOR THE RED HORSE WIND 2 ENERGY FACILITY

SWCA ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

TETRA TECH

Eagle Conservation Plan for the Red Horse Wind 2 Energy Facility

Applicant
Red Horse Wind 2, LLC

Prepared by
SWCA Environmental Consultants

Revised by
Tetra Tech, Inc.

January 2015; Revised March 2020

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1.0 Introduction

Red Horse Wind 2, LLC (RHW2) owns and operates the Red Horse Wind 2 Energy Facility (Project) in Cochise County, Arizona (Figure 1). The Project is a 15-turbine wind energy facility that began commercial operations in September 2015. It is located within the ranges of the bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), and has the potential for take of these species during normal operations. Bald eagles and golden eagles are protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA; 16 U.S.C. 668–668d).

This document has been prepared in support of an Eagle Incidental Take Permit (ITP) application for incidental take of golden eagles. Although this document addresses both bald eagles and golden eagles, the Project and surrounding vicinity do not contain suitable bald eagle nesting or foraging habitat, and no bald eagles were observed during pre-construction Project surveys. Therefore, because the Eagle ITP application is for golden eagles, and the occurrence of bald eagles in the Project area is minimal, the primary focus of this document is on golden eagles.

This Eagle Conservation Plan (ECP) documents RHW2's due diligence with respect to eagles and has been prepared in consultation with the U.S. Fish and Wildlife Service (USFWS) to support an application for an Eagle ITP. This ECP represents an agreed-upon understanding and commitment between the owner/operator of the Project, USFWS, and the Arizona Game and Fish Department (AGFD) and is designed to minimize potential impacts to eagles and effectively address impacts that may occur as a result of the Project. RHW2 is committed to developing environmentally compatible projects and has followed the current USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013a) and the 2016 Eagle Rule Revisions (USFWS 2016) for wind energy development in preparing this ECP.

RHW2 began preparing an ECP in April 2014, submitted initial drafts to the USFWS in 2014 and 2015, and submitted a further refined draft to the USFWS in May 2016, prior to the finalization of the 2016 Eagle Rule Revisions (USFWS 2016). On June 13, 2016, a golden eagle fatality was discovered at the Project during post-construction mortality monitoring (PCMM). In August 2016, RHW2 proactively mitigated for two eagle fatalities through the retrofitting of 26 power poles, in accordance with the 2016 draft ECP (see Section 5.0). Additionally, to gain a better understanding of risks to eagles at the Project, RHW2 initiated two additional years of PCMM beginning in August 2017 (Section 4.0). Subsequently, three more golden eagle fatalities were discovered; one on September 6, 2017, one on May 30, 2018, and one on September 11, 2018.

This document has been updated to reflect the operational status of the Project, to include the results of additional studies including Project-specific PCMM, and to capture additional monitoring and mitigation commitments. Additionally, the document has been updated for consistency with the 2016 Eagle Rule Revisions.

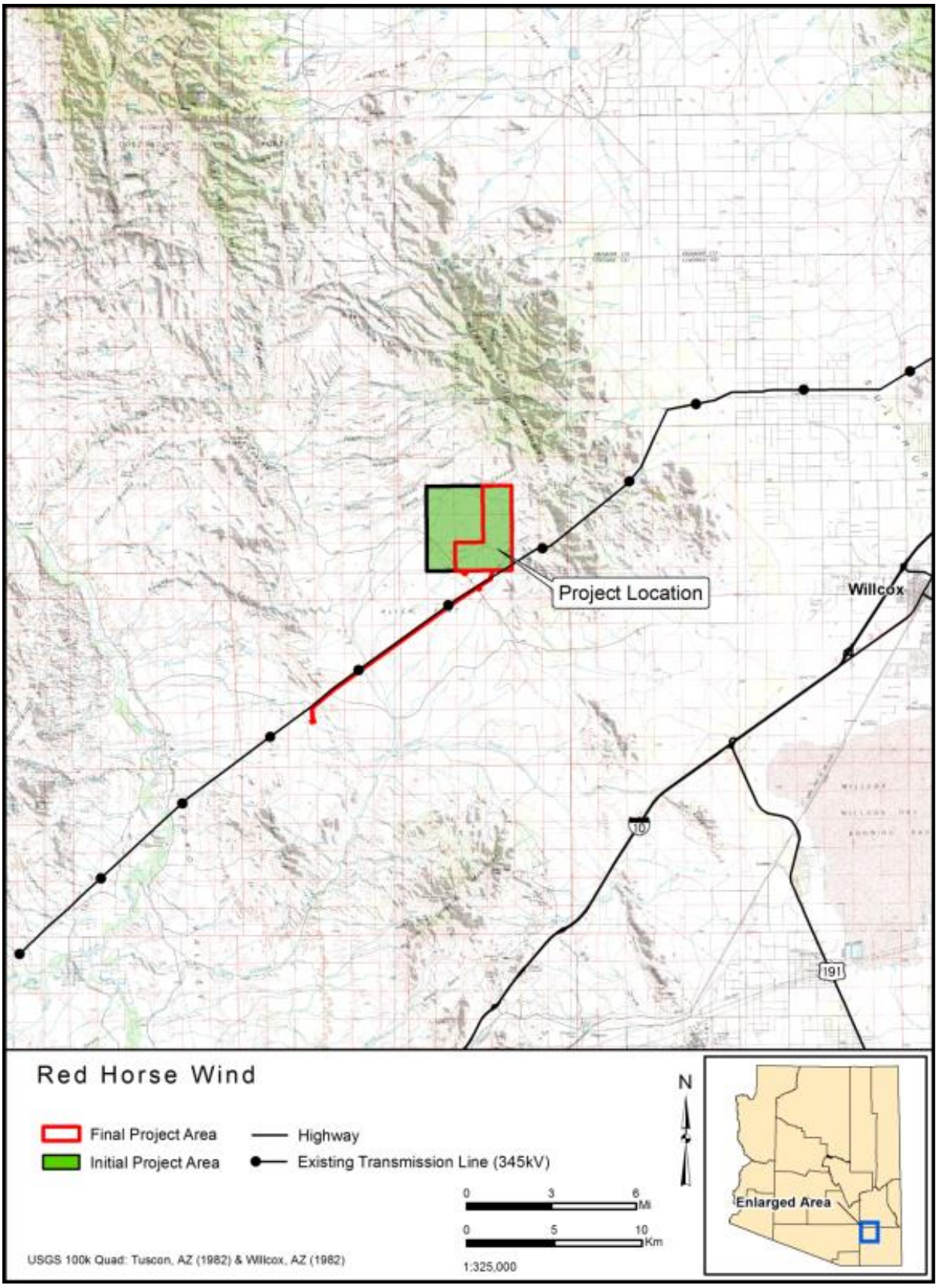

Figure 1. Project Location

1.1 Project Overview

The Project is a wind energy generating facility with a nameplate capacity of 30 megawatts (MW), located approximately 15 miles west of the city of Willcox, Arizona (Figure 1). The Project was reduced in size from 5,798 acres (Initial Project Area), to 2,765 acres (Final Project Area; Figure 1) based on results of pre-construction studies. Project infrastructure includes meteorological (MET) towers, 15 wind turbines of 2.0-MW and their foundations, buried electrical collection lines, access roads, an operations and maintenance building, a switchyard at the point of interconnection, and an overhead transmission line. The maximum blade tip height (MBTH) of the turbines is 135 meters, measured from the ground to the top of the turbine blade; each turbine has an 80-meter hub height, a 110-meter rotor diameter, a cut-in speed of 3 meters per second (m/sec), and a cut-out speed of 25 m/sec. The Final Project Area (Project Area hereafter) and transmission line are located on state lands.

Targeted bald and golden eagle studies were developed to meet the USFWS's ECPG (USFWS 2013a) and the AGFD's guidelines for wind energy development (AGFD 2012a) by using existing environmental data and recommendations provided to RHW2 by both agencies. A preliminary site screening report (SWCA 2013a) and pre-construction study plan (SWCA 2013b) for the Project were submitted to USFWS and AGFD in March 2013; interim pre-construction field data reports, including results of eagle field studies, were submitted to the USFWS and AGFD in June, October, and December 2013 (SWCA 2013c, SWCA 2013d, SWCA 2013e); and a summary report of all pre-construction studies (2012 – 2014) was submitted to USFWS and AGFD in March 2014 (SWCA 2014). Three years of PCMM were conducted between July 2015 and August 2019 (SWCA 2016, Tetra Tech 2018, Tetra Tech 2019).

1.2 Purpose and Goal of the Eagle Conservation Plan

The principal goal of this ECP is to serve as a supporting document for an Eagle ITP application and to meet the intent of the BGEPA by managing potential risk to eagles, for no net loss to populations of either species. It is RHW2's goal to operate an environmentally sustainable project, which means ensuring that Project-specific impacts do not lead to a net loss of eagles.

Wind energy development can affect eagles in a variety of ways. The primary threat to eagles from wind energy facilities are collisions with the turbines themselves (Hunt 2002, Pagel et al. 2013, USFWS 2013a), and USFWS's ECPG is primarily aimed at this threat. Second, disturbance from pre-construction, construction, or operation and maintenance activities might disturb eagles at important use areas or result in loss of productivity at nearby nests. Third, serious disturbance could result in the permanent or long-term loss of a nesting territory. Additionally, disturbances near important eagle use areas or migration concentration sites might stress eagles to a degree that they suffer reproductive failure or mortality elsewhere, amounting to prohibited "take."

1.3 Legal Drivers and Permit Compliance

All native migratory birds are covered under the MBTA, whereas the BGEPA specifically protects bald and golden eagles. The MBTA prohibits "take" of migratory birds—more than 1,000 species (Federal Register; 50 Code of Federal Regulations [CFR] 10 and 21), including the bald eagle and golden eagle—

their parts, eggs, or nests "at any time, by any means." "Take" is defined by the MBTA as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or any attempt to carry out these activities." A "take" does not include habitat destruction or alteration, as long as it does not involve a direct taking of birds, nests, or eggs. The Department of Interior's current interpretation is that the MBTA's take prohibition does not extend to incidental take of migratory birds from otherwise lawful activities. A December 22, 2017 memorandum from the U.S. Department of the Interior's Office of the Solicitor opined that the prohibitions of take under the MBTA apply only to "affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs". An April 11, 2018 memorandum from the USFWS reinforced this interpretation, stating that the "take of birds, eggs or nests" was prohibited only when the purpose of the activity was to conduct take of birds, but was not prohibited when the take was "incidental" meaning resulting from an otherwise lawful activity whose purpose was not to conduct take.

The BGEPA prohibits anyone without a permit from "taking" bald eagles and golden eagles, their parts, eggs, or nests. "Take" is defined by the BGEPA as "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb;" and does not include habitat destruction or alteration, unless such damage "disturbs" an eagle. "Disturb" is defined as "to agitate or bother to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." Any take, intentional or incidental, is prohibited under the BGEPA.

The USFWS recognizes that wind energy facilities, even those developed and operated with the utmost effort to conserve wildlife, may under some circumstances "take" eagles under BGEPA. In 2009, the USFWS promulgated permit rules for eagles that addressed this issue (50 CFR 22.26 and 22.27). These rules were updated in 2016 and became effective on January 15, 2017 (USFWS 2016). Under these rules the USFWS can issue permits that authorize take of eagles when the take is associated with, but not the purpose of, an otherwise lawful activity (i.e., incidental), and cannot practicably be avoided. The regulations authorize permits for up to 30 years, subject to monitoring and reporting requirements and reviews conducted by USFWS at a minimum of once every 5 years. However, under these regulations, permits must be "compatible with the preservation of the species and consistent with the goals of maintaining stable or increasing breeding populations in eagle management units and the persistence of local area populations." Furthermore, any take must be reduced to a level where it is practicably unavoidable even after the "consideration of existing technology, logistics, and cost in light of a mitigation measure's value to eagles and activity's overall purpose, scope, and scale" (USFWS 2016).

2.0 Eagle Site Assessment and Characterization

This section follows site assessment and characterization recommendations of the USFWS's *Land-Based Wind Energy Guidelines* (USFWS 2012) and ECPG (USFWS 2013a), combining Tiers 1 and 2 from the *Land-Based Wind Energy Guidelines* with Stage 1 of the ECPG. For eagle-specific site assessment and

characterization, different landscape scales were evaluated to assess the relative importance of various areas to resident breeding, non-breeding/floater, migrant, and wintering eagles. USFWS and AGFD provided valuable habitat- and eagle-specific information early on during Project development, further informing ground-based and aerial habitat reconnaissance surveys of the Initial Project Area (SWCA 2013a, SWCA 2013b, SWCA 2013c, SWCA 2013d, SWCA 2013e, SWCA 2013f, SWCA 2014). Through that process, the following resources were also reviewed:

- AGFD Heritage Database Management System (HDMS) special-status species list of species observed within 10 miles of the Initial Project Area;
- List of avian species observed within 10 miles of the Initial Project Area (Arizona Breeding Bird Atlas [Corman and Wise-Gervais 2005] data summarized by AGFD);
- AGFD 2012 eagle nest survey and observational data provided to SWCA on December 12, 2012 and January 31, 2013;
- Biotic Communities: Southwestern United States and Northwestern Mexico (Brown 1994);
- AGFD's Arizona's State Wildlife Action Plan: 2012–2022 (AGFD 2012b);
- USFWS Birds of Conservation Concern (USFWS 2008);
- AGFD's HabiMap Online Project Evaluation Tool (AGFD 2013);
- USFWS National Wetlands Inventory (USFWS 2013b);
- Arizona Department of Transportation, Arizona Wildlife Linkages Assessment Tool (ADT 2013); and
- U.S. Geological Survey (USGS) National Gap Analysis Program, Provisional Digital Land Cover Map for the Southwestern United States, Version 1.0 (USGS 2004).

2.1 Regional Habitat and Landscape-Scale Eagle Assessment

The dominant biotic communities present within the greater geographic region of the Project (southeastern Arizona) are Semidesert Grassland, Madrean Evergreen Woodland, Chihuahuan Desert Scrub, and Arizona Upland Subdivision (AGFD 2013, Brown 1994). One of the most characteristic geographical features of southeastern Arizona is the mountainous terrain that encompass the Madrean Sky Islands, which comprises the Baboquivari, Whetstone, Chiricahua, Huachuca, Dragoon, Galiuro, Pinaleño, Santa Catalina, and Santa Rita mountains. The Project Area lies in the approximate center of this area. At the highest elevations, these mountains comprise Madrean pine-oak woodlands, with lower elevations surrounded by the Sonoran and Chihuahuan deserts. The Sky Island region of southeastern Arizona is one of the most biologically diverse areas in North America, where the temperate and tropical zones meet, and North America's two major deserts convene (Heald 1993).

Breeding and non-breeding, resident golden eagles have been recorded throughout southeastern Arizona, with core breeding areas occurring throughout mountainous areas of the region (Corman and

Wise-Gervais 2005). Because golden eagles breed and winter as far south as northern Mexico (Kochert et al. 2002), the region is used by breeding, migrant, and wintering individuals, with migrants likely using north-south-trending mountains and ridgelines during migration, while wintering individuals use the extensive grasslands and rolling hills abutting the mountains.

Breeding, resident bald eagles have not been recorded in southeastern Arizona (Corman and Wise-Gervais 2005), as the region is largely devoid of water bodies that support fish. Bald eagles can occur throughout Arizona in winter, and the species does winter in southeastern Arizona. Confirmed wintering individuals have been recorded in the Sulphur Springs Valley, which lies approximately 12 miles to the east of the Project Area (AGFD 2012b).

2.2 Project Area–Specific Habitat and Landscape-Scale Eagle Assessment

Based on a combination of commercial requirements (wind resource, transmission, and power purchase agreement availability) and regional environmental review, the Allen Flat area (see Figure 1) was selected for the Project's development. Moreover, the wind resource within the Project Area is unique to Allen Flat, with the relatively complex terrain features surrounding the Project Area (rising elevation to the northeast, toward the Winchester Mountains) creating a well-defined area of increased wind energy potential. The Project Area is reduced in size from what was originally anticipated (5,798 acres; Initial Project Area; Figure 1) to 2,765 acres. The following sections differentiate between the Initial Project Area and the Project Area, where appropriate.

2.2.1 Project Area Description – Habitat, Topography, Geographical Features, Soils, Land Use and Prevailing Wind Direction

The Project Area is located on Allen Flat (see Figure 1) and is characterized as relatively flat to moderately rolling semidesert grassland, bisected by several ephemeral washes that drain largely to the southwest. The Winchester Mountains, composed of scattered Madrean Evergreen Woodland, border the Project Area to the north and east, and form part of the southern terminus of the larger Galiuro Mountain chain which runs northwest to southeast. The Winchester Mountains separate the Project Area from Sulphur Springs Valley. The San Pedro River Valley is located approximately 15 miles west of the Project Area, and the Willcox Playa is located approximately 12 miles to the southeast. There are approximately four human-made stock tanks near the Project Area, with water availability in the tanks dependent on local precipitation. Ash Creek crosses the southeast corner of the Project Area. The Project Area reaches a maximum elevation of 5,456 feet above mean sea level. The Winchester Mountains that border the Project Area to the north and east reach 7,428 feet above mean sea level.

The dominant soils in the Project Area are Terrarossa-Blacktail and Cherrycow-Rock outcrop complexes (USDA 2010). A considerable amount of soil disturbance has occurred as a result of decades of agricultural practices (cattle and horse ranching) over the entire Project Area. Prior to development, modifications within the Project Area included access roads to residences, and facilities associated with ranching (e.g., access roads, dirt stock tanks, corrals, outbuildings, windmills, and fences). Based on hourly wind direction data (1992 – 2002) accessed from the Western Regional Climate Center (WRCC;

WRCC 2014), the prevailing wind direction within approximately 50 miles of the Project Area is westerly throughout the year. Weather data recorded as part of eagle use surveys conducted within the Project Area (see SWCA 2014) confirmed WRCC (2014) data, with prevailing winds recorded as west/southwest.

2.2.2 Vegetation

The dominant biotic community present within the Initial Project Area is semidesert grassland, with some Madrean evergreen woodland located in the eastern portion of the Project Area (AGFD 2013, Brown 1994). Figure 2 depicts the USGS National Gap Analysis (USGS 2004) provisional digital land cover in the vicinity of the Initial Project Area and Project Area. A site/habitat reconnaissance conducted out to at least a 2-mile radius of the Initial Project Area (SWCA 2013a, SWCA 2013c, SWCA 2013d, SWCA 2013e, SWCA 2014) showed that one dominant vegetation type occurs within the vicinity of the Project: moderately to heavily grazed, human-disturbed grasslands comprising largely *Bouteloua* spp., *Hilaria* spp., *Aristida* spp., *Eragrostis* spp., *Nolina* spp., and *Tridens* spp. Within and immediately adjacent to ephemeral washes and widely scattered throughout the Project Area are tree species, including oak (*Quercus* spp.), juniper (*Juniperus* spp.), mesquite (*Prosopis* sp.), and ash (*Fraxinus* sp.). Within the human-disturbed grasslands are also yucca (*Yucca* spp.) and agave (*Agave* sp.), mostly occurring on the eastern and northern boundary of the Project Area. Russian thistle (*Salsola iberica*) and rabbitbrush (*Chrysothamnus viscidiflorus*) are quite common and are distributed throughout the Project Area. Cactus species occurring throughout the Project Area include hedgehog cactus (*Echinocereus* spp.), candy barrelcactus (*Ferocactus wislizeni*), cactus apple (*Opuntia engelmannii*) and staghorn cholla (*Cylindropuntia versicolor*).

2.2.3 Wetlands and Riparian Areas

Using the digital USFWS National Wetlands Inventory online tool (USFWS 2013b), the human-made stock tanks located within and near the Project Area were identified as “freshwater ponds.” No wetlands or riparian areas were observed during the site reconnaissance (SWCA 2013a) or via the USFWS National Wetlands Inventory online tool (USFWS 2013b). The stock tanks are subject to local precipitation, landowner manipulation, are ephemeral, and do not support vegetation/trees, or fish. Further, because of their small surface area (< approximately 2 acres), shallow depth, and lack of vegetation, these stock tanks would not support large numbers or concentrations of waterfowl. Because of the ecological and physical environment of the stock tanks, bald eagles will not likely use these ephemeral water sources for foraging. This is supported by no bald eagles observed within or adjacent to the Project during eagle use surveys from December 2012 to mid-November 2013 (SWCA 2013c, SWCA 2013d, SWCA 2013e, SWCA 2014).

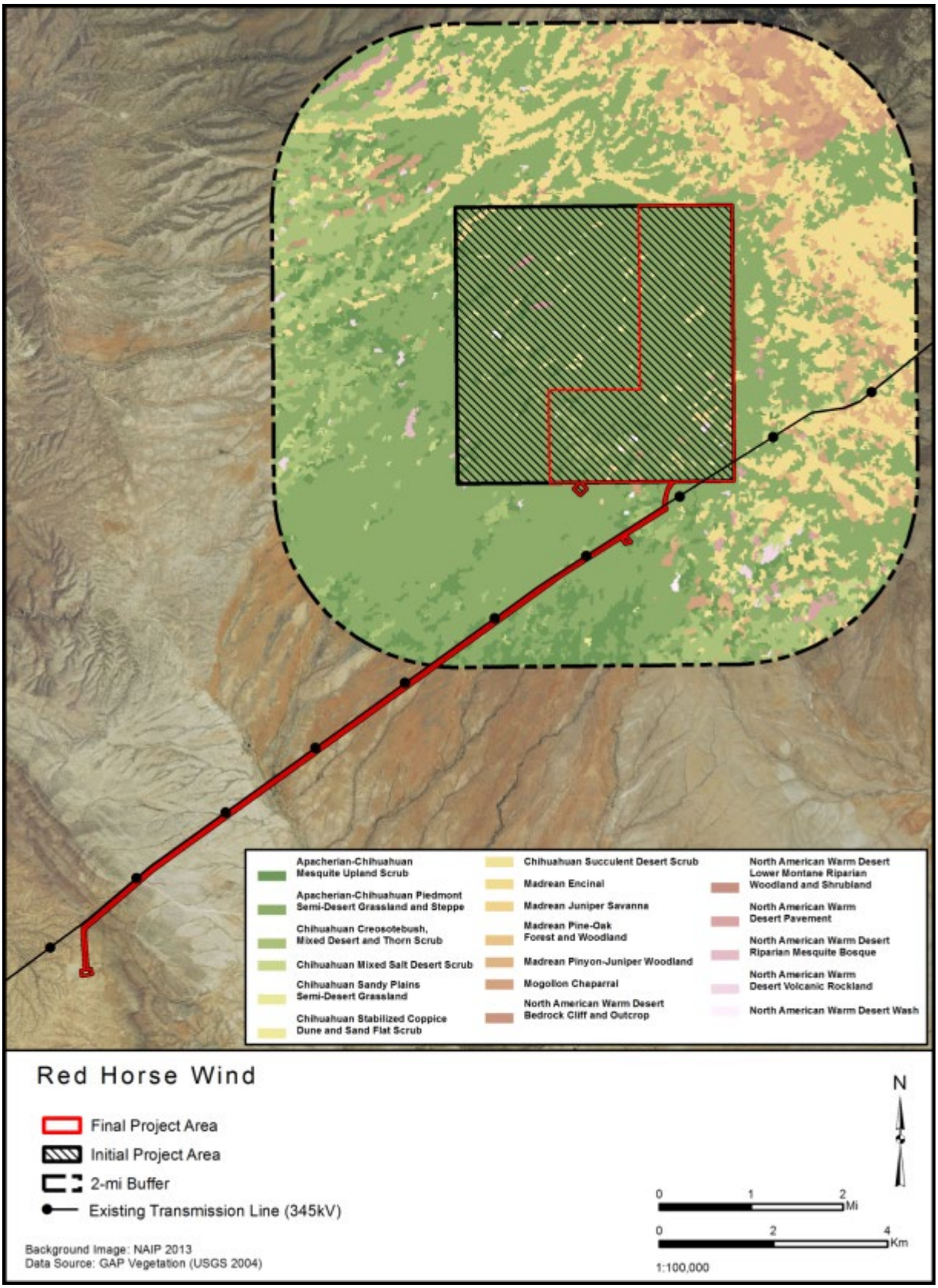

Figure 2. Vegetation Land Cover

2.2.4 Site-Specific Assessment—Eagle Use Surveys

The following sections follow eagle use (site-specific surveys and assessments) study recommendations using the USFWS's *Land-Based Wind Energy Guidelines* (USFWS 2012) and ECPG (USFWS 2013a), combining Tier 3 from the *Land-Based Wind Energy Guidelines* with Stage 2 of the ECPG. Pre-construction eagle surveys were started prior to locating wind turbines; therefore, a delineation of the Initial Project Area was mapped, whereby 800-meter-radius point count plots were distributed across the entire Initial Project Area (Figure 3). Once an initial turbine layout was determined, a 1-kilometer buffer around all turbines was delineated as the "Initial Turbine Area" based on the ECPG (USFWS 2013a:57). Eagle risk for a layout was then assessed based on use measured from any part of the 800-meter point counts that fell within the Initial Turbine Area, ensuring that at least 30 percent of the Initial Turbine Area was covered by 800-meter point counts. Data presented in this site-specific assessment are based on all point-count data across the Initial Project Area. The Project design assessment (Section 3.0) and risk characterization (Section 4.5) are then based on data specific to the Final Turbine Area, which is defined as the final turbine layout with a 1-kilometer buffer.

2.2.4.1 Potential Eagle Migration Corridors

It is well known that raptors do not typically concentrate during spring migration as they do during fall migration (Bildstein 2006), with some raptor species exhibiting a broad migration front in the western United States in spring (personal communication, M. Neal, Hawk Watch International, 2010). Spring and fall migration studies were conducted at the Initial Project Area in 2013, using 2-hour avian/eagle use point count stations located across the Initial Project Area (see Section 2.2.4.2 for detailed methods; SWCA 2013b, SWCA 2013c, SWCA 2013d, SWCA 2013e, SWCA 2014; see Figure 3).

There was no indication that the Initial Project Area concentrated raptors (including eagles)/turkey vultures (*Cathartes aura*) during spring or fall migration. In spring, raptors/turkey vultures were recorded at 0.583 observations/20-minute survey, with turkey vultures comprising almost half of the total observations (0.271 observations/20-minute survey). In fall, raptors/turkey vultures were recorded at 0.705 observations/20-minute survey, with turkey vultures comprising 66 percent of the total observations (0.462 observations/20-minute survey). Of the five and six golden eagle observations recorded during spring and fall migration, respectively, no individuals exhibited migratory behavior (SWCA 2013c, SWCA 2014).

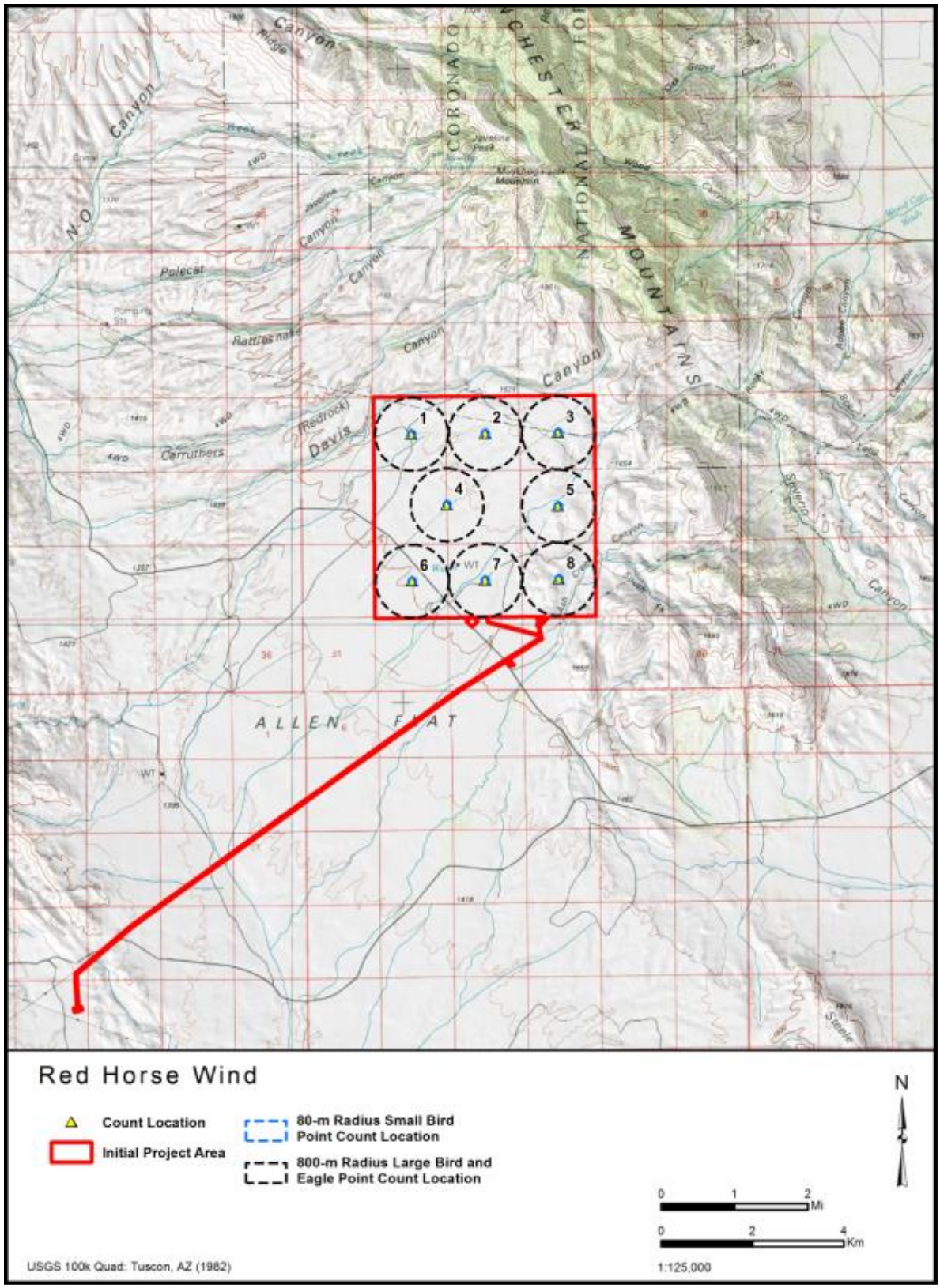

Figure 3. Avian Observational and Point-Count Survey Locations, 2012 and 2013

The Project does not contain the specific habitat features that are known to concentrate raptors during migration (e.g., north-south-trending ridgelines, slopes and headwalls; Barrios and Rodriguez 2004, USFWS 2013a). However, a potential migration flyway may be located less than 2 miles to the north and east of the Project along the Winchester Mountains, as these mountains comprise north-south-trending ridgelines and some headwalls (see Figure 1). Given that the prevailing winds in the Project are from the west throughout the year (see Section 2.2.1 above), the Winchester Mountains do provide orographic lift conditions, which can facilitate raptor migration. As related to both fall and spring raptor migration near the Project, raptor migration concentration areas have yet to be identified in southeastern Arizona (personal communication, Tice Supplee, Director of Bird Conservation, Audubon Arizona, June 11, 2013). Based on coarse and unpublished information on exploratory spring migration surveys in southeastern Arizona conducted by Hawk Watch International in 1980, potential for raptor concentrations in spring does exist (personal communication, Kenneth Jacobson, Eagle Coordinator, AGFD, June 2014); however, pre-construction surveys did not detect any spring or fall raptor migration concentrations within the Project.

2.2.4.2 Eagle Use

From December 7, 2012 to November 15, 2013, an attempt was made to sample all eight eagle use survey plots 27 times each (total of 216 eagle use surveys; conducted weekly during December 2012 and every other week from January to November 15, 2013). Portions of three of the 216 use surveys (1 hour not conducted for two points each, and 1 hour 40 minutes not conducted for one point) were not conducted because of inclement weather (thunderstorms) during the summer season. Therefore, a total of 213 2-hour eagle use surveys (72 in winter, 48 in spring, 45 in summer, and 48 in fall) were conducted for a total of 25,560 observer minutes (426 hours). Although intensive (2-hour use surveys) eagle use surveys were conducted for 1 year, it is recognized that 1 year of surveys has limitations in the understanding of eagle use at a project site, particularly annual variation in use.

At each eagle use survey point, a camouflaged observer remained at the point for 2 hours and recorded eagle flight activity within an 800-meter radius and within 200 meters above the ground; eagles observed outside of this area were recorded as incidental observations and are not included in calculations of eagle minutes. The 2-hour sample period was divided into 1-minute intervals, and the number of eagles in flight within the plot in each 1-minute interval was recorded. One eagle in flight in the cylinder in a given minute = 1 exposure minute; two eagles in flight in the cylinder in a given minute (or the same eagle in flight continuing into a second 1-minute interval) = 2 exposure minutes, and so on. All eagle flight paths were mapped on high-resolution topographic maps in the field, then digitized using geographic information system (GIS) technology. An eagle's aboveground height and the distance from the point-count station to the eagle were estimated for each 1-minute interval. During each 1-minute interval, behavior was also recorded as either soaring flight (circling broadly with wings outstretched), flapping-gliding, kiting-hovering, stooping or diving at prey, stooping or diving in an agonistic context with other eagles or other bird species, being mobbed, undulating/territorial flight, or perched. Age of each eagle was categorized as juvenile (less than 1 year of age), subadult (1–5 years of age), adult (older

than 5 years of age), or unknown. Weather data were also recorded, including wind direction and speed, extent of cloud cover, precipitation (if any), and temperature. Surveys were distributed across daylight hours and were conducted under all weather conditions except where visibility was less than 800 meters horizontally and 200 meters vertically.

No bald eagles were recorded during eagle use surveys. Golden eagles were observed within the sampling point-count cylinders for a total of 65 eagle minutes; no eagles were observed perched during eagle use surveys (Table 1; Figure 4). No sub-adult golden eagles were recorded within sampling point-count cylinders or incidentally during surveys.

Table 1. **Details of Golden Eagle Minutes Recorded in the Initial Project Area, from December 7, 2012 to November 15, 2013**

Eagle Plot Number	Date	Total Number of Eagle Minutes	Number and Age of Individuals Observed	Eagle Behavior(s)
4	December 27, 2012	2	Single adult	Soaring between 40 and 120 meters above ground level (AGL)
6	December 28, 2012	9	Single adult	Gliding/flapping between 50 and 200 meters AGL
4	February 19, 2013	2	Single adult	Soaring between 50 and 200 meters AGL
1	March 5, 2013	20	Suspected adult pair	Soaring together (11 eagle minutes for one individual, 9 for the other) between 180 and 200 meters AGL
7	March 20, 2103	3	Single adult	Soaring between 100 and 200 meters AGL
6	October 29, 2013	12	Single adult	Soaring between 50 and 100 meters AGL
3	October 29, 2013	8	For two different adults	One eagle soaring at 200 meters AGL and the other soaring between 30 and 200 meters AGL (4 eagle minutes each)
3	November 15, 2013	7	At least one adult (possibly two, as there was a gap in continuous observation time and two adults were observed in the area simultaneously prior to and after these observations)	Flapping between 40 and 100 meters AGL
4	November 15, 2013	2	Single adult	Soaring between 30 and 40 meters AGL

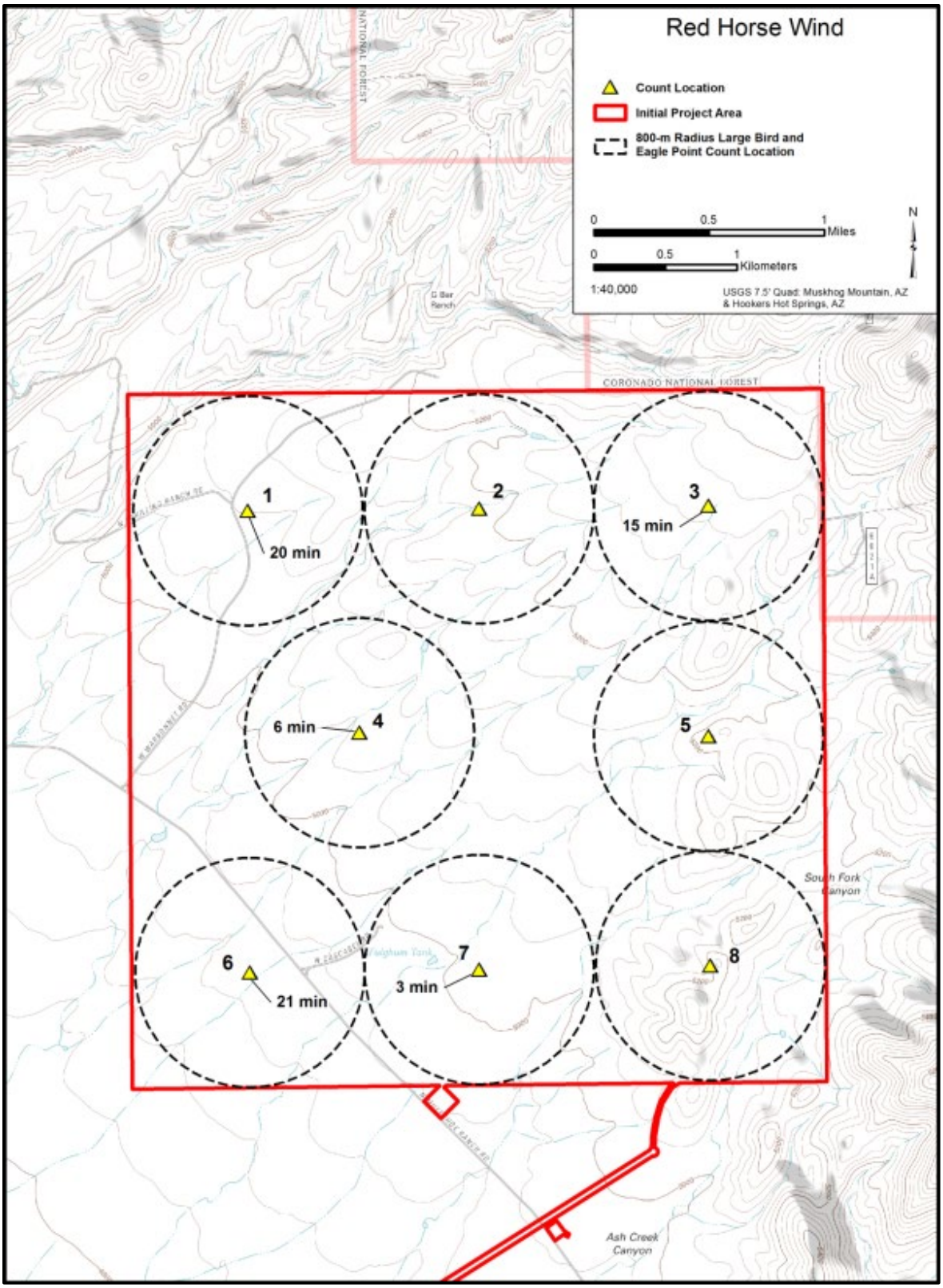

Figure 4. Golden Eagle Minutes Recorded during Long-Sit Use Counts from December 2012 through November 2013 for the Initial Project Area

During the sampling period there was no indication that eagles concentrated within the Initial Project Area during any season, with a total of 10, five, zero, and six eagle observations recorded in winter, spring, summer and fall, respectively[1].

Flight paths of all golden eagle detections are depicted in Figure 5. It should be noted that depictions of flight paths (within and outside of sampling cylinders) are best estimates made in the field. All spatial and descriptive data of all eagle flights have been digitized and attributed using GIS technology.

Incidental golden eagle observations recorded outside of sampling point-count cylinders (as depicted in Figure 5) provide some insight into possible movements around nesting territories and travel between mountain habitats and lower level foraging areas. Only single adults or a suspected pair was recorded, exhibiting similar behaviors as individuals recorded within sampling point-count cylinders (see Table 1).

2.2.5 Potentially Suitable Golden Eagle Nesting Habitat

Prior to conducting golden eagle nest inventory and occupancy surveys in 2013 (see Section 2.2.6), 46,829 acres of suitable golden eagle nesting habitat (e.g., headwalls, ridgelines, rock faces/outcrops, large trees and snags, transmission towers) were identified and delineated within a 10-mile buffer of the Initial Project Area (Figure 6; SWCA 2013c, SWCA 2013d, SWCA 2013e, SWCA 2014). Suitable nesting habitat is primarily located in the Winchester Mountains north and east of the Project, and in canyons (e.g., Kelsey Canyon, Bass Canyon) northwest and west of the Project. Golden eagle nesting area locations provided to SWCA during a meeting with AGFD and USFWS on January 24, 2013 (see Appendix B; SWCA 2013a) were all within the delineated potentially suitable nesting habitat. Towers associated with an existing transmission line present within the southeastern corner of the Initial Project Area that runs southwest to northeast (see Figures 1 and 6) provide suitable golden eagle nesting substrate as well. The transmission line in the southwestern portion of the 10-mile buffer is not structurally suited for golden eagle nesting. Other than this transmission line, no other potentially suitable golden eagle nesting habitat was identified within the Initial Project Area or Project Area.

[1] Total observations include eagles observed above/outside sampling cylinders.

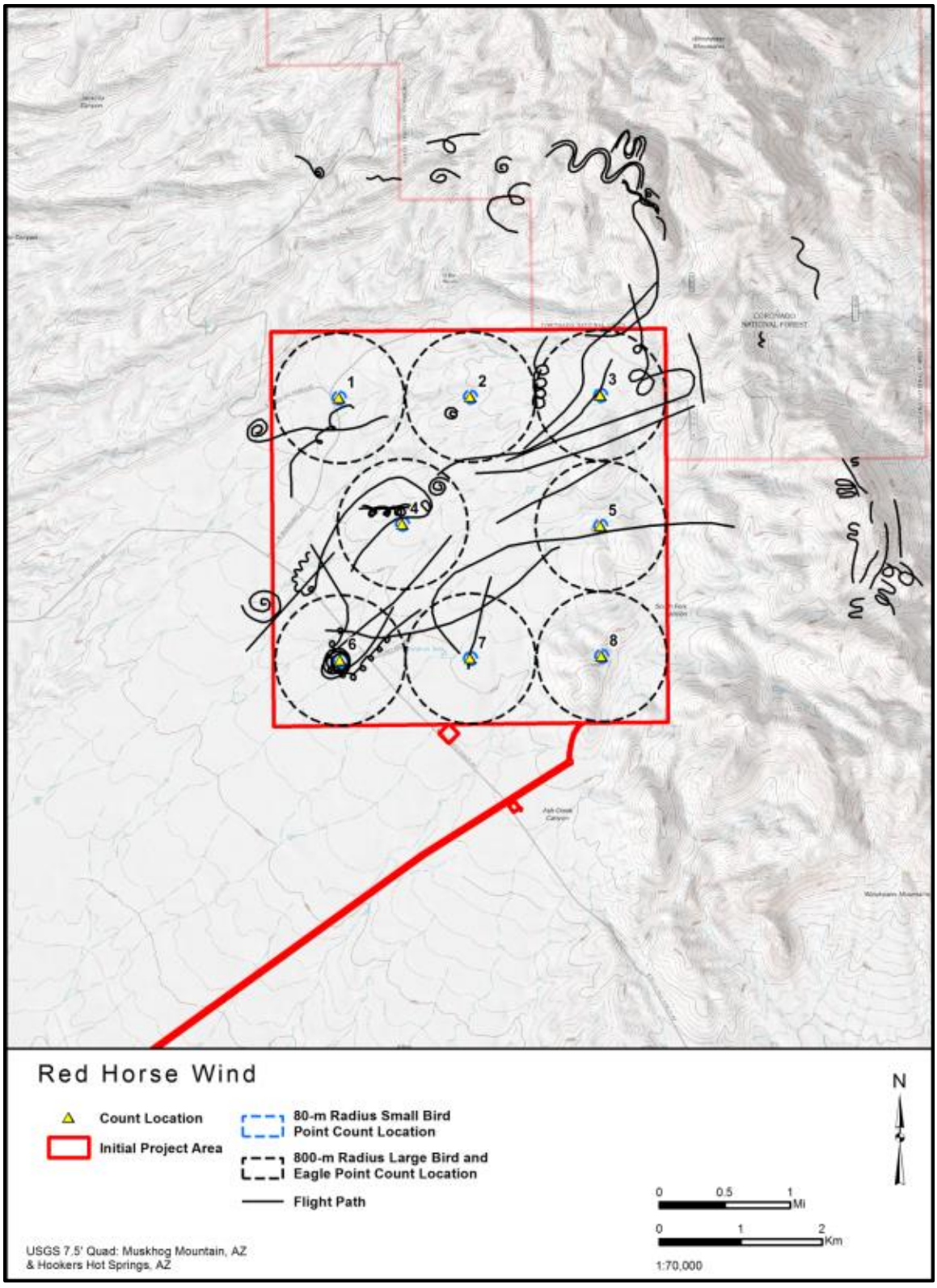

Figure 5. Golden Eagle Flight Paths Recorded during Formal Surveys and Incidentally from December 2012 through November 2013 for the Initial Project Area

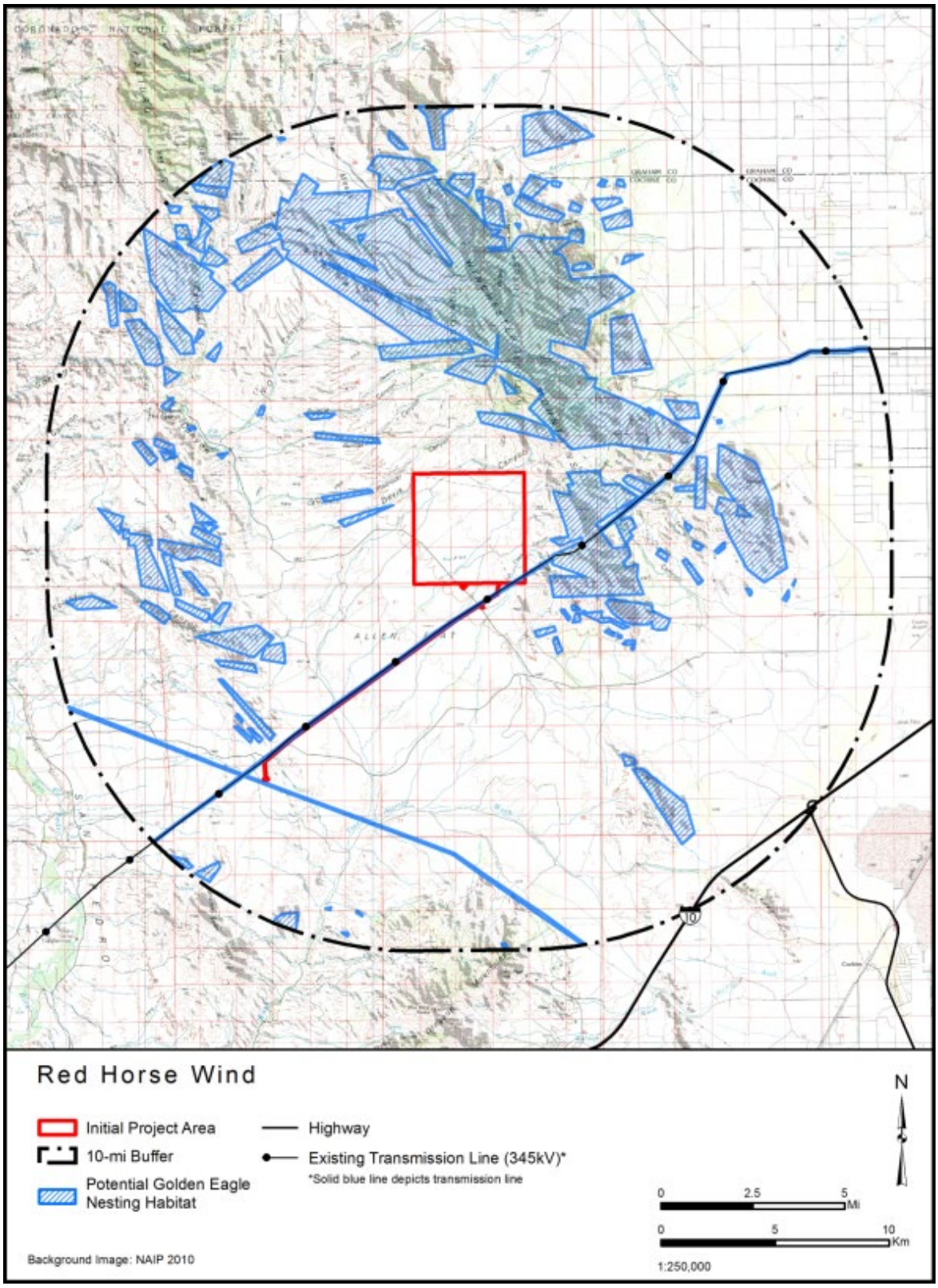

Figure 6. Potentially Suitable Golden Eagle Nesting Habitat within a 10-Mile Buffer of the Initial Project Area

2.2.6 Golden Eagle Nest Inventory and Occupancy Studies

During the 2012 golden eagle breeding season, AGFD completed an aerial golden eagle nest inventory survey within approximately 10 miles of the Initial Project Area (McCarty and Jacobson 2012). This survey identified 12 golden eagle nesting areas. These nesting area locations (2 × 2–mile blocks) were provided to SWCA during a meeting with AGFD and USFWS on January 24, 2013. Of the 12 golden eagle nesting areas, six were located completely within and two were located partially within a 10-mile buffer of the Initial Project Area. These eight nesting locations were targeted for multiple golden eagle nest inventory and occupancy surveys conducted by SWCA on February 18 and 19, 2013 (Survey 1; early nest occupancy period); all potentially suitable eagle nesting habitat not covered by AGFD in 2012 was surveyed by SWCA in 2013. A second aerial nest survey was conducted by SWCA on April 3, 2013 (Survey 2) to make a final determination of nest occupancy and activity. All survey methods generally followed Pagel et al. (2010) and USFWS (2012 and 2013a).

One avian ecologist with more than 3 years of flight experience surveying for eagle nests (as recommended by USFWS) and one GIS specialist experienced in aerial eagle surveys conducted the aerial surveys. A Robinson R-44 Raven II helicopter and a Bell 206 BIII Jet Ranger helicopter were used during Survey 1 and Survey 2, respectively; both allowed for close approach to accurately determine nest contents. A Garmin Aera global positioning system (GPS) unit affixed to the helicopter instrument panel was used, enabling the avian ecologist and pilot to navigate to all known eagle nesting areas and potentially suitable golden eagle nesting habitat not surveyed by AGFD in 2012; this unit also allowed for data point collection and data backup. Surveyors recorded golden eagle and possible golden eagle nests. Other raptor (non-eagle) and non-raptor species nests were recorded opportunistically during both surveys. For each nest found, surveyors recorded the date and time of observation, a nest identification number, species four-letter alpha code or "undetermined species," nest substrate (e.g., cliff, tree, transmission tower), and nest condition/contents. Undetermined species nests included any nests that were too deteriorated to confidently identify as to species, or exhibited qualities characteristic of more than one species; for these nests, surveyors recorded an informed opinion regarding which species was most likely to use the nest based on nest structure and placement. The following nest conditions/contents were recorded: 1) sticks-intact, 2) sticks-deteriorating, 3) greenery/ornamentation, 4) adult in incubation/brooding posture, or 5) number of egg(s)/nestling(s).

Upon completion of the 2013 golden eagle nest inventory and occupancy surveys, the 2013 half-mean inter-nest distance was calculated using ECPG methods, by means of a site-specific approach based on the spacing between nearest, simultaneously occupied nests for the eagle species present in the area (USFWS 2013a). The half-mean inter-nest distance is a coarse approximation of a territory boundary used as a buffer to identify eagle nests/pairs and their young potentially susceptible to collision mortality or disturbance. For additional details of golden eagle aerial survey and calculation of half-mean inter-nest distance methods, see SWCA (2013b, 2013c, 2013d, 2013e, and 2014).

The 2013 SWCA surveys identified 126 nest structures within the 10-mile buffer survey area, of which 22 were identified as golden eagle and 27 were identified as possible golden eagle (Figure 7). All other

nests (77) were categorized as red-tailed hawk (*Buteo jamaicensis*), *Buteo* spp., raven spp., or falcon spp. Among the 22 known golden eagle nests, eight territories were identified (Table 2), five of which were occupied nesting territories (see Figure 7), and were used for half-mean inter-nest distance calculations. The golden eagle half-mean inter-nest distance for 2013 was 1.47 miles. Figure 8 depicts the measurements used to calculate the half-mean inter-nest distance for golden eagle in 2013; only known, occupied golden eagle nests were used for the calculation. Figure 9 depicts the half-mean inter-nest distances for 2013.

Table 2. Golden Eagle Nest Status within 10 Miles of the Project, 2013

Territory Name[1]	Nest ID[2]	Nest Occupancy Status
Mud Springs	RH068	Not Occupied
	RH069	Not Occupied
	RH070	Occupied-Active
Rose Canyon	RH009	Not Occupied
	RH010	Occupied-Active
	RH011	Not Occupied
Square Mountain	RH060	Not Occupied
	RH064	Occupied-Active
	RH147	Not Occupied
Square Top	RH018	Not Occupied
Teran Basin	RH045	Not Occupied
V-F Spring	RH055	Not Occupied
	RH096	Not Occupied
Winchester Mountains - East	RH038	Not Occupied
	RH039	Not Occupied
	RH040	Occupied
Winchester Mountains - West	RH025	Not Occupied
	RH027	Occupied
	RH028	Not Occupied
	RH030	Not Occupied
	RH034	Occupied
	RH035	Occupied
Eight Territories	22 Nest Structures	Five Occupied Nesting Territories

1. SWCA-given territory name.
2. SWCA-given nest ID.

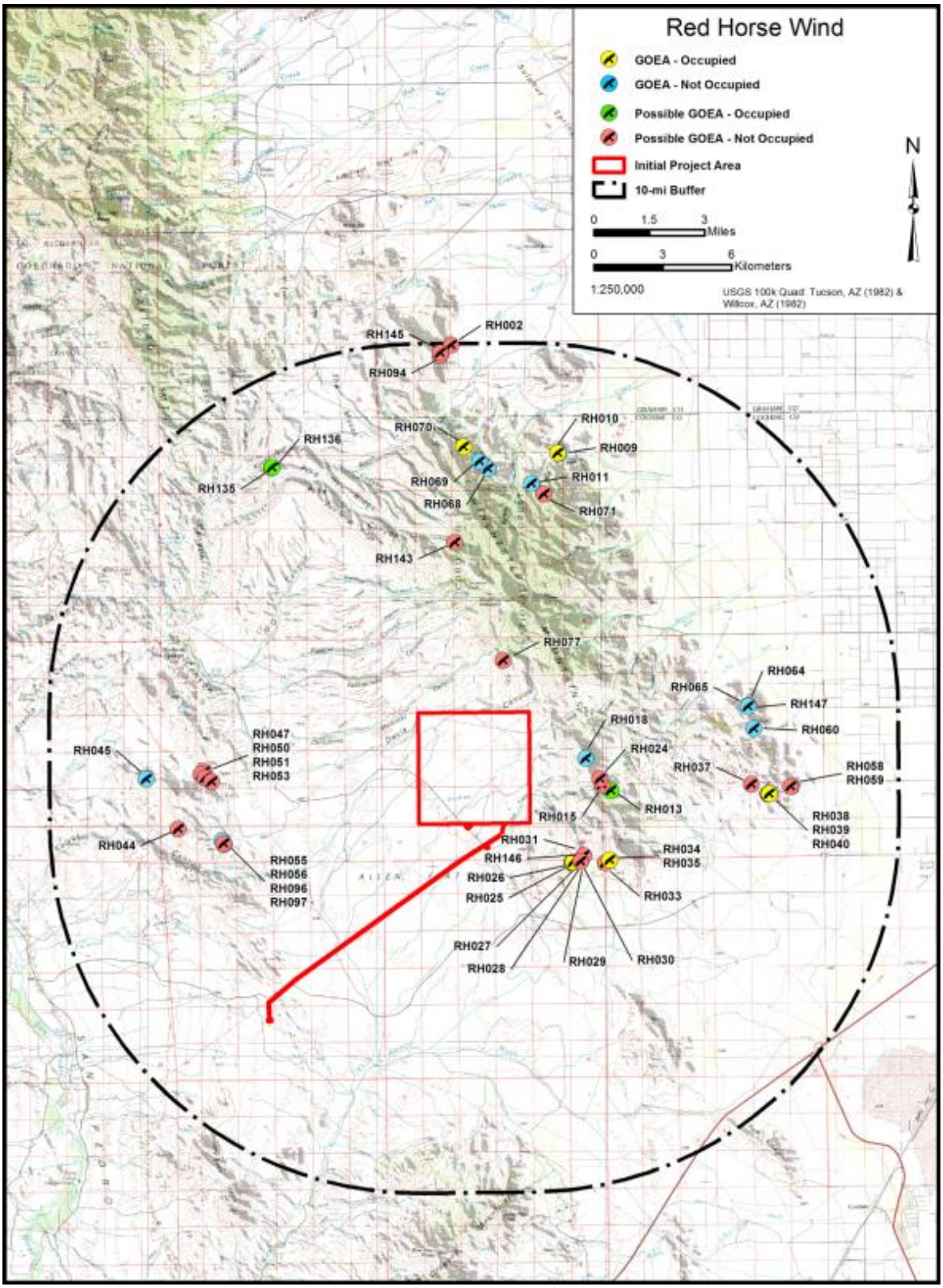

Figure 7. Confirmed and Possible Golden Eagle Nests Recorded during 2013 Surveys within a 10-Mile Buffer of the Initial Project Area

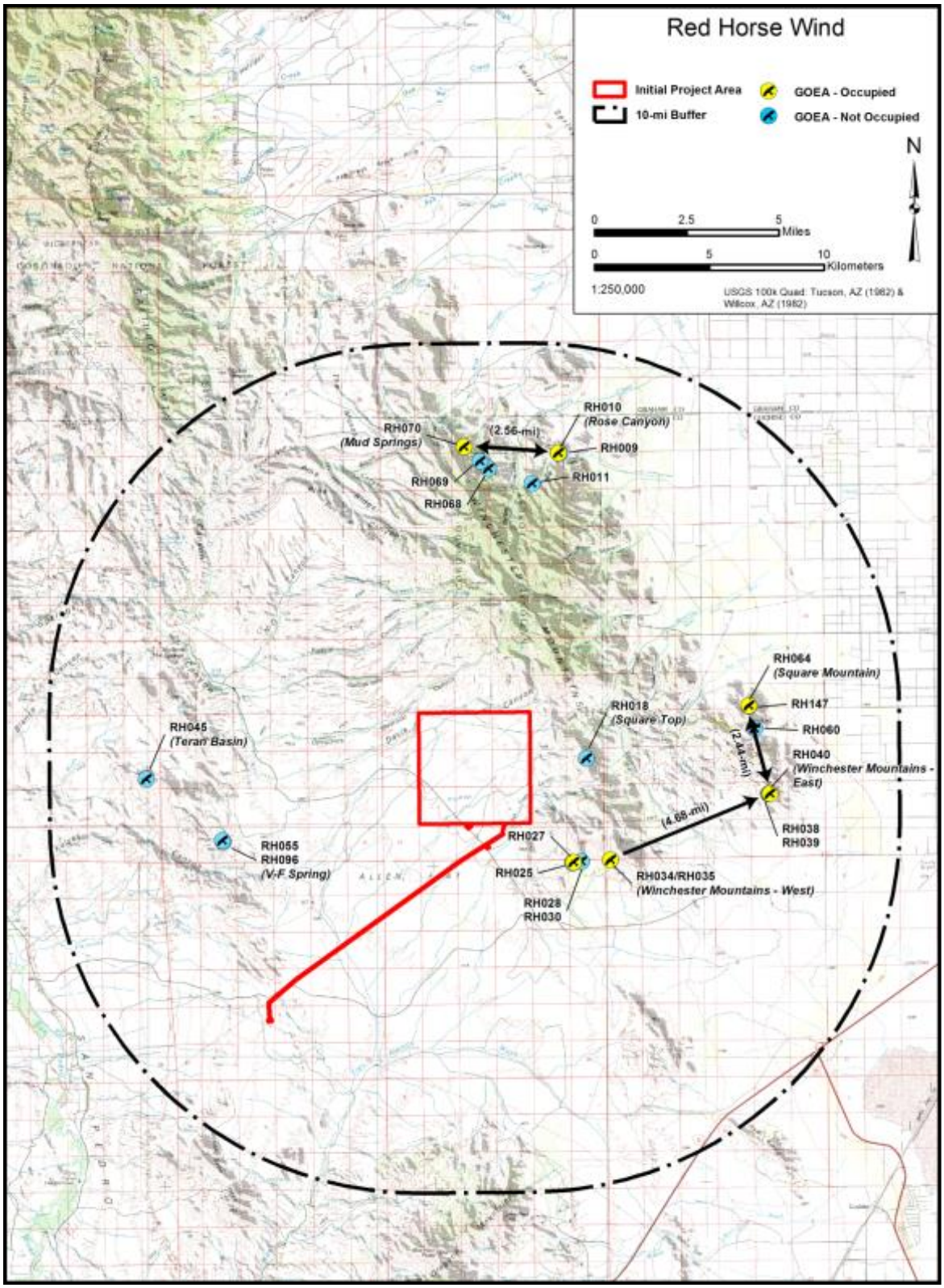

Figure 8. Measurements Used to Calculate the Half-Mean Inter-Nest Distance for Golden Eagles during 2013 Surveys within 10 Miles of the Initial Project Area

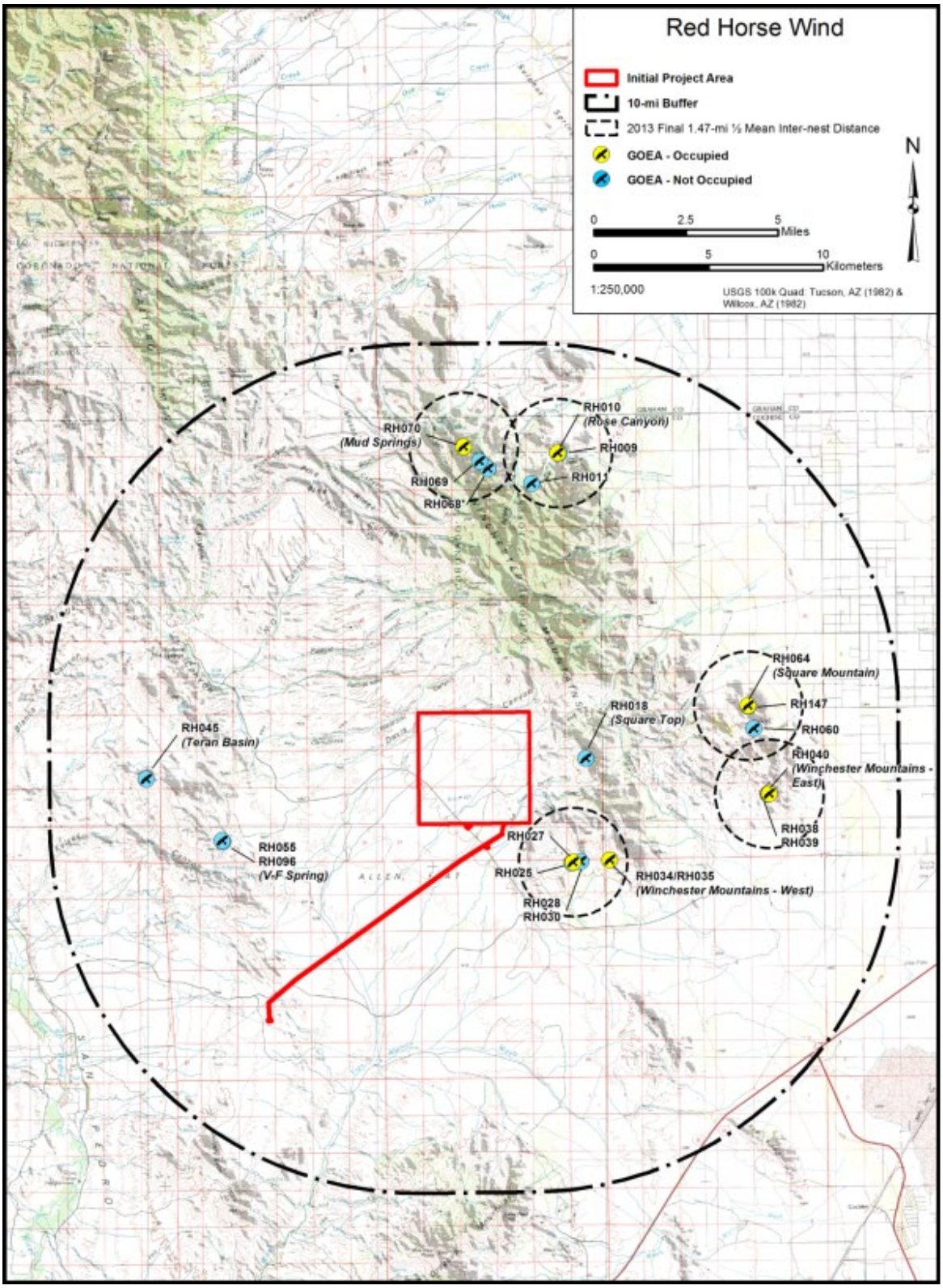

Figure 9. Observed Golden Eagle Half-Mean Inter-Nest Distance within 10 Miles of the Initial Project Area

Regarding potential future spatial distribution of golden eagle nesting within a 10-mile buffer of the Project Area, it is likely that golden eagle nesting would not occur within the Project Area or the half-mean inter-nest distance (1.47 miles) calculated from 2013 nest data. All potentially suitable golden eagle nesting habitat, identified via GIS and aerial surveys, has been identified to occur outside of the Project Area (see Figure 6). Additionally, all golden eagle nests (occupied, unoccupied, and potential nests) located by AGFD (McCarty and Jacobson 2012) and SWCA were located outside of the 2013 half-mean inter-nest distance (see Figures 7-9).

2.2.7 Areas of Potentially High Prey Density

In Arizona and adjacent areas, golden eagles most commonly prey on jackrabbits (*Lepus* sp.), cottontail rabbits (*Sylvilagus* spp.), prairie dogs (*Cynomys* spp.), and other small mammals, including ground and rock squirrels (*Spermophilus* spp.; Kochert et al. 2002, Stahlecker et al. 2009). They also frequently feed on carrion and offal piles (Watson 2010). They feed secondarily on birds and less often on reptiles, fish, and large prey (e.g., pronghorn fawns, *Antilocarpa americana*) (Howard 1995, Olendorff 1976).

Observations of potential eagle prey were noted during field surveys. No prairie dog colonies were observed; black-tailed prairie dogs (*Cynomys ludovicianus*), which are the predicted prairie dog species for the region, were extirpated in Arizona sometime between 1930 and 1960 (Johnsgard 2005). Other potential raptor prey such as rabbits (cottontails and jackrabbits) were observed frequently outside of the Initial Project Area to the south and southeast, most frequently in areas with larger stands of mesquite and other woody plants/cover (SWCA2013a). Further, during avian field surveys, cottontails and jackrabbits were observed less than five times from early December 2012 to mid-November 2013. The ecological reason(s) for the observed low abundance of rabbits within the Initial Project Area has not been determined, but it appears it may be attributable to the lack of woody and/or shrub cover, as well as the severe and extended drought which occurred during this period leading to direct effects on both the rabbits and their cover (personal communication, Kirsten Cruz-McDonnell, USFWS, 2019). Several possible ground squirrel groups (dirt mounds with scattered holes present) were located on the southern boundary of the Initial Project Area at the bases of mesquite trees adjacent to washes; however, no live squirrels were observed (SWCA 2013b). Pronghorn were frequently observed within and near the Initial Project Area, but because the Allen Flat population is small and fragmented (AGFD, personal communication, January 24, 2012) this species does not likely comprise a substantial portion of local eagle prey. Because cattle are grazed within and adjacent to the Project, cattle carcasses may provide food for eagles, especially during winter. Carcasses and offal piles left by hunters may also provide some food for eagles.

2.3 Pre-Construction Impact Assessment

2.3.1 Collision

Golden eagles can be killed by colliding with structures such as wind turbines, and this is expected to be the primary threat to the species from operation of the Project. Some data suggest that golden eagle

collisions with wind turbines are more likely when golden eagles are hunting (Hunt 2002, National Wind Coordinating Collaborative 2010). Because golden eagles often search for prey by soaring, this hunting strategy puts them at heights similar to wind turbines. Golden eagles also use low contour flying/contouring along hills, bluffs, and washes to ambush prey, and when caught in strong updrafts individuals can suddenly and quickly rise into the rotor-swept area (RSA) of turbines (Hunt 2002). Both of these hunting strategies have been observed and mapped at the Project (see Figure 5).

In contrast, bald eagles primarily hunt from a perch or by soaring high over foraging areas, with fish composing more than 90 percent of their diet (Buehler 2000). Although bald eagles can occur anywhere in Arizona in winter, large, fish-bearing waters are not present near the Project Area, and there are no confirmed records of breeding bald eagles in greater southeastern Arizona (Corman and Wise-Gervais 2005). Bald eagle fatalities have occurred increasingly at wind facilities in recent years, even at projects for which bald eagle use was low (personal communication, Corrie Borgman, USFWS, January 2018). Nonetheless, the threat to bald eagles at the Project from collision with wind turbines is likely minimal given the lack of foraging and nesting habitat.

2.3.2 Electrocution

Although all electrical collection lines have been buried underground for the Project, the 34.5-kilovolt (kV) transmission line from the collection substation to the existing 345-kV line is aboveground, posing an electrocution threat to eagles. Avian electrocutions, including eagles, typically occur on power lines with voltages less than 60 kV, with electrocution occurring when a bird simultaneously contacts electrical equipment either phase-to-phase or phase-to-ground; and, where horizontal separation of energized parts is less than a bird's wingspan or where vertical separation is less than a bird's length from head to foot (APLIC 2006, APLIC 2012). RHW2 constructed all new overhead power lines and poles to Avian Power Line Interaction Committee (APLIC; APLIC 2006) standards to help minimize risk of electrocution (see Section 3.2.2). Therefore, electrocution risk to eagles at the Project is expected to be negligible.

2.3.3 Disturbance/Displacement

Although targeted field studies have shown that eagles did not concentrate at the Project, resident golden eagles do use the Project Area during the breeding season (see Table 1 above; SWCA 2013e, SWCA 2014). Activities associated with operation of the Project may disturb and/or displace resident or transient golden eagles during any season, as demonstrated at operating wind energy facilities in Scotland (see Fielding and Haworth 2010). Whether disturbance and/or displacement are significant enough to cause impacts to territory occupancy, productivity, or survivorship is unknown.

Operation of the Project may affect the breeding or movements of eagles within the Project Area, as demonstrated at operating wind energy facilities in Scotland (see Fielding and Haworth 2010). However, the Project Area comprises approximately 2,765 acres, of which only approximately 4 percent is occupied by permanent and temporary Project infrastructure (see Section 3.3.1). Further, during Project

operation, human presence is minimal, with no more than three to five persons and vehicles sporadically operating and traversing the facility over time.

3.0 Project Design, Assessment, and Proponent-Committed Conservation Measures

As part of RHW2's efforts to reduce eagle take to the extent practicable (USFWS 2016) the Initial Project design was evaluated and then modified to minimize the risk of eagle take. This section details those designs and changes.

3.1 Initial Project Design

3.1.1 Project Design

The Initial Project Area encompassed approximately 5,798 acres of land, approximately 1 percent of which would have been occupied by permanent and temporary Project infrastructure, including MET towers, thirty-four 1.6-MW wind turbines, including alternates, (rotor diameter 110 meters; cut-in speed 3 m/sec; cut-out speed 25 m/sec) and foundations, buried electrical collection lines, access roads, laydown areas, an operations and maintenance building, a switchyard at the point of interconnection, and an overhead transmission line (Figure 10). The Initial Project Area was located on private and State lands, whereas the transmission line would have crossed State lands to reach the point of interconnection.

The Project footprint (the area to be directly disturbed by grading, vegetation removal, etc., during construction and throughout the life of the Project) was limited to the areas immediately adjacent to turbines, access roads, and other facilities. The short-term (the period from beginning of construction until reclamation) and long-term (the duration of the Project) disturbance areas for the Initial Project design are described in Tables 3 and 4.

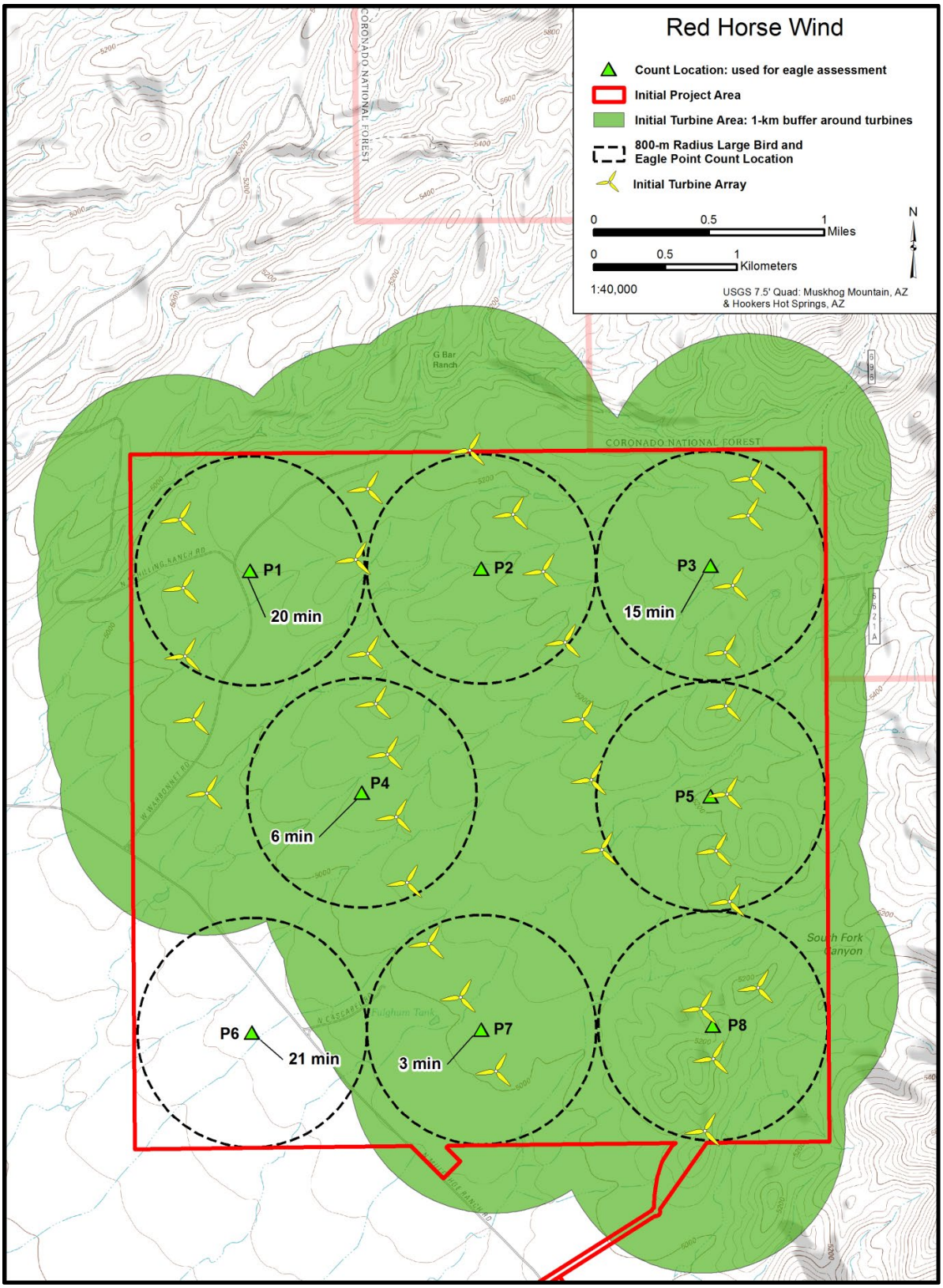

Figure 10. Initial Project Layout and Total Eagle Minutes Recorded by Location

Table 3. Short-Term Disturbance Summary—Initial Project Design

Facility Component	Disturbance Length (feet)	Disturbance Width (feet)	Short-Term Disturbance (acres)
Turbine foundations and crane pads (×34)	N/A	N/A	220
Operations and Maintenance building and laydown yard	N/A	N/A	9.5
34.5-kV step-up substation	N/A	N/A	4.1
Existing Tucson Electric Power corridor (345-kV switchyard)	N/A	N/A	N/A
Two 34.5-kV Project power lines	43,824	150	150.9
Turbine access roads	30,240	100	69.42
Access roads with adjacent underground electric cable collection (UGC)	27,123	257.5	160.33
UGC only	20,241	75	34.85
Total	–	–	**649.10**

Table 4. Long-Term Disturbance Summary—Initial Project Design

Facility Component	Disturbance Length (feet)	Disturbance Width (feet)	Long-Term Disturbance (acres)
Turbine foundations and crane pads (×34)	N/A	N/A	6.13
Operations and maintenance building and laydown yard	N/A	N/A	0.06
34.5-kV step-up substation	N/A	N/A	0.17
Existing Tucson Electric Power corridor (345-kV switchyard)	N/A	N/A	N/A
Two 34.5-kV Project power lines	43,824	75	75.45
Turbine access roads	30,240	20	13.88
Access roads with adjacent underground electric cable collection (UGC)	27,123	45	28.02
UGC only	20,241	25	11.62
Total			**135.33**

3.1.2 Initial Project Design Risk Factor Analysis

Largely based on USFWS (2011) methodology, evaluation of eagle collision risk specific to each turbine for an Initial Project design (34 wind turbines rated 1.6 MW each, including alternates) was completed by scoring the 14 physical and ecological risk factors presented in Table 5 as either two (indicating unmitigated risk) or zero (indicating absence of risk). Therefore, for the initial design, each individual turbine score could range from 28 (highest risk) to zero (lowest risk), with the sum of all turbine risk factors (R_I) equating to the total risk score for the entire facility. All turbines with

Table 5. Physical and Ecological Factors Used to Score Potential Risk of Individual Turbines (Initial Project Design) to Golden Eagles at the Project

Factor	Subfactor
Topographic features conducive to slope soaring	On or bordering the top of a slope oriented perpendicular to the prevailing wind direction?
	Near (within 50 meters) of a ridge-crest or cliff edge?
Topographic features that create potential flight corridors	In a saddle or low point on a ridge line?
	Near shorelines, wetland areas, or riparian corridors?
	Near a drainage/wash or topographic feature that facilitates contour hunting?
Proximity to potential foraging sites	Near perennial or ephemeral water sources that support a robust fishery or harbor concentrations of waterfowl?
	Near a prairie dog colony or area of high ground-squirrel density?
	Near cover likely to support a high abundance of rabbits or squirrels in at least two to three of every 10 years?
	Near concentrations of livestock where carcasses and neonatal stock occur which could attract eagles?
	Near sources of wildlife carrion and/or offal piles?
	Near a game dump or landfill which could attract eagles?
Near likely perch structures or roost sites?	
In an area where eagles may frequently engage in territorial interactions?	Turbines located within approximately the golden eagle half-mean inter-nest distance (1.47 miles)?
In an eagle "use area" as identified during use counts. Specifically, within 1,800 meters of the centroid of a use count location where eagle use was recorded.	

risk greater than zero were evaluated for risk avoidance/minimization through conservation measures and mitigation (see Section 3.2). Turbine evaluations were conducted using GIS tools and information gathered from ground-based habitat and landscape feature reconnaissance surveys. It was recognized that these factors may be subjective; therefore, a conservative approach was used in scoring each turbine. For example, no area-specific concentrations of livestock could be identified in the Initial Project Area, but as a working ranch, cattle are present across the site; therefore, all turbines received a risk score greater than zero for this category. For purposes of this analysis, "near" was defined as within 0.25 miles.

The sum of risk factors for the Initial Project Design (R_I) was 270, as it was determined that no turbines were proximal to 1) a ridge-crest or cliff edge, 2) a saddle or low point on a ridgeline, 3) shorelines, wetland areas, or riparian corridors, 4) a prairie dog colony or area of high ground-squirrel density, 5) a game dump or landfill which could attract eagles, or 6) the 1.47-mile half-mean golden eagle inter-nest distance. Six proposed turbines were near topographic features conducive to eagle slope soaring, 14

were near a topographic feature that creates a potential flight corridor, all 34 were near potential foraging sites, two were near a likely perch structure or roost site, and 31 were in an eagle "use area."

3.2 Proponent-Committed Conservation Measures

The following sections follow avoidance and minimization of risk and compensatory mitigation recommendations using the USFWS's *Land-Based Wind Energy Guidelines* (USFWS 2012) and ECPG (USFWS 2013a), combining Tier 3 from the *Land-Based Wind Energy Guidelines* with Stage 4 of the ECPG. This section describes avoidance and minimization measures that RHW2 has integrated into the Project to reduce risk to bald and golden eagles.

3.2.1 Design and Avoidance Measures

3.2.1.1 Design Changes to Avoid Take

Based on the results of Project field studies conducted prior to development, RHW2 changed the Initial Project design to minimize and avoid risk to golden eagles. In the Final Project design, the number of turbines was reduced by 19 turbines, the Project footprint was reduced, and turbines were selected that were away from nests and areas of higher eagle use.

The Initial Project Design comprised thirty-four 1.6-MW wind turbines, including alternates. In an effort to avoid eagle use areas, the Final Design consists of fifteen 2.0-MW wind turbines. This change also decreased the amount of ground disturbance and infrastructure needed.

Because golden eagle nest structures were identified near the Initial Project Area (see Section 2.2.6, and SWCA 2013c, SWCA 2013d, SWCA 2013e, SWCA 2014), the Project was designed such that no wind turbines were located within the 2013 golden eagle half-mean inter-nest distance (1.47 miles; Section 2.2.6; Figure 9). This design was intended to reduce potential disturbance and collision risk to nesting golden eagles.

To the greatest extent practicable, wind turbines were located away from eagle high use areas identified via eagle use surveys (see Figures 10 and 11). This design intended to minimize potential golden eagle collisions with wind turbines during hunting and when interacting with conspecifics.

3.2.1.2 Design and Avoidance Measures

The following measures were implemented to avoid impacts on eagles. These measures were originally listed in the BBCS for raptors/large birds (see Table 13 in SWCA 2015) but also apply to eagles. These measures included:

- Utilize existing roads to the greatest extent possible.
- SS2 – Minimize the amount of infrastructure and disturbance to the greatest extent possible.
- Turbines were placed back from ridge-crests or cliff edges by at least 180 feet, which will substantially reduce the area the RSA overlaps with the cliff edge. Wherever practicable (i.e.,

where topography allows, and energy production is still financially acceptable), turbines were placed back from ridge-crests or cliff edges by at least 360 feet.

- Establishment of a diurnal raptor nest buffer (including specific eagle buffers).
- Implemented scientifically rigorous avian pre-construction surveys.
- Buried all collection lines. Limited overhead transmission to the greatest extent possible and installed bird diverters on overhead transmission lines.
- Used tubular tower designs to reduce bird perches.
- Permanent MET towers were constructed without guy lines.
- Used the minimum number of MET towers required.
- Removed any Project or natural materials from beneath turbines which provide shelter for small mammals. Reduced forage beneath turbines for small mammals.
- Employed existing fencing wherever possible. Used wildlife-compliant fencing wherever new fence was installed.
- Located Project facilities outside of known weed occurrences wherever possible.
- Developed and implemented a site-specific noxious weed plan.

Additional avoidance measures were developed specific to eagles and included:

- No bald eagle nesting was recorded within the Initial Project Area or greater geographical area (see Sections 2.1 and 2.2.6); however, golden eagle nests were located near the Initial Project Area (see Section 2.2.6 and SWCA 2014). Therefore, to reduce potential disturbance and collision risk to nesting golden eagles, no wind turbines were located within the 2013 golden eagle half-mean inter-nest distance (1.47 miles). Given that all unoccupied and potential golden eagle nests (see Figure 9) as well as a conservative estimate of potential golden eagle nesting substrate (see Figure 6) are located farther than the 2013 golden eagle half-mean inter-nest distance from operating turbines, the probability of golden eagles nesting within the half-mean inter-nest distance in the future is unlikely.
- To the greatest extent practicable, wind turbines were located away from eagle use areas identified via eagle use surveys. These design changes were intended to minimize potential golden eagle collision with wind turbines during hunting and interacting with conspecifics.

3.2.2 Construction and Operation Minimization Measures

This section describes measures that were followed during construction and are currently being implemented during operation to avoid eagle take.

3.2.2.1 Construction

All measures listed in the BBCS (see Table 13 in SWCA 2015) for raptors/large birds also apply to eagles. Those measures included:

- Constructed new overhead power lines and poles to APLIC standards (APLIC 2006).
- Used appropriate erosion-control measures.
- Reclaimed and restored temporary use areas.
- Limited vehicle movement to the Project boundary, pre-designated access, and public roads.
- Implemented a vehicle cleaning station. Ensured vehicles and equipment are clean prior to working in the Project Area.
- Implemented site controls to reduce wildlife collisions.
- Implemented a wildlife and livestock carcass removal program (Appendix A).
- Implemented a Worker Education Awareness Program addressing construction-specific educational needs.
- Removed any Project or natural materials from beneath turbines which provide shelter for small mammals. Reduced forage beneath turbines for small mammals.
- Employed existing fencing wherever possible. Used wildlife-compliant fencing wherever new fencing was installed.
- Followed handling guidelines for toxic substances. Maintained Hazardous Materials Spill Kits on-site and trained personnel in the use of these.
- Limited wildfire hazards from vehicles and human activities by implementing appropriate best management practices.
- Developed and implemented a site-specific noxious weed plan.
- Any blasting was done outside of the eagle nesting season.

3.2.2.2 Operation and Maintenance

The following measures have been or continue to be implemented during Project operations. These measures were originally outlined in the BBCS for raptors/large birds (see Table 13 in SWCA 2015) but also apply to eagles. These measures include:

- Limit vehicle movement to Project roads, designated access roads, and public roads.
- Implement site controls to reduce wildlife collisions.
- Implement a wildlife and livestock carcass removal program (Appendix A).

- Implement a Worker Education Awareness Program addressing eagle-specific educational needs.
- Employ existing fencing wherever possible. Use wildlife-compliant fencing wherever new fence is installed.
- Follow handling guidelines for toxic substances. Maintain Hazardous Materials Spill Kits on-site and train personnel in the use of these.
- Limit wildfire hazards from vehicles and human activities by implementing appropriate best management practices.
- RHW funded golden eagle nest monitoring for the first 2 years of operation (Section 4.1).

3.3 Final Project Design

3.3.1 Project Design, with Conservation Measures Incorporated

The Project Area was reduced in size, encompassing approximately 2,765 acres of land. Additionally, the Final Design took into account Project-specific design-changes as well as conservation measures to avoid and minimize potential risk to golden eagles. The Final Design included fifteen 2.0-MW wind turbines placed on the east side of the Initial Project Area (Figure 11) away from higher eagle use areas. Specifically, the locations of turbines for the Final Design avoided the western side of the Initial Project Area where 72 percent of all eagle use was recorded via eagle use surveys (see Figure 4). Further, reducing the number of turbines for the Final Design (from 34 to 15) decreased the total RSA of the Project by 61 percent. The Project Area is located completely within state lands.

The installation process and ancillary facilities were the same as described for the Initial Project Design. The Project footprint (i.e., the area directly disturbed by grading, vegetation removal, etc.,) was limited to the areas immediately adjacent to turbines, access roads, and other facilities. The short-term (the period from beginning of construction until reclamation) and long-term (the duration of the Project) disturbance areas are described in Tables 6 and 7.

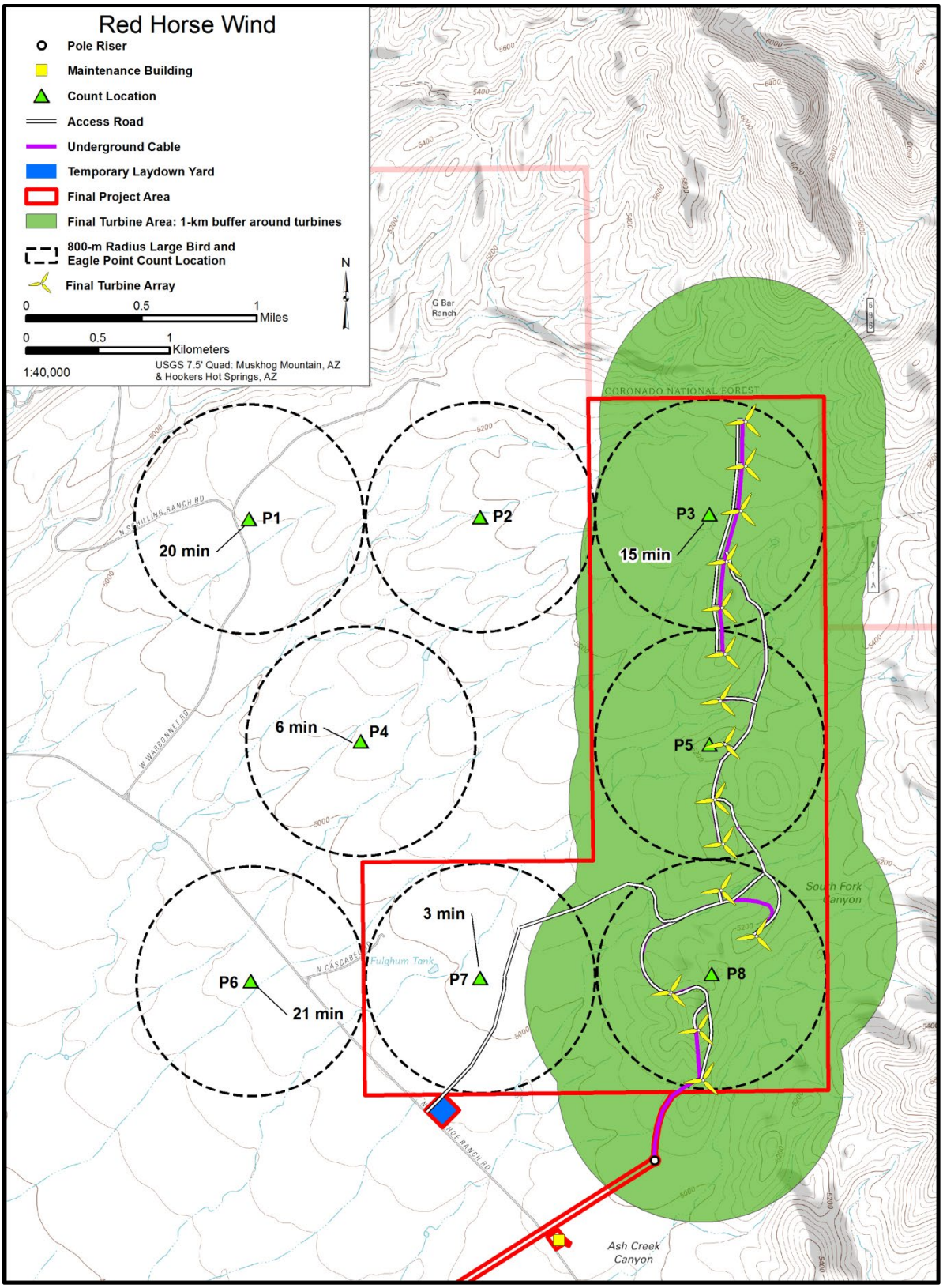

Figure 11. Final Project Layout and Total Eagle Minutes Recorded at by Location

Table 6. Short-Term Disturbance Summary—Final Project Design

Facility Component	Disturbance Length (feet)	Disturbance Width (feet)	Short-Term Disturbance (acres)
Turbine foundations and crane pads (×15)	N/A	N/A	97.0
Operations and maintenance building and laydown yard	N/A	N/A	9.5
34.5-kV step-up substation	N/A	N/A	4.1
Existing Tucson Electric Power corridor (345-kV switchyard)	N/A	N/A	N/A
Two 34.5-kV Project power lines	43,824	150	150.9
Turbine access roads	34,915	34	27.25
Underground Electric Cable Collection (UGC)	29,270	40	26.87
Total	**–**	**–**	**315.62**

Table 7. Long-Term Disturbance Summary – Final Project Design

Facility Component	Disturbance Length (feet)	Disturbance Width (feet)	Long-Term Disturbance (acres)
Turbine foundations and crane pads (×15)	N/A	N/A	2.70
Operations and maintenance building and laydown yard	N/A	N/A	0.06
34.5-kV step-up substation	N/A	N/A	0.17
Existing Tucson Electric Power corridor (345-kV switchyard)	N/A	N/A	N/A
Two 34.5-kV Project power lines	43,824	75	75.45
Turbine access roads	34,915	16	12.82
UGC	0	0	0
Total	**–**	**–**	**91.2**

Table 8. Collision Risk Factors and Sub-Factors Scored Per Turbine for the Final Project Design

Factors/Sub-Factor(s)		Turbine Risk Level (0, 1, or 2 Scored Per Turbine)[1]															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Topographic features conducive to slope soaring	On or bordering the top of a slope oriented perpendicular to the prevailing wind direction?	0	0	0	0	2	2	0	0	2	2	0	2	2	2	0	–
	Near (within 50 meters) of a ridge-crest or cliff edge?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–
Topographic features that create potential flight corridors	In a saddle or low point on a ridge line?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–
	Near shorelines, wetland areas, or riparian corridors?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–
	Near a drainage/wash or topographic feature that facilitates contour hunting?	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	–
Proximity to potential foraging sites	Near perennial or ephemeral water sources that support a robust fishery or harbor concentrations of waterfowl?	0	0	2	2	2	0	0	0	0	2	2	2	0	0	0	–
	Near a prairie dog colony or area of high ground-squirrel density?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–
	Near cover likely to support a high abundance of rabbits or squirrels in at least two to three of every 10 years?	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	–
	Near concentrations of livestock where carcasses and neonatal stock occur which could attract eagles?	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	–
	Near sources of wildlife carrion or offal piles?	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	–
	Near a game dump or landfill which could attract eagles?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–
Near likely perch structures or roost sites?		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–

Factors/Sub-Factor(s)		Turbine Risk Level (0, 1, or 2 Scored Per Turbine)[1]															
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Total**
In an area where eagles may frequently engage in territorial interactions?	Turbines located within approximately the golden eagle half-mean inter-nest distance (1.47 miles)?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	–
In an eagle "use area" as identified during use counts?		2	2	2	2	2	2	2	2	0	0	2	0	2	2	2	–
Sum of Risk Factors (R_F)		**4**	**4**	**6**	**8**	**10**	**8**	**6**	**6**	**6**	**8**	**8**	**10**	**8**	**8**	**6**	**= 106**
1. 0 = absence of risk, 1 = low risk (e.g., mitigated risk), 2 = moderate–high risk (e.g., unmitigated risk).																	

3.3.2 Final Project Design Risk Factor Analysis

For the Final Project Design, the 14 physical and ecological risk factors presented in Table 5 were scored as either 2 (indicating unmitigated risk), 1 (indicating mitigated risk), or 0 (indicating absence of risk). The sum of risk factors for the Final Project Design is 106 (Table 8), compared to the Initial Project Design score of 272 (see Table 8), indicating a reduction in the potential risk to eagles. For the Final Project Design, no turbines are proximal to 1) a ridge-crest or cliff edge, 2) a saddle or low point on a ridgeline, 3) shorelines, wetland areas, or riparian corridors, 4) an area of high ground-squirrel density, 5) a game dump or landfill which could attract eagles, 6) near likely perch structures or roost sites, or 7) within the 1.47-mile half-mean inter-nest distance. Of the 15 constructed turbines, seven turbines are near topographic features conducive to slope soaring, 12 are near a topographic feature that creates a potential flight corridor, all 15 are near potential foraging sites, and 12 are in eagle use areas.

The 61 percent reduction in collision risk according to the analysis between the Initial and Final Project Design is primarily due to reducing the number of wind turbines (from 36 to 15), removing several turbines from eagle use areas, and the proposed implementation of a wildlife and domestic livestock carcass/offal pile removal program (Appendix A). Additionally, two turbines were relocated from areas near likely perch structures to further reduce risk.

4.0 Post-Construction Monitoring and Reporting

Although design, avoidance, and minimization measures were put in place to reduce impacts to eagles, post-construction monitoring is essential to tracking any impacts and ensuring persistence of the local eagle population. Post-construction monitoring studies for eagles that have been completed or are ongoing include nest occupancy studies and standardized PCMM searches, including searcher efficiency and carcass removal trials. The following sections follow the USFWS post-construction survey recommendations from the *Land-Based Wind Energy Guidelines* (USFWS 2012) and ECPG (USFWS 2013a), combining Tiers 4 and 5 from the *Land-Based Wind Energy Guidelines* with Stage 5 of the ECPG.

4.1 Golden Eagle Nest Occupancy Studies

As recommended by USFWS Region 2 Migratory Birds, during the first 2 years of Project operation (2016 and 2017), RHW2 provided funding to AGFD to conduct golden eagle nest occupancy studies. Occupancy studies included aerial or ground-based nest revisits of all eagle nests located within 5 miles of the Project. Nest revisits were timed such that early and late nest occupancy was recorded, with two revisits conducted between mid-February and early March, annually.

AGFD revisited 16 golden eagle and possible golden eagle nests within 5 miles of the Project during the 2016 eagle breeding season (personal communication, Kyle McCarty, Eagle Field Projects Coordinator). Among the 16 nests, two active golden eagle nests (RH024 in the Square Top territory and RH035 in the Winchester Mountains-West territory) were observed. Both nests were successful, fledging young on

approximately May 29 (RH024) and June 6 (RH035), 2016. Findings from these observations were reported to USFWS Region 2 Migratory Birds.

AGFD revisited the same golden eagle territories during the 2017 eagle breeding season (personal communication, Kyle McCarty, Eagle Field Projects Coordinator). There were 20 nests detected among approximately four territories. Of the 20 nests, three active golden eagle nests (RH024 in the Square Top territory, RH029 in the Winchester Mountains-West territory, and RH143 in an unnamed territory) were observed. Follow-up visits on May 16, 2017 determined that all three of the active nests had failed; no eggs or young were present and no adults were observed (personal communication, Kyle McCarty, AGFD, September 25, 2019).

4.2 Post-Construction Mortality Monitoring (PCMM)

This section describes methods that were used to monitor and analyze impacts that occurred during the first three years of operation. The first year (Year 1) of PCMM included searches using methods for all birds as described in the Project BBCS (SWCA 2015), as well as eagle-focused searches. The second and third years (Year 2 and Year 3, respectively) of PCMM used a revised protocol to increase the robustness of the monitoring program, particularly to detect eagles.

As recommended in the USFWS's *Land-Based Wind Energy Guidelines* (USFWS 2012), initial surveys for eagle fatalities were completed for 1 year following construction from July 2015 – July 2016 (SWCA 2016) to evaluate mortality levels from operation of the Project. The additional two consecutive years of surveys began on August 28, 2017 and were completed on August 31, 2019. Additionally, eagle mortality will be recorded for the lifetime of the Project via a Worker Search Program (see Section 4.3, below; Appendix B).

4.2.1 Year 1 PCMM Methods

The following sections describe the methods used during Year 1 of PCMM at the Project (SWCA 2016).

4.2.1.1 Surveys for all Birds, Including Eagles

During Year 1, 10 of the 15 turbines at the Project were surveyed for all bird and bat fatalities, including eagles. This sample size was determined based on recommendations in the ECPG (USFWS 2013a), citing Strickland et al. (2011), that if a project contains fewer than 30 turbines, at least 10 turbines will be searched. Turbines (T2–7, 9, 11, 13, and 15) were chosen using a random number generator. All 10 turbines were sampled every other week the first year following construction, across all seasons. Observed and adjusted (as recommended by the USFWS's *Land-Based Wind Energy Guidelines* [2012] and ECPG [USFWS 2013a]) avian and bat fatality rates, species composition, and spatial and temporal attributes of fatalities were assessed.

Surveys at each sampled turbine were conducted by a team of one to three (most commonly one to two) trained biologists within a square search plot oriented such that the largest distance searched (i.e., diagonal of the square) was in the direction of prevailing winds, whenever possible. Search plot sizes were 135 meters wide, centered on the turbine mast (50 percent MBTH). Surveyors searched the entire

search plot area during each survey. Search transects were spaced at 6-meter intervals as recommended by the *Land-Based Wind Energy Guidelines* (USFWS 2012), and each searcher scanned for carcasses out to approximately 3 meters, with occasional scans out to approximately 10 meters. One lead surveyor, designated for each turbine, followed transects on a GPS unit and set the pace of the search: 30 to 60 meters per minute. Data collected for each carcass followed the USFWS *Land-Based Wind Energy Guidelines* (USFWS 2012) and ECPG (USFWS 2013a). Photographs were taken to document all fatalities or injuries.

4.2.1.2 Eagle-Focused Surveys

In Year 1, eagle-focused surveys were conducted on 7 turbines once per month using larger search areas. Surveyed turbines included the 5 turbines not searched during the all-bird surveys, plus 2 turbines that were surveyed on a rotating basis such that all turbines were surveyed with a larger search area at least twice during the survey year. An example survey schedule is illustrated in Table 9. The one-month search interval has generally been used where raptor mortality has been the focus, with this interval leading to reasonably precise estimates for raptors like golden eagles and large hawks (Strickland et al. 2011).

Table 9. Example Survey Schedule

Survey Type	Turbines Surveyed				
	Week 1	Week 2	Week 3	Week 4	Week 5
All birds, including Eagles	2, 3, 4, 5, 6, 7, 9, 11, 13, 15	No turbines searched	2, 3, 4, 5, 6, 7, 9, 11, 13, 15	No turbines searched	2, 3, 4, 5, 6, 7, 9, 11, 13, 15
Eagle-Focused[1]	1, **4, 5**, 6, 8, 10, 12, 14	No turbines searched	Not searched	No turbines searched	1, **2**, **7**, 8, 10, 12, 14
1. Turbines highlighted in bold indicate turbines in rotation which will be surveyed at least twice each year.					

Eagle-focused surveys for each sampled turbine were conducted by two to three (most commonly two) trained biologists within a square search plot oriented such that the largest distance searched (i.e., diagonal of the square) was in the direction of prevailing winds, whenever possible. Search plot sizes were 270-meter wide (i.e., twice the turbine height from the ground to the top height of the turbine blade, or 100 percent MBTH), centered on the turbine mast.

In Year 1, surveyors searched the entire search plot area during each survey. Surveyors/search transects were spaced to adequately observe eagle carcasses relative to the habitat and conditions. Eagle-focused carcass searches were surveyed using the same methods as the other avian carcass searches, with the exception that transects were spaced at 10-meter intervals with each surveyor scanning for carcasses out to approximately 5 meters. Data collected for each carcass followed the USFWS *Land-Based Wind Energy Guidelines* (USFWS 2012) and ECPG (USFWS 2013a). Photographs were taken to document all fatalities or injuries.

4.2.1.3 Carcass Search Correction Factors

As part of PCMM for all birds, including eagles, bias trials consisting of searcher efficiency and carcass persistence trials were conducted in all 3 years to quantify the following carcass detection biases: 1) imperfect detection by searchers (searcher efficiency) and 2) removal by scavengers or other means (carcass persistence). Searcher efficiency was calculated as the proportion of trial carcasses found by searchers relative to the total number of trial carcasses available to be found during the trial. Carcass persistence was calculated as the length of time (in days) a trial carcass persisted at the site and was calculated as the midpoint between the day the carcass was last known to be present and the day it was no longer observable. The objective of these trials was to develop correction factors to estimate mortality that occurred during the time period of each study.

Year 1 searcher efficiency trials were conducted within both search plot types on 1-2 days per season at a subset of the turbines. Searchers searched for surrogate large birds (adult chickens) within the avian and bat search plots. The trials were conducted during each of the four seasons to account for different field conditions that may have affected searcher success. The same number of large bird carcasses was distributed for each trial, with at least one and no more than three placed at each search plot. For both search plot types, trial carcasses were placed at randomly generated locations; the locations of carcasses found by searchers were directly compared with these locations. Carcasses that were not detectable because they were removed (by a scavenger or other means) prior to the search were excluded from analyses. Searcher efficiency rates for large birds were pooled for all searchers and grouped by season and substrate.

Searcher efficiency trial carcasses were also used to estimate carcass persistence in Year 1, and were revisited on days 1 through 7, 14, 21, and 28. Like the searcher efficiency trials, the carcass persistence trials were conducted during each of the four seasons to account for different conditions that may have affected carcass removal. During each visit, a biologist recorded presence or absence of each carcass and any relevant notes (e.g., signs of scavenging, insect infestation, or decomposition). When a carcass was recorded as absent and no obvious signs of scavenging were apparent (e.g., feathers), it was revisited the next day to confirm absence. Carcass persistence for large birds was grouped by season and substrate.

4.2.2 Years 2 and 3 PCMM Methods

The following sections describe the methods used during Year 2 (August 2017 – August 2018; Tetra Tech 2018) and Year 3 (September 2018 – August 2019; Tetra Tech 2019) of PCMM at the Project, which were refined based on the results of Year 1.

4.2.2.1 Surveys for all Birds, Including Eagles

During Years 2 and 3, the turbine sample size and search frequency were increased because both eagle and bat fatalities had been documented at the Project. The turbine sample size was increased to 100 percent (up from 66 percent in Year 1) to reduce extrapolation associated with unsearched turbines. The

search interval was decreased in spring, summer, and fall (from 14 days in Year 1 to every 7 days in Years 2 and 3) to reduce the bias associated with carcass removal by scavengers or other means. In winter, searches were conducted once per month for eagles only, because bird use is typically lower and thus collision risk is presumed to be lower during that season. During Year 1 monitoring, more bird fatalities were documented during spring than any other season.

Surveys were conducted by a team of trained biologists who searched the entirety of a 135 x 135-meter search plot during each survey with 6-meter transects. Searchers systematically walked parallel transects while scanning both sides of each transect for carcasses, visually covering 100 percent of each plot. This search plot size and transect spacing was conservatively designed to be sufficient to detect bat fatalities and provide sufficient detection of eagle species as well.

4.2.2.2 Eagle-Focused Surveys

During Years 2 and 3, surveys were conducted monthly at all 15 turbines for a total of 12 eagle-focused searches at each turbine per year (360 eagle-focused searches over the 2 years). Eagle-focused searches were conducted within a search plot size of 202 x 202 meters (75 percent MBTH); these plots had sides 68 meters longer than the smaller square search plots. Based on Tetra Tech's analysis using the Hull and Muir (2010) theoretical model of carcass distribution, search plots with a radius of 75 percent MBTH are expected to include 94 percent of the large bird carcass distribution at this Project.

Eagle-focused surveys were conducted using the same methods as the other avian carcass surveys, except that the transect spacing was increased to 15 meters. In spring, summer, and fall when the smaller 135 x 135-meter plots were searched, the transect spacing only increased in the additional outer area surrounding the smaller plot (Figure 12).

4.2.2.3 Carcass Search Correction Factors

During each of Years 2 and 3 a total of 13 searcher efficiency trials were conducted: four trials in fall, two trials in winter, three trials in spring, and four trials in summer. Between four and 15 carcasses were placed on each trial day, with up to four carcasses placed at any one turbine. If a trial carcass was not found by the searchers and could not be located at the end of the trial day, it was assumed that the carcass was not available for detection during the trial (e.g., lost due to scavenging) and was not included in the analysis. Trial carcasses were discreetly marked to distinguish them from naturally occurring carcasses.

During each of Years 2 and 3 two 28-day carcass persistence trials for large birds were conducted each season (fall, winter, spring, and summer). After placement (Day 0), carcasses were checked on Days 1-7, 14, 21, and 28. Carcass persistence trials were conducted within the searchable area of selected search plots during each season. For each trial, a designated bias trial coordinator placed 7 to 13 carcasses of each size class. Up to 21 large bird carcasses were placed per season. Up to four carcasses were placed at randomly generated locations within each turbine's search plot.

4.2.3 Years 1-3 PCMM Results

Four golden eagles have been found during the 3 years of PCMM completed to date. One adult golden eagle was found during Year 1 on June 13, 2016 at Turbine 1. Two adult golden eagles were found during Year 2; one on September 6, 2017 at Turbine 1, and the second on May 28, 2018 also at Turbine 1. One adult golden eagle was found during Year 3 on September 11, 2018 at Turbine 9. All eagles were found during scheduled searches and within search plots.

Year 1 searcher efficiency for large birds was 0.94 and carcass persistence was a mean of 7 days which varied from 5 days in summer to 10 days in winter (SWCA 2016). Year 2 searcher efficiency for large birds was 0.74 (90 CI=0.64-0.83), with mean carcass persistence for large birds of 8.97 days (90 percent CI=6.59-12.39) with a mean proportion of carcass distribution searched of 0.89 (Tetra Tech 2018). The best fit model for searcher efficiency of large birds in Year 3 included season and ranged from 0.69 in fall (90 CI=0.46-0.91) to 0.86 in spring (90 CI=0.71-1.00). Season was also included in the best fit model for carcass persistence, with large bird carcass persistence in Year 3 ranging from 2.89 days in summer (90 CI=1.57-5.20) to 10.96 days in fall (90 CI=5.04-24.15). The mean proportion of large bird carcass distribution searched was the same as in Year 2 (0.89 percent).

Eagle-specific fatality estimates were not calculated for any of the years of PCMM. However, fatality estimates were produced in conjunction with predicting Project-related take (Section 4.5.1.2).

4.3 Worker Search Program

In addition to formal searches, a Worker Search Program (WSP; Appendix B) has been developed and will be implemented for the lifetime of the facility. The WSP provides specific direction to on-site operations staff on how to look for and record any avian fatalities. The WSP was initiated at the start of operation; however, during periods when standardized fatality searches are being conducted, workers have been trained to record observations in place, but not to disturb them as they are part of the formal study program.

When standardized fatality searches are not being conducted, turbines are searched by operations staff on a regular basis, with every turbine being visited at least once each month. Operations staff search the cleared area under turbines by walking a loop around the turbine approximately halfway between the turbine and the edge of the cleared area. At each cardinal direction the worker stops and scans the ground out as far as possible, looking for dead birds. The worker also walks a transect down one side of the turbine access spur road and up the other side, searching for avian fatalities.

Figure 12. PCMM Search Turbines

If a dead or injured bird is found at the facility by on-site personnel, the on-site manager will be notified immediately. The on-site manager will contact the Facility Project Manager. The following information will be collected:

- Permits are required to handle wildlife. The animal will not be moved or removed by any individual who does not have the appropriate permits.
- The location will be marked using GPS.
- An Incident Reporting Form (Appendix B) will be filled out that includes all data as described in the USFWS *Land-Based Wind Energy Guidelines* (USFWS 2012) and ECPG (USFWS 2013a), and photos will be taken.
- The on-site manager will coordinate with the USFWS to arrange transportation and treatment of an injured ESA-listed species or eagle. At RHW2's cost, animals that are approved for removal/relocation will be taken to a local USFWS- and AGFD-approved rehabilitation center such as Liberty Wildlife or disposed of as recommended by AGFD and USFWS. Non-eagle carcasses, and parts, would be legally distributed via licensed repositories such as Liberty Wildlife.

If an ESA-listed species or an eagle is found, RHW2 will notify the USFWS and AGFD within 48 hours of species identification. RHW2 does not currently possess state or federal salvage or collection permits.

4.4 Additional Golden Eagle Nest Occupancy Studies

AGFD completed a 5-year study of golden eagle productivity and nest occupancy rates within Arizona. The study was statewide and included golden eagle territories within 5 miles of the Project (Section 4.1). AGFD is initiating a follow-up study in 2020 focused on specific areas of Arizona where there are concentrations of known golden eagle nests lacking recent occupancy data. The focus area for the 2020 breeding season is southeastern Arizona, including the Project area and vicinity. Furthermore, AGFD plans to perform periodic monitoring of golden eagle territories across the state over the foreseeable future as part of their golden eagle management program. AGFD has agreed to provide RHW2 with relevant data (e.g., occupancy, productivity, nest success) collected from golden eagle territories within 5 miles of the Project. RHW2 will use these data to inform operational risk assessments on an ongoing basis.

4.5 Fatality and Risk Assessment and Compensatory Mitigation

This section provides a prediction of Project-related take by informing the USFWS Bayesian Collision Risk Model (CRM) with Project-specific information on collision risk derived from PCMM data. The predicted take for the Project was then evaluated in a Local Area Population (LAP) and Eagle Management Unit (EMU) analysis. This section also details compensatory mitigation for the predicted take.

4.5.1 Fatality Assessment

The USFWS calculated a golden eagle fatality prediction for the Project using their CRM. Since the Project was operational prior to the 2016 Eagle Rule Revisions it qualifies for the Pre-construction Eagle Survey Waiver (personal communication, Kirsten Cruz-McDonnell, USFWS) allowing USFWS to use the exposure priors-only model to calculate the fatality estimate. In other words, the CRM did not incorporate Project-specific pre-construction eagle use information. The Evidence of Absence (EOA) program (Dalthorp et al. 2017) was used to produce eagle fatality estimates from Year 1 and Year 2 PCMM data (Section 4.5.1.1) and these estimates were then used to sequentially inform the CRM (Section 4.5.1.2). Data from Year 3 of PCMM were still being collected at the time of the take prediction analysis and were not included in this analysis.

4.5.1.1 Fatality Estimates from PCMM Data

USFWS used the EOA program (Dalthorp et al. 2017) to produce eagle fatality estimates from the two complete years of PCMM (Years 1 and 2). The EOA program generates probability distributions for wildlife fatalities based on the results of PCMM surveys, and accounts for carcass persistence time, searcher efficiency, and the proportion of the carcass distribution that is searched (Dalthorp et al. 2017). Specifically, the single year analysis module of the EOA program was used to generate a probability distribution of the number of fatalities estimated to occur given the user-defined credibility level, observed fatalities, and bias correction values for each of Years 1 and 2. The single year module inputs include the number of observed fatalities, searcher efficiency and carcass persistence field trial data, and the proportion of the carcass distribution searched (Table 10). The 50 percent credibility level of the probability distribution was used by USFWS to produce the point estimate of golden eagle fatalities in each year. The mortality estimate (M*) at the 50 percent credibility level was calculated by USFWS to be 6 golden eagles for Year 1 and 7 golden eagles for Year 2.

Table 10. EOA Single Year Input Parameters and Bias Correction Outputs for Eagle Fatality Estimation at the Project

Monitoring Period	Search Interval	Percent Temporal Coverage	No. of Search Turbines	Percent Spatial Coverage[1]	Observed Golden Eagle Fatalities	Mean Searcher Efficiency	Mean Probability of Carcass Persistence
Year 1 July 2015 – July 2016	30 days[2]	100	7	47	1	94	44 [3]
Year 2 August 2017 – August 2018	30 days	100	15	82	2	74	44

Sources: Tetra Tech 2018, USFWS 2019.

1. Proportion of large bird carcass distribution searched at entire site.
2. The search interval for two of the seven search turbines was variable based on the study design; however, given smaller plots at those turbines were searched every other week, 30 days was selected as a reasonable simplifying assumption.
3. Available carcass persistence information from Year 1 was insufficient for analyzing in EoA; therefore, data from Year 2 were used for Year 1.

4.5.1.2 Fatality Prediction from CRM

USFWS uses the Conjugate Update portion of the CRM to inform the collision probability prior with the annual fatality estimates derived from PCMM data. The Conjugate Update produces a collision probability posterior distribution, which becomes the new collision probability prior for the purposes of predicting annual eagle take. USFWS sequentially updated the collision prior with the Year 1 fatality estimate followed by the Year 2 estimate because different PCMM methods were used in Years 1 and 2, and the years were not independent (i.e., the carcass persistence distribution was assumed to be the same in both years).

The annual mean predicted take at the Project was estimated by USFWS as 4.03 golden eagles with an 80th upper credible limit of 6.47. USFWS has agreed to an initial 2-year mitigation and review period for the Project. The 2-year review period would be followed by the more typical 5-year review periods for the remainder of the permit term. A 17-year permit is being sought by RHW2 for the Project. The predicted 2-year, and full permit period 17-year take (rounded up) using both the annual mean and 80th upper credible limit are presented in Table 11.

Table 11. Predicted Take for Golden Eagles at the Project Using the USFWS ECPG Exposure Prior and an Informed Collision Probability Prior

Annual Fatality Prediction			2-Year Predicted Take (rounded up)		17-Year Predicted Take (rounded up)	
Annual Mean	Standard Deviation	80th Quantile	Annual Mean	80th Quantile	Annual Mean	80th Quantile
4.03	4.34	6.47	9	13	69	110

Source: USFWS 2013a.

4.5.2 Local Area Population and Eagle Management Unit Analysis

USFWS estimated the Project LAP to be approximately 176 golden eagles (USFWS Cumulative Effects Tool, run July 12, 2019). Using this estimate, the 5 percent annual take threshold for the Project's LAP is 8.79 golden eagles (i.e., 9 individual eagles). There are currently no permitted projects that overlap this LAP; therefore, the Project's predicted annual take at the 80th upper credible limit of 6.47 golden eagles (i.e., 7 individual eagles) falls below the 5 percent threshold.

Furthermore, USFWS determined that the take that would be authorized by this Eagle ITP for the Project will be offset by the compensatory mitigation that will be provided by RHW2. As a result, the Project-related take will not cause a net loss at the EMU nor will it significantly impact local area eagle populations.

4.5.3 Compensatory Mitigation

The USFWS has a standard of no-net-loss to the golden eagle breeding population to be compatible with existing permit regulations. To achieve no-net-loss, a mitigation action can either reduce a current ongoing form of mortality (e.g., electrocutions from power poles) or it can increase carrying capacity allowing the eagle population to increase. In either case, the mitigation action for golden eagles must offset predicted take by a ratio of 1.2:1 (i.e., 1.2 eagles saved or created for every eagle taken) and occur within the same EMU. These mitigation actions are considered compensatory mitigation.

Power pole electrocution has been shown to cause a significant number of eagle fatalities (APLIC 2006). Therefore, retrofitting high-risk electric poles is an effective way to minimize fatalities in eagle populations (USFWS 2013a). Retrofits are also an effective and quantifiable compensatory mitigation measure that may be used to offset any fatalities that may occur as a result of operation of a project. USFWS calculated using their Resource Equivalency Analysis that 288 retrofitted poles, each with a 20-year effectiveness duration, would be needed to mitigate for the first 2 years of predicted take at the Project. RHW2 previously funded 26 pole retrofits in 2016 which USFWS agreed could be credited toward the number of retrofitted poles needed for the first 2 years of the permit term. Therefore, RHW2 has committed to funding 262 additional power pole retrofits to be completed according to the permit conditions. Over the duration of the 17-year permit, additional compensatory mitigation will be funded by RHW2 as required. The details of the compensatory mitigation program are presented in Appendix C.

5.0 Compliance Monitoring

Should an Eagle ITP be issued, eagle-focused compliance monitoring will be conducted using a study design consistent with the ECPG and 2016 Eagle Rule Revisions, and approved by the USFWS. RHW2 will work with the USFWS to determine the level of uncertainty that is mutually acceptable and perform appropriate analyses to determine sufficient levels of search effort to inform permit compliance. In this ECP, RHW2 has proposed to implement compliance monitoring that will achieve a minimum average

carcass detection probability (g-value) determined by the USFWS over the duration of a given permit review period (see Section 6.0). The final permit compliance monitoring and other requirements will be negotiated with USFWS and included in the Eagle ITP conditions. As noted above (Section 4.3), the WSP will be conducted over the life of the Project's operation and will provide additional information to demonstrate permit compliance.

RHW2 will report all eagles injured or killed, as well as any actions taken to address such events. These data will be reported to the local USFWS Ecological Services Office, USFWS Migratory Bird Office, and AGFD within 48 hours of species identification. These data will be available for review and broad-scale evaluations by the USFWS Office of Law Enforcement, as is done for the electric utility industry (APLIC 2006). As allowed by law, confidentiality will be maintained between RHW2 and all agencies reviewing the Project reports.

6.0 Adaptive Management (ECP Stage 4)

RHW2 has developed an adaptive management framework in cooperation with USFWS that will be applied over the course of the 17-year permit term. The adaptive management framework establishes trigger levels over a specified number of years of monitoring effort (Section 6.1) which will result in implementation of a combination of enhanced monitoring and specific conservation measures (Section 6.2). Each subsequent trigger level will result in more extensive or focused conservation measures. RHW2 will use this framework to adaptively manage Project-related golden eagle fatalities and address the underlying uncertainty in collision risk to golden eagles posed by the Project. RHW2, in coordination with the USFWS, may adjust adaptive management triggers and implementation of corresponding conservation measures based on the results of permit reviews.

6.1 Triggers

The following triggers will be used to determine when the conservation measures described below (Section 6.2) must be employed. Over a 17-year permit, there will be four review periods for the Project (years 1-2, 3-7, 8-12, and 13-17). At the conclusion of each year of compliance monitoring, RHW2 and USFWS will evaluate the number of eagle remains found over the years of compliance monitoring performed to date and determine whether this value exceeds the corresponding trigger value (Table 12). Trigger values are specific to the rigor and number of years of monitoring effort performed because fewer eagle remains are expected to be missed during more rigorous monitoring compared to less rigorous monitoring, and because there should be less uncertainty with each additional year of monitoring. Thus, as more rigorous monitoring is accomplished, the number of eagle remains found to meet each trigger increases. Numerous scenarios of eagle take projected over the 17-year permit term were modeled using the EoA program. These projections were used to identify trigger values that would indicate a level of take that would have a high likelihood of permit exceedance in the absence of an adaptive management response.

Table 12. Adaptive Management Trigger Levels

Trigger Levels	Standard Fatality Monitoring	Years of Enhanced Monitoring[1]	
		5	≥10
1	≥4 GOEA remains found in first 2 years	Not applicable	Not applicable
2	≥12 GOEA remains found in first 7 years	≥17 GOEA remains found in first 7 years	Not applicable
3	≥21 GOEA remains found in first 12 years	≥26 GOEA remains found in first 12 years	≥32 GOEA remains found in first 12 years
4	The minimum average g-value of 0.25 is not achieved in any review period during the permit tenure, as determined by the USFWS. OR Enhanced Monitoring, if required through this adaptive management table, does not achieve a minimum average g-value of 0.4 during the required review period, as determined by the USFWS.		

1. Upon achievement of any trigger, Enhanced Monitoring will only be required for the next 5 years, at which point Standard Monitoring can resume as initially prescribed (i.e., g-value of $\geq$ 0.25), unless another trigger is achieved.

6.2 Measures

The following conservation measures (or comparable measures based on best available science and practicability) will be implemented by RHW2 when their respective trigger level is reached. The trigger levels were designed to indicate when there is reason to be concerned that eagle take rates are higher than predicted (6.47 golden eagles per year). Once triggered, a selected conservation measure (including enhanced monitoring) will be implemented for the duration of the subsequent permit review period. Implementation of a given measure for a longer period, if applicable, will be determined by RHW2 in coordination with USFWS based on the effectiveness of the measure at reducing risk of take, its practicability, and the availability of potentially more effective measures.

If Trigger Level 1 is Met:

At the beginning of the next year of compliance monitoring, implement both of the following:

a) Examine monitoring data to identify when and where take is occurring and perform updraft modelling to identify specific turbines with the highest collision risk under a suite of wind conditions, or perform another measure not listed here if agreed upon by the USFWS.

b) Perform enhanced monitoring over the next 5 years (i.e., achieve an average g-value of 0.4 over the subsequent 5 years).

If Trigger Level 2 is Met:

At the beginning of the next year of compliance monitoring, implement both of the following:

a) Test a conservation measure designed to reduce the number of eagles exposed to collision risk (i.e., test a deterrent). This measure could involve an automated video camera-based detection

system coupled with an audible deterrent such as those developed by DT Bird or BirdsVision to minimize the likelihood of future take. Modules would be installed at a subset of turbines using results of a desktop analysis of collision risk (e.g., spatial pattern of documented fatalities among turbines, updraft modelling if performed in response to Trigger Level 1) to prioritize those turbines of highest collision risk. Turbines with documented fatalities will be prioritized. Implementation of the measure would incorporate a study designed to evaluate the effectiveness of the conservation measure. Alternatively, perform another measure not listed here if agreed upon by the USFWS. Implementation of the conservation measure will occur no later than 1 year from date of triggering.

b) Perform enhanced monitoring over the next 5 years (i.e., achieve an average g-value of 0.4 over the subsequent 5 years).

Note: if Trigger Level 2 is met simultaneous to meeting a previous Trigger Level (i.e., if Trigger Level 2 is met for the first time at the same time that Trigger Level 1 is met for the first time), the measures listed under Trigger Level 2 will be implemented, with implementation of measures under previous triggers being at the discretion of RHW.

If Trigger Level 3 is Met:

Implement both of the following:

a) Test a conservation measure designed to reduce the source of collision risk (i.e., curtailment of turbines). This measure would involve an informed curtailment program wherein turbines would be feathered when eagles approach a turbine or group of turbines. The program would be implemented during specific seasons and times of day as informed from the results of previous studies. Triggering of curtailment could occur using either 1) biomonitors, or 2) an automated video camera-based detection system such as Identiflight. Implementation of the measure would incorporate a study designed to evaluate the effectiveness of the conservation measure. Alternatively, perform another measure not listed here if agreed upon by the USFWS. This alternative measure might be the continuation of the measures described under Trigger Level 2, if it has been previously implemented and proven effective in consultation with the USFWS. Implementation of the conservation measure will occur no later than one year from date of triggering.

b) Perform enhanced monitoring during the next 5 years (i.e. achieve an average g-value of 0.4 over the subsequent 5 years).

Note: if Trigger Level 3 is met simultaneous to meeting a previous Trigger Level (i.e., if Trigger Level 3 is met for the first time at the same time that Trigger Level 1 or 2 is met for the first time), the measures listed under Trigger Level 3 will be implemented, with implementation of measures under previous triggers being at the discretion of RHW2.

If Trigger Level 4 is Met:

Perform enhanced monitoring during the next 5 years (i.e., achieve an average g-value of 0.4 over the subsequent 5 years).

6.3 Cost Caps

As described in the ECPG, the adaptive management measures would be subject to a cap, proportional to the overall risk, providing certainty as to the maximum costs (USFWS 2013a). The adaptive management measures are capped at the cost associated with taking 13 golden eagle fatalities in a 2-year period. The cause, timing, and specific circumstances surrounding a future fatality are unknown at this time, thus the cost of implementing appropriate risk reduction is currently unknown. Adaptive management costs will be capped at $325,000 for the first 2-year review period and at $825,000 during every subsequent 5-year review period, plus the inflation escalator. To account for future escalation in costs due to inflation, the average inflation rate in the U.S. was evaluated for the past 100 years, equating to 3.22 percent (McMahon 2013) per year. For the first 2-year period, costs would be escalated at future respective annual inflation rates or 3.22 percent annually, whichever is lower. The maximum cost cap, excluding inflation escalators, of all compensatory mitigation and adaptive management measures over the 17-year permit period is provided in Table 13.

Table 13. Total Compensatory Mitigation /Adaptive Management Cost Cap

Type	2-Year Cost Cap[1]	17-Year Cost Cap[1,2]
Initial Compensatory Mitigation	$471,600 (or 262 poles)	$4,181,400 (or 2,323 poles)
Adaptive Management	$325,000	$2,800,000
Total	**$796,600**	**$6,981,400**

1. Costs based on $1,800 per pole for retrofitting and monitoring sufficient to achieve a minimum effectiveness of 20 years. Inflation escalators are not included in cost cap summary.
2. 17-year Cost Cap is the total permit period together assuming the maximum 2 and 5-year caps were reached during each review period. If the cost cap is not met in a review period, the remaining funds would not be rolled into the next period; thereby reducing the 17-year cost cap after that point.

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Appendix A

Red Horse Wind 2 Wildlife and Livestock Carcass Removal Plan

1.0 Introduction

This Wildlife and Livestock Carcass Removal Plan (WLCRP) provides a response and communications protocol regarding large mammal carcasses discovered on the property operated by the Red Horse Wind 2 Energy Facility (the Project), inclusive of operations staff or their contractors. The Project is located on state lands leased by the project and the Warbonnet Ranch, with the ranch owned and operated by the Todd family since approximately 1980. The Warbonnet Ranch functions as a small cattle ranching operation, with approximately 250-300 cattle located throughout the ranch annually. There is a possibility that deceased livestock may be found on the property from time to time. Golden eagles and bald eagles frequently feed on carrion and offal piles, primarily during winter (Watson 2010, Buehler 2000); therefore, the presence of cattle and wildlife carcasses and may attract eagles to the Project Area. Per the Project Eagle Conservation Plan (ECP; SWCA 2014), livestock carcasses are to be managed on the property to avoid attracting avian scavengers to the wind energy facility, thereby reducing the potential for eagles to collide with wind energy turbines.

A Wildlife and Livestock Carcass Observation (WLCO) form shall be used to document all large mammal carcasses observed. If a large mammal carcass or evidence of avian scavengers is observed, the observer is responsible for completing the WLCO form immediately and submitting the form with corresponding pictures to the Project's Site Manager. The Site Manager is responsible for contacting Warbonnet Ranch staff and/or a carcass removal contractor, who is responsible to investigate the location and remove and dispose of the carcass.

As part of the Project's ECP and Bird and Bat Conservation Strategy (SWCA 2015), a Worker Education Awareness Program (WEAP) will be implemented for project operations staff, contractors, and other staff who will be on-site on a regular basis throughout the lifetime of the project. The WEAP includes an eagle education component that consists of on-site instruction to staff and others by a qualified biologist, printed reference materials, and protocols for documenting and reporting potential eagle/wildlife issues. Included in the eagle component of the WEAP is a training to the Project and Warbonnet Ranch operation staff to identify the potential presence of wildlife/livestock carcasses, most frequently identified by the presence of concentrations/kettles of ravens (*Corvus* spp.), turkey vultures (*Cathartes aura*) and/or eagles.

2.0 Objective

To ensure that appropriate Project staff and contractors have a consistent and established process for responding to and reporting the occurrence of any large mammal carcasses found on site, resulting in the removal of large mammal carcasses to reduce the potential for eagles to collide with wind energy turbines.

3.0 Definitions

Site Manager – Primary point of contact on site for the Project.

Wildlife/Livestock Carcass – Any large deceased mammal, or parts of an individual, such as cows, sheep, horses, goats, deer, elk, and pronghorn.

Avian Scavengers – A gathering of avian scavengers is defined as an unusual concentration of scavenging avian species such as crows, ravens, vultures, or eagles. All personnel on site should be observant of any unusual bird activity while traversing the site or visiting turbines for maintenance. Some examples of unusual bird activity that might represent a gathering of scavengers on a carcass could be:

1. Groups of eagles or vultures circling in a focused area
2. Groups of crows or ravens on the ground
3. Eagles seen perching in unusual numbers

4.0 Plan Implementation Methods

The following are the procedures the owner/operator of the Project will follow in implementation of the Plan.

- A WEAP will be implemented for the Project and their contractors, project operations staff, and other staff who will be on-site on a regular basis throughout the lifetime of the project; specifics of the WEAP will include identification of the potential presence of wildlife and livestock carcasses/offal piles.
- As possible, Warbonnet Ranch staff will be trained in the identification of the potential presence of wildlife and livestock carcasses/offal piles, similar to that of the WEAP.
- All large mammal carcasses or avian scavenger observations shall be reported to the Site Manager via the WLCO form (example provided in Attachment 1) and shall include the following:
    - Carcass size and type
    - Scavenger species present
    - Nearest landmark and GPS coordinates
    - Photographs, if possible, shall be attached to each WLCO form. In addition to the carcass, photos of other nearby structures, e.g., turbines, pole lines, fences, roads, etc. shall be included in the photographs to assist with carcass relocation
- If a wildlife/livestock carcass/offal pile is located, the Project will coordinate with Warbonnet Ranch or another local contractor to remove or bury the carcass/offal pile as soon as possible.

5.0 Reporting Procedure

Due to the potential increase in eagle use due to carcasses on site, it is very important that any large carcasses or observations of avian scavengers are recorded and reported immediately to the Site Manager. Discussions and notifications with appropriate persons are critical to determine carcass species, facts and potential risks (legal, operational, media).

1. The Site Manager shall receive all pertinent information regarding incident, e.g., discovery of event, location, contact person, condition of find, photographs, etc.
2. The Site Manager will contact the Warbonnet Ranch staff and/or carcass removal contractor immediately to investigate and remove the carcass.

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ATTACHMENT 1 – WILDLIFE AND LIVESTOCK CARCASS OBSERVATION FORM

RED HORSE WIND 2 ENERGY FACILITY
WILDLIFE AND LIVESTOCK CARCASS OBSERVATION FORM

Observer Name: _____

Date: _____

Carcass species: _____

Carcass size (i.e. juvenile, adult): _____

Carcass condition (i.e. fresh, old, etc.): _____

Scavengers present (i.e. ravens, eagles, etc.): _____

Nearest landmark: _____

UTM Zone: _____ N: _____ E: _____

Photographs (include carcass as well as photos of other nearby structures, etc. to assist with carcass relocation):

Photo #: Photo description:	Photo #: Photo description:

Photo #: Photo description:	Photo #: Photo description:

Photo #: Photo description:	Photo #: Photo description:

Appendix B

Red Horse Wind 2 Worker Search Program

Red Horse Wind 2

Avian and Bat Worker Search Program

August 1 – 20, 2017

Red Horse Wind 2, LLC has prepared this Avian and Bat Worker Search Program (Search Program) for the Red Horse Wind 2 Energy Facility (Project) to satisfy obligations under the Project's Eagle Conservation Plan and Bird and Bat Conservation Strategy. Compliance with this plan during the operations phase of the Project is mandatory.

OPERATION STAFF SEARCHES:

Frequency:

- August 1 through August 20, 2017: All turbines must be searched by operations staff on a weekly basis until formal post construction mortality monitoring (conducted by Tetra Tech) begins the week of August 21, 2017.
- After August 20: TBD

Procedure for Search:

- Interim period from August 1 – August 20, 2017: Search the cleared area under each turbine by walking meandering transects spaced roughly 10 meters apart, scanning the ground looking for dead birds and bats.
- At each cardinal direction the worker should stop and scan the ground out as far as possible, using both the naked eye and binoculars, looking for dead birds and bats.
- Additionally, the operation staff worker must also walk a transect down one side of the turbine access spur road and up the other side, searching for avian and bat fatalities.
- After August 20: TBD

Documentation:

- Searches must be document on the attached Avian and Bat Worker Search Log. This is the Project's record that searches were performed even if nothing was found.
- The Avian and Bat Worker Search Logs will be kept onsite and copies sent to Rusty.Sage@deshaw.com at the end of each week.
- After August 20: TBD

WHAT TO DO IF YOU FIND A BIRD OR BAT:

If dead or injured bird is found at the Project, notify Emily Festger at Tetra Tech immediately (Emily.Festger@tetratech.com; 714-478-7171). Copy Emily, the Project's Asset Manager, Rusty Sage (Rusty.Sage@deshaw.com) and Tetra Tech's Project Manager, Mark Martell (on email notifications.

- Document the fatality by taking photos (see photograph instructions) and noting the location with a handheld global positioning system (GPS) unit.
- Complete the Wildlife Incident Reporting Form.
- IMPORTANT: Leave the carcass where it was found. Permits are required to collect and possess wildlife.
- Email all photos and data sheets for any carcasses to Emily at the end of each day.

TRAINING:

- All personnel working at the Project must be trained on this Search Program at the start of their employment and every 6 months thereafter.
- Training after August 20 is TBD.
- Training must be documented via the sign-in sheet.

ATTACHMENT 1 – WILDLIFE INCIDENT REPORTING FORM

RED HORSE WIND 2 PROJECT WILDLIFE INCIDENT REPORTING FORM

INCIDENT DETAILS

Date: _____ Time:_____ Observer/s:_____

Type of Incident: ☐ Injury ☐ Fatality

Carcass Condition: ☐ Intact Carcass ☐ Partial Carcass ☐ Feathers Only

Carcass ID* (date_carcass #):_____

(Take photos of - Birds: beak, legs, feathers, body. Bats: face and ears, tail and feet, body)

Photo numbers: _____

Suspected Cause of Fatality/Injury:_____

Carcass Condition Details or Behavior of Injured Animal:_____

_____

LOCATION

Nearest Turbine:_____ Distance from Turbine: _____(m) Direction from Turbine:_____

Found: ☐ On Road ☐ Under Turbine ☐ Other _____

GPS Location (decimal degrees): Latitude:_____ Longitude:_____

Location Remarks: _____

_____

IDENTIFICATION

☐ Large bird (>10") ☐ Small bird (≤ 10") ☐ Bat ☐ Unknown

Species:_____ Sex:_____ Age:_____

Color/Markings: _____

How Identified: ☐ Field Guide ☐ Expert Opinion

Identification Remarks: _____

_____

_____

(Describe details of - **Birds**: beak size, color, and shape; leg size, color, and shape; feather color; body size. **Bats**: color of fur and wings; length of forearm if possible, tail attached or extending; ear color and shape)

ENVIRONMENTAL CONDITION

Weather (Check all that apply): ☐ Clear ☐ Fog ☐ Cloudy ☐ Rain ☐ Snow

Approximate Temperature: _____ (F°)

Wind: ☐ Calm ☐ Gusty ☐ Storm ☐ Violent Storm

Habitat: ☐ Bare Ground ☐ Shrubs ☐ Gravel road or pad

COMMENTS: _____

_____

_____

* Carcass ID = four digit date, underscore, two digit number (e.g., 073117_01). Carcass IDs should be numbered sequentially each day, for each surveyor.

Please submit completed form and incident photos to the on-site manager.

Appendix C.

Draft Mitigation Program for the Red Horse Wind 2 Energy Facility

DRAFT MITIGATION PROGRAM FOR THE RED HORSE 2 WIND FARM

1.0 Introduction

Red Horse Wind 2, LLC (RHW2) proposes to provide quantifiable compensatory mitigation for the take of golden eagles attributable to the Red Horse Wind 2 Energy Facility (Project) by retrofitting high-risk power-poles. Power-pole retrofitting was selected as the preferred mitigation option based on this option currently being the only quantifiable means of offsetting the authorized take of eagles (pers. comm., Kirsten Cruz-McDonnell, USFWS Region 2 Office, April 17, 2019). This plan includes a summary of the proposed retrofitting program, including RHW2's rationale for the number of retrofits needed, identification of potential candidate poles to be retrofitted, approach to retrofitting and implementation, and commitments to monitoring, maintenance, and reporting. In addition to guidance received from U.S. Fish and Wildlife (USFWS) Region 2 and the Eagle Conservation Plan Guidance (USFWS 2013), RHW2 also incorporated Avian Power Line Interaction Committee recommendations for developing a mitigation plan based on power-pole retrofits (APLIC 2014).

2.0 Calculation of Retrofits Needed

USFWS calculated the number of pole retrofits needed over a 2-year permit review period using their Resource Equivalency Analysis (REA; USFWS 2013). The annual debit input used was 6.5 golden eagles based on 13 golden eagles predicted to be taken at the Project over a 2-year period at the upper 80th credible limit (rounded up to the nearest integer; 13 golden eagles/2 years = 6.5 golden eagles/year). RHW2 will make their best efforts to complete the retrofits within two breeding seasons following permit issuance. RHW2 anticipates that permit issuance would occur at the beginning of the 2020 breeding season, with retrofits completed by the end of the 2021 breeding season. The retrofit methods selected will have a minimum effectiveness of 20 years based on the monitoring and maintenance commitments included in this mitigation program (Section 5.0). Based on these inputs, 240 high-risk poles would need to be retrofitted to offset the predicted take over a 2-year period (accounts for mitigation being completed within two breeding seasons of permit issuance). This value of poles was then multiplied by 1.2, in order to achieve the required 1.2:1 offset ratio required under the Final Eagle Rule. Therefore, 288 high-risk poles would need to be retrofitted. In September 2016, RHW2 provided funding to Tucson Electric Power Company (TEP) to complete the retrofitting of 26 poles as part of the mitigation commitments included in the original Eagle Conservation Plan. USFWS agreed that these retrofits could be deducted from the number of retrofitted poles needed for the first 2 years of the permit term. Therefore, 262 additional pole retrofits are needed to be completed after deducting the previously completed retrofits. In the event that RHW2 and USFWS determine this amount of mitigation exceeds the amount of take estimated over the initial 2-year review period, the excess mitigation may

be applied to subsequent review periods, including annual escalation of the value of the excess mitigation, if applicable.

3.0 Identification of Potential Candidate Poles

RHW2 expects to work with TEP to perform the necessary retrofits. RHW2 has developed specific criteria, in consultation with the U.S. Fish and Wildlife Service (USFWS) and Arizona Game and Fish Department (AGFD), to identify high-risk power-poles for retrofitting from those owned and maintained by TEP. TEP has existing avian power line protection procedures for their company which include methods to assess the risk poles pose to raptors and other migratory birds (TEP 2015). TEP's existing methods to evaluate risk are heavily influenced by proximity of active raptor nests and nesting structures. Because there are no golden eagle nests or known nesting structures within 300 meters of poles in TEP's service area, additional criteria were used to evaluate pole risk specific to golden eagles. Poles were identified in an iterative manner, first using qualitative criteria related to known golden eagle nesting and foraging areas within TEP's service area to identify large target areas (Section 3.1.1). Within these target areas, poles were evaluated using quantitative criteria informed by a given pole's configuration and associated equipment (Section 3.1.2). Poles within the Plan Area that meet these iterative criteria will be defined as high-risk poles and will be retrofitted by TEP, despite these poles not being a priority for inspection or maintenance under TEP's existing raptor protection program.

3.1 Eagle Risk Factors

RHW2 and TEP coordinated with USFWS and AGFD to identify target areas based on golden eagle habitat within the TEP service territory. AGFD provided spatial data depicting the overlap of the TEP service territory and an 8-mile buffer of known golden eagle breeding territories, including habitat descriptions (Figure 1). AGFD further communicated that eagle activity was higher in the southern portion of these areas of overlap. Published studies indicate that eagle electrocution rates may be related to consistent use of the area by golden eagles, high prey availability, scarcity of trees, low levels of human disturbance, and unforested unpaved areas (Cartron et al. 2000, Lehman et al. 2010, Dwyer et al. 2014). Based on this information and recommendations from USFWS and AGFD, TEP focused on two high-density areas of poles in the south and southeastern portion of the area of overlap that match these criteria (Figure 2). The Pima County South Area (Figure 3) contains 614 power poles whereas the Vail Area (Figure 4) contains 453 power poles. The landcover and individual pole locations in both target areas can be seen in Figures 3 and 4. Potential candidate poles must be located within golden eagle foraging habitat with low levels of human disturbance. Therefore, poles in the two target areas that are located in the center of residential areas will be excluded and not considered as potential candidate poles.

Figure 1. Tucson Electric Power Service Area and Golden Eagle Nesting Territory Buffers

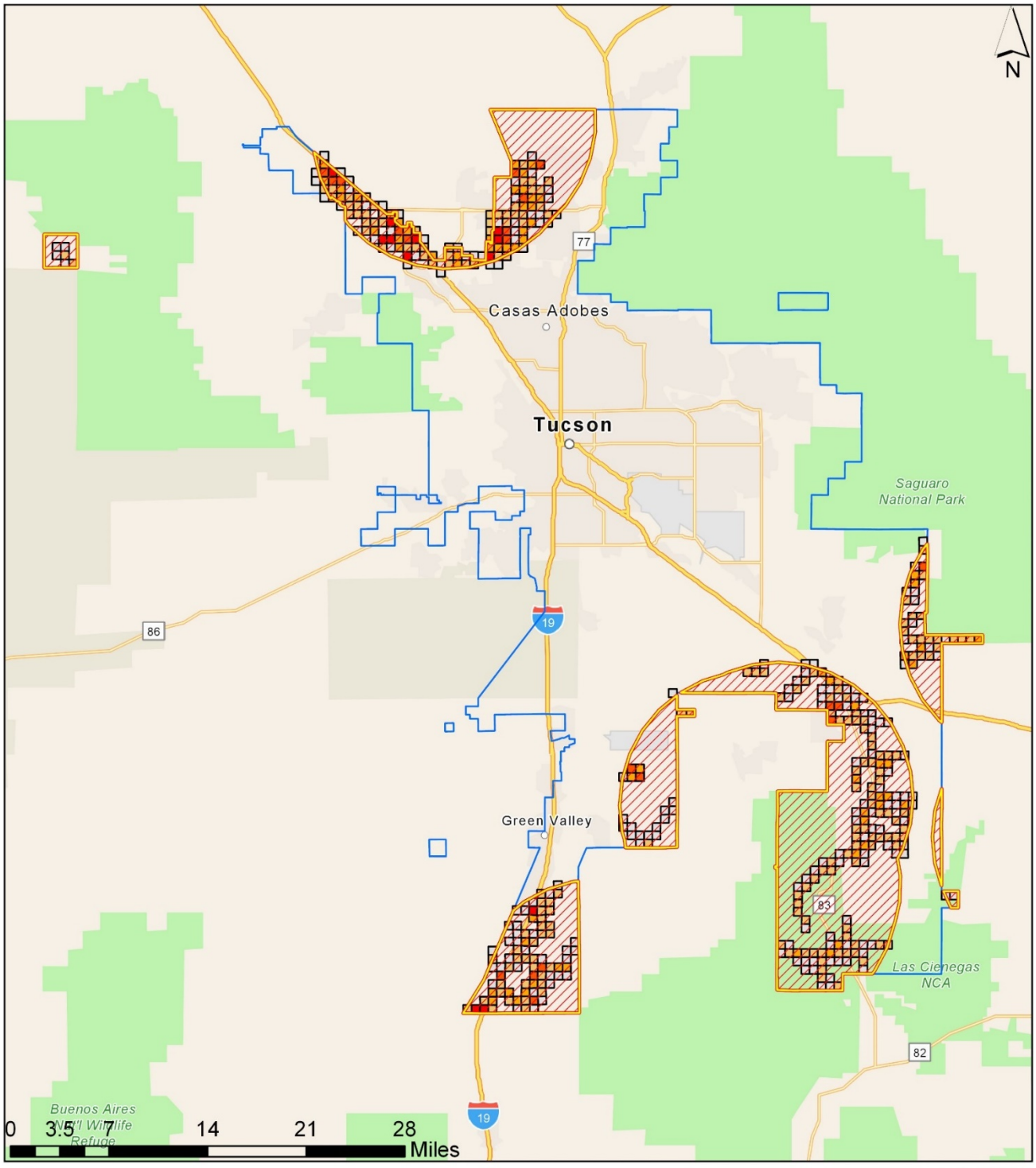


Figure 2. Selected High-Pole Density Target Areas

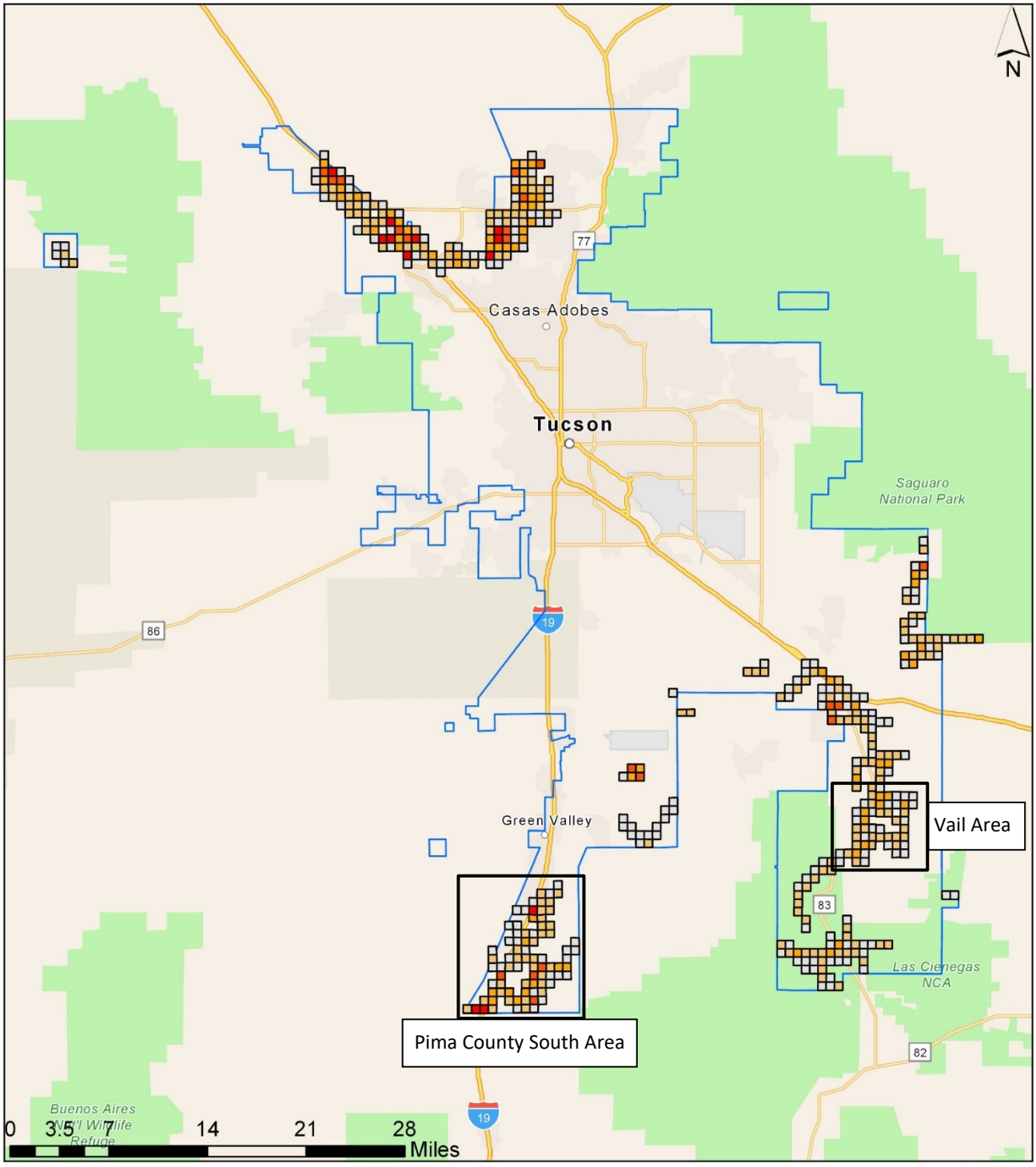
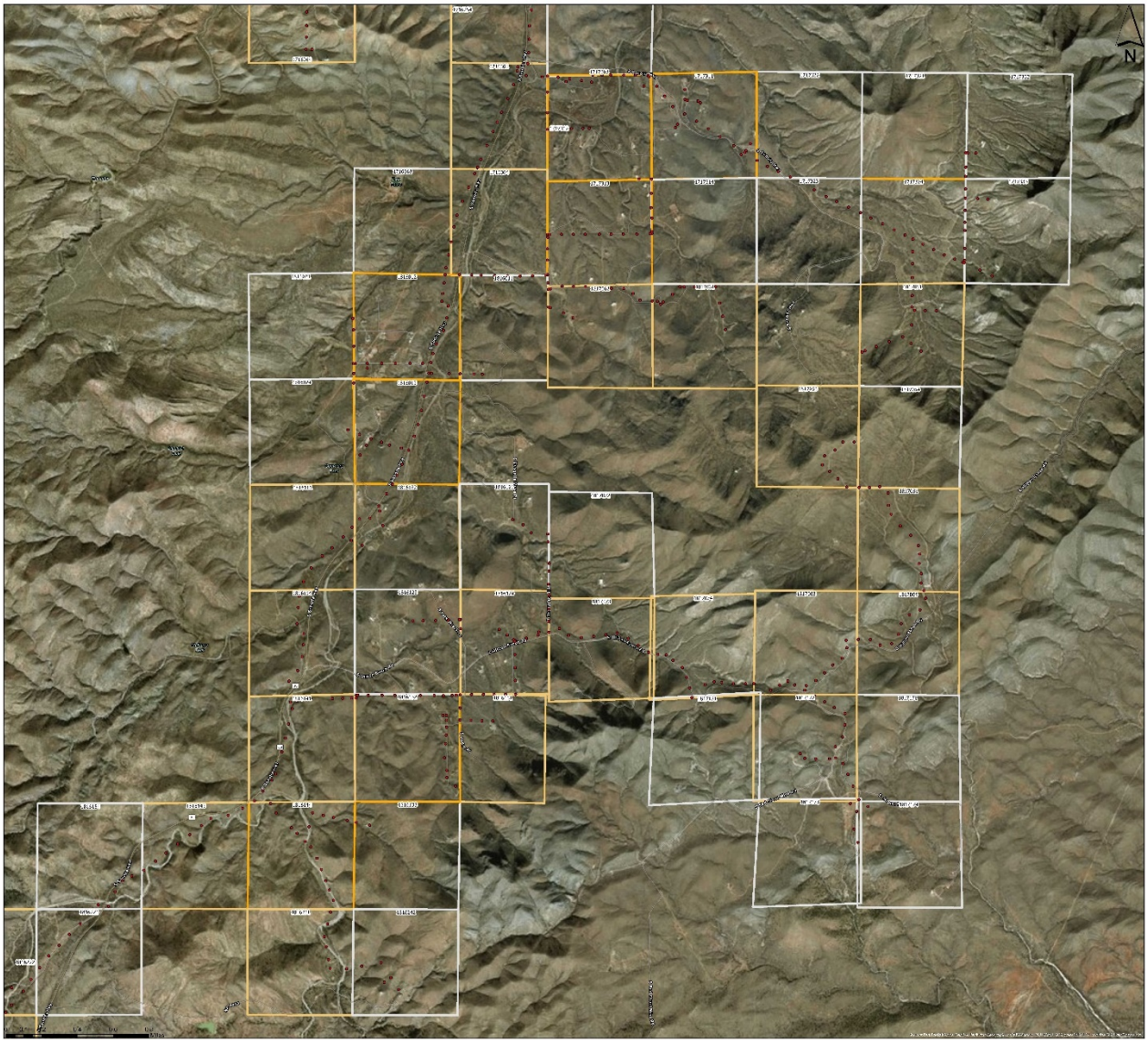


Figure 3. Pima County South Aerial Imagery and Pole Locations

Figure 4. Vail Aerial Imagery and Pole Locations



3.2 Pole Risk Factors

Eagle electrocutions are more frequent at certain pole configurations. In general, poles where the energized conductors or grounded hardware and energized conductors are separated by less than the wrist-to-wrist or head-to-foot distance of a bird pose electrocution risk to that bird (APLIC 2006). Equipment poles typically have additional wires (such as transformer tap wires and jumper wires over crossarms) in proximity to energized and/or grounded equipment, posing higher electrocution risk for birds. A predictive model developed by Dwyer et al. (2014) uses the number of jumper wires, phases, and presence of grounded hardware in addition to the presence of nesting or foraging habitat to quantify the probability of electrocution at a given pole. TEP used field evaluations of representative poles in the Pima County South Area within the Dwyer et al. (2014) pole risk ranking tool to quantify the relative electrocution risk to golden eagles (Figure 4). Most of the poles in the Pima County South Area are single-phase, two-phase, and three-phase poles lacking avian protection equipment (e.g., covers). USFWS has indicated that high-risk poles should have an average probability of electrocution ≥ 0.40. TEP determined that most of the three-phase poles should exceed this value, and most of the two-phase poles as well, particularly those with equipment or grounding. Single phase poles are less likely to meet this minimum value. Final selections of poles for retrofitting will be based on the results of the ranking tool and the cost-effectiveness of retrofitting a given pole or group of poles.

4.0 Implementation Methods and Schedule

RHW2 will commit funding up front to enable completing the retrofits such that the predicted take over the first 2 years of the permit term is mitigated. The final implementation schedule will depend on the final selection of poles to be retrofitted. Most likely, groups of poles will be identified and retrofitted in batches to enable a cost-effective strategy for retrofitting. This technique is recommended in the Avian Electrocution Risk Assessment Predictive Model (EDM 2015).

Retrofit methods will be determined by TEP on a case-by-case basis and will primarily address electrocution risk through insulation (i.e., covering electrified components such as jumper wires, conductors and equipment). Addressing risk through isolation (i.e., increasing distance between electrified components) will not be feasible in most of the target areas due to pole access constraints, but may be implemented if TEP determines that replacing a given pole is necessary to meet their own maintenance program requirements. Table 1 presents photos of representative poles identified by TEP in the Pima County South Area along with a description of their respective electrocution risk and retrofitting options. Regardless of the chosen retrofit method, the retrofitted poles will be monitored and maintained as described in Section 5.0 in such a fashion as to be considered eagle-safe.

5.0 Monitoring and Maintenance

RHW2 will commit funding to enable routine monitoring and maintenance of the 262 power-poles every 5 years for the assumed effective life of the retrofits. During the initial monitoring period, TEP will monitor 100 percent of retrofitted poles. Retrofitted poles will be inspected to ensure that the pole and associated equipment is intact and functioning properly to minimize eagle electrocution risk. If components on a retrofitted pole appear to be deteriorating to the point where the pole may pose electrocution risk to eagles, they will be repaired or replaced during the same visit, or as soon as practicable. Less than 100 percent of poles may be monitored in subsequent monitoring periods depending on the outcome of the initial monitoring period and concurrence with USFWS.

6.0 Reporting

TEP will inspect, and document using photos, the completed retrofit of each pole upon completion. RHW will submit a report to USFWS documenting the completed retrofits. This report will describe which poles were retrofitted, what their eagle electrocution risk was, how it was calculated, what measures for retrofitting were used, and how the retrofits were consistent with APLIC (2006) recommendations. It will also include photos of the retrofits. The report will be provided to USFWS within 6 months of completion of the retrofitting effort.

RHW2 will provide a report to USFWS documenting the results of each 5-year monitoring and maintenance period. Reports will summarize the results of pole inspections, any maintenance performed, and any raptor incidents detected. Reports will be provided to USFWS within a year of the monitoring effort.

7.0 References

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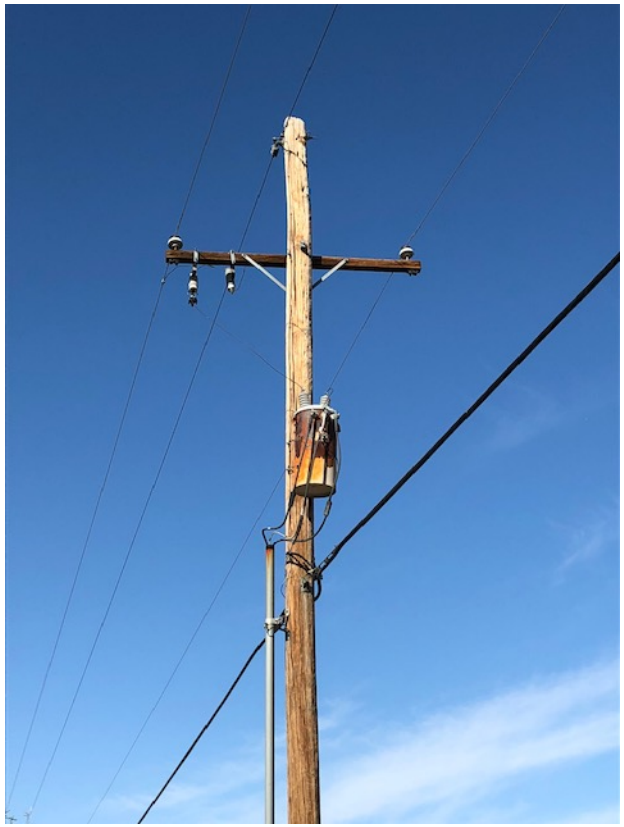
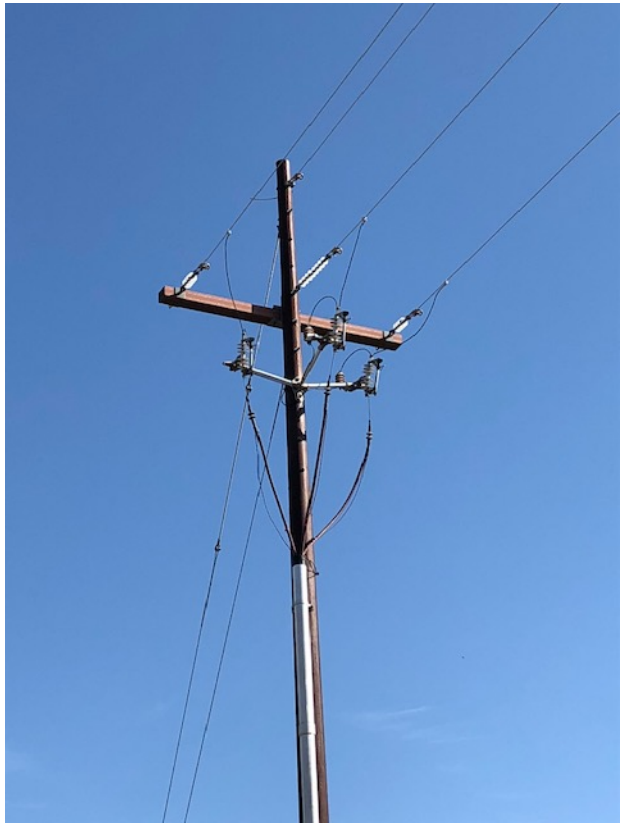
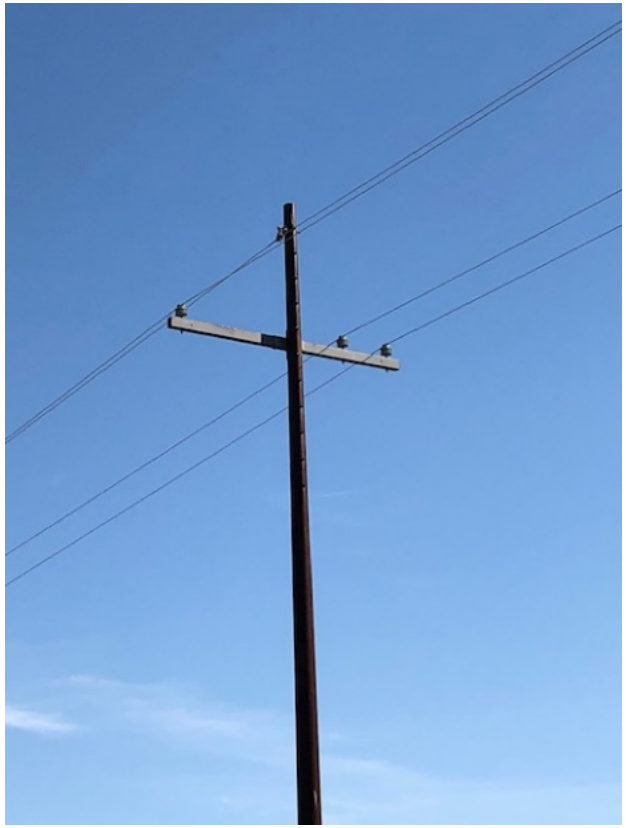
Table 1. Representative Poles in the Pima County South and Vail Area

Poles in the Pima County South and Vail Area generally pose electrocution risk to eagles as a result of inadequate spacing (i.e., energized and/or grounded parts are spaced <60 inches apart horizontally and <40 inches vertically; APLIC 2006). Representative retrofit options are described below and include covering exposed energized hardware. Several factors will influence the final retrofit method and include pole and line design constraints, topography, and current design standards. Schematics referenced from APLIC (2006) are for visual reference and do not necessarily match the exact configuration of the example pole.

Example No.	Photo	Pole Description	Electrocution Risk Description	Retrofit Approach	APLIC Manual Reference
1		Two-phase design with single transformer, arrester, cutout, and jumper. Ground wires present.	Exposed arrester, cutout, jumper, and bushing.	Cover exposed arrester, cutout, jumper, and bushing.	See schematic in APLIC 2006 Figures 5.44 and 5.45.

Example No.	Photo	Pole Description	Electrocution Risk Description	Retrofit Approach	APLIC Manual Reference
4		Three-phase dead-end design with arresters, cutouts, and jumpers. Ground wires present.	Inadequate spacing of energized phases. Exposed arresters, cutouts, and jumpers.	Cover exposed central phase, arresters, cutouts, and jumpers.	See schematic in APLIC 2006 Figures 5.45 and 5.46.

Example No.	Photo	Pole Description	Electrocution Risk Description	Retrofit Approach	APLIC Manual Reference
5		Three-phase design.	Inadequate spacing of energized phases.	Cover exposed central phase.	See schematic in APLIC 2006 Figures 5.15 and 5.16.

Example No.	Photo	Pole Description	Electrocution Risk Description	Retrofit Approach	APLIC Manual Reference
7		Three-phase tangent design.	Inadequate spacing of energized phases. Exposed jumpers.	Cover exposed central phase and jumpers.	See schematic in APLIC 2006 Figures 5.15 and 5.16.

Example No.	Photo	Pole Description	Electrocution Risk Description	Retrofit Approach	APLIC Manual Reference
8		Two-phase double dead-end design with single transformer.	Exposed arresters, cutouts, jumpers, and bushing.	Cover exposed arresters, cutouts, jumpers, and bushing.	See schematic in APLIC 2006 Figures 5.15 and 5.16.

APPENDIX B. INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Kristin Madden, Deputy Chief

Station: Region 2, Migratory Birds

Telephone: 505-248-6876

Email: Kristin_madden@fws.gov

Date: December 21, 2018

TAILS:

PROJECT NAME: Red Horse Wind 2
Consultation Code: 02EAAZ00-2019-SLI-0254

I. Service Activity (Program): Migratory Bird Permits

II. T&E Species, Candidate and Critical Habitat: from ECOS (If using IPAC attach IPAC list)

SPECIES	CRITICAL HABITAT	LISTING STATUS
Jaguar (*Panthera onca*)	Yes	Endangered
Mexican spotted owl *(Strix occidentalis lucida)*	Yes	Threatened
Northern aplomado falcon *(Falco femoralis septentrionalis)*	No	Experimental population, non-essential
Yellow-billed cuckoo *(Coccyzus americanus)*	Proposed	Threatened
Northern Mexican gartersnake *(Thamnophis eques megalops)*	Proposed	Threatened
Chiricahua leopard frog *(Rana chiricahuensis)*	Yes	Threatened
Wright's marsh thistle *(Cirsium wrightii)*	No	Candidate

III. Project Location: Information from Tails

Ecoregion Number and Name

County

Latitude, Longitude

Distance and direction to nearest town center

Species/habitat occurrence:
Three federally listed species have a very slight chance of occurring within the Project Area, but are unlikely to be adversely affected by the Project. None of the federally listed species were observed during pre-construction surveys. These species are the Mexican spotted owl (*Strix occidentalis lucida*), northern aplomado falcon (*Falco femoralis septentrionalis*), and jaguar (*Panthera onca*). Other federally listed species identified as potentially occurring do not have suitable habitat present in the Project Area.

Mexican Spotted Owl

Mexican spotted owls breed, roost, and forage in montane forests and woodlands and in shady canyons (USFWS 2012). No such habitat is present within or adjacent to the Project Area; however, there is a very small chance that dispersing juvenile owls or seasonally migrating adult owls may pass through the Project Area. In southeastern Arizona, dispersing Mexican spotted owls are known to fly from one mountain range to another across normally unsuitable habitat in the intervening valleys (USFWS 2012). Seasonally migrating owls have also been observed moving through unsuitable habitat between high-elevation breeding grounds and low-elevation riparian woodlands.

In the general vicinity of the Red Horse Wind 2 Project, Mexican spotted owls are known to breed in a wide arc around the Project Area in the Winchester, Galiuro, Santa Catalina, and Rincon mountains. One Mexican spotted owl Protected Activity Center (PAC) has been designated in the Winchester Mountains; 5 PACs are in the Galiuro Mountains, and a total of 17 PACs are in the Santa Catalina and Rincon mountains (USFS 2009, USFS 2011a, USFS 2011b). Critical Habitat for the Mexican spotted owl has been designated in all four ranges (USFWS 2004). While it is possible for Mexican spotted owls to fly through the Project Area, the probability of this happening is extremely low. The total owl population in the surrounding mountain ranges is unknown, but it is small. The 23 PACs mentioned above, for example, represent a total of fewer than 50 resident adult owls.[1] In contrast, the area through which a small number of dispersing juvenile owls and possibly migrating adult owls might pass is very large; the Project turbines occupy only a tiny portion of that large area. Consequently, the risk of a Mexican spotted owl being exposed to any harmful effects associated with Project operations is extremely low and therefore discountable.

Northern Aplomado Falcon

Northern aplomado falcons are known to utilize a broad range of habitats, including semidesert grasslands (Arizona Game and Fish Department 2001). Suitable habitat is present in the Project Area, but this falcon is unlikely to occur there because the species is extremely rare in the United States. Since 1910, northern aplomado falcons have been credibly documented in Arizona only three times—in 1939, 1940, and 1977—and may be extirpated from the state (Arizona Game and Fish Department 2001). The nearest extant populations of northern aplomado falcons are in Mexico and South Texas. Captive-bred northern aplomado falcons were released in southern New Mexico in 2010 and 2011; but they did not persist and the program was terminated (The Peregrine Fund 2014). On the basis of this species' rarity in the region, the probability of a northern aplomado falcon being exposed to any harmful effects associated with Project operations is extremely low and therefore discountable.

Jaguar

In the United States, recent jaguar sightings have overwhelmingly been in the Madrean evergreen woodland habitat in mountainous terrain, which does not occur in the Project Area. However, jaguars

[1] Each PAC is occupied by either a single resident Mexican spotted owl or a breeding pair

have also have been recorded in semidesert grasslands with low levels of cover (USFWS 2014). Therefore, portions of the Project Area may provide suitable habitat for a jaguar moving between mountain ranges. Jaguars are extremely unlikely to occur in the Project Area; however, because the species is very rare in Arizona. Class I records[2] exist for only five jaguars in Arizona since 1996 (USFWS 2014). Two of the jaguars were sighted in Cochise County: one in 1996 in the Peloncillo Mountains at least 80 miles southeast the Project Area, and another in 2011 in the Whetstone Mountains at least 30 miles southwest of the Project Area. All five jaguars were males, apparently ranging into extreme southern Arizona from breeding populations in Mexico (USFWS 2014). On the basis of this species' rarity in the region, the probability of a jaguar being exposed to any environmental effects associated with Project operations is extremely low and therefore discountable.

IV. Description of Proposed Action (Attach Additional Pages if Needed):

We propose to issue a 17-year permit to take up to six golden eagles per each 5-year review period (18 golden eagles over the permit term) with associated conditions.

Avoidance and Minimization Requirements (Attach separate sheet if necessary):

The Applicant will implement avoidance and minimization measures (listed below), will retrofit 80 power poles to mitigate for the take of six eagles within the first 5-year review period and will implement adaptive management as triggered. Following permit issuance, eagle-focused monitoring will be conducted using a study design consistent the ECPG and agree upon with the USFWS recommendations for the purpose of demonstrating compliance with permitted take values. RHW2 will work with the USFWS to determine the level of uncertainty acceptable to USFWS and RHW2 and perform appropriate analysis to determine sufficient levels of effort to inform permit compliance. At least one year of PCMM already conduced at RHW2 will be credited toward post-permit fatality monitoring. A Worker Search Program will be conducted over the life of the Project's operation and will provide additional information for USFWS 5-year reviews of the take permit.

The following avoidance and minimization measures will be implemented:

- Limit vehicle movement to the Project boundary, pre-designated access, and public roads.
- New overhead power lines and poles were built to Avian Power Line Interaction Committee standards.
- Implement site controls to reduce wildlife collisions.
- Implement a wildlife and livestock carcass removal program.
- Implement a Worker Education Awareness Program addressing construction-specific educational needs.
- Remove any Project or natural materials from beneath turbines which provide shelter for small mammals. Reduce forage beneath turbines for small mammals.
- Employ existing fencing wherever possible. Use wildlife-compliant fencing wherever new fence is installed.

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[2] For a record to be rates Class I, physical evidence (e.g., skin, skull, photograph, track) must have been reviewed and accepted by the Arizona Game and Fish Department, New Mexico Department of Game and Fish, or other credible person(s).

- Follow handling guidelines for toxic substances. Maintain Hazardous Materials Spill Kits on-site and train personnel in the use of these.
- Limit wildfire hazards from vehicles and human activities by implementing appropriate best management practices.

V. Determination of Effects:

A. Explanation of effects of the action on species and critical habitat:

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Jaguar (*Panthera onca*)	NLAA
Mexican spotted owl *(Strix occidentalis lucida)*	NLAA
Northern aplomado falcon *(Falco femoralis septentrionalis)*	NLAA
Yellow-billed cuckoo *(Coccyzus americanus)*	NE
Northern Mexican gartersnake *(Thamnophis eques megalops)*	NE
Chiricahua leopard frog *(Rana chiricahuensis)*	NE
Wright's marsh thistle *(Cirsium wrightii)*	NE

B. Explanation of actions to be implemented to reduce adverse effects:

SPECIES/ CRITICAL HABITAT	ACTIONS TO MINIMIZE IMPACTS
	See IV above

VIII. Effect determination and response requested:

[* = optional]

A. Listed species/designated critical habitat:

SPECIES/CRITICAL HABITAT	DETERMINATION		
	NE	NLAA	LAA
Jaguar (*Panthera onca*)		x	
Mexican spotted owl *(Strix occidentalis lucida)*		x	
Northern aplomado falcon *(Falco femoralis septentrionalis)*		x	
Yellow-billed cuckoo *(Coccyzus americanus)*	x		
Northern Mexican gartersnake *(Thamnophis eques megalops)*	x		
Chiricahua leopard frog *(Rana chiricahuensis)*	x		
Wright's marsh thistle *(Cirsium wrightii)*	x		

1 DETERMINATION/RESPONSE REQUESTED:
NE = NO EFFECT. No response requested.
NLAA = NOT LIKELY TO ADVERSELY AFFECT. "Concurrence" requested.
LAA = LIKELY TO ADVERSELY AFFECT. "Formal Consultation" requested. "Conference" for proposed/candidate species.

KRISTIN MADDEN Digitally signed by KRISTIN MADDEN
Date: 2018.12.21 14:03:40 -07'00'

Kristin Madden, Deputy Chief Date
Southwest Region, Division of Migratory Birds

IX. Reviewing ESFO Evaluations:

A. Concurrence: ✓ Nonconcurrence: _____

B. Formal consultation required: _____

C. Conference required _____

D. Informal conference required _____

E. Remarks (attach additional pages as needed):

Signature 2/13/2019 Date

Field Supervisor
Arizona Ecological Services Field Office

References

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