

Draft Environmental Assessment
for
the Proposed Issuance of an Eagle Incidental Take Permit
for Thunder Ranch Wind

Prepared by
Stantec Consulting Services Inc.
for
U.S. Fish and Wildlife Service
Southwest Region, Division of Migratory Bird Management
500 Gold SW - 8th Floor; Albuquerque NM
U.S. Department of the Interior
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Contents

List of Acronyms and Abbreviations V

1.0 Introduction 1

 1.1 Purpose and Need 1

 1.2 Authorities 2

 1.3 Background 2

 1.3.1 Project Area 2

 1.3.2 Eagle Information and Surveys to Date 6

 1.4 Scoping, consultation and coordination 6

 1.5 Tribal coordination 6

2.0 Proposed Action and Alternatives 7

 2.1 Proposed Action 7

 2.1.1 Avoidance and Minimization Measures (Appendix A; Section 7) 7

 2.1.2 Post-Construction Monitoring (Appendix A; Section 8) 7

 2.1.3 Adaptive Management (Appendix A; Section 8) 8

 2.2 Alternative 1: No Action 8

 2.3 Other Alternatives 9

 2.3.1 Alternative 2: Deny Permit 9

3.0 Affected Environment 9

 3.1 Bald Eagle 10

 3.1.1 Eagle Risk Assessment 10

 3.1.2 Eagle Use Surveys 10

 3.1.3 Eagle Nest Surveys 11

 3.2 Golden Eagle 13

 3.3 Migratory Birds 13

- 3.4 Species Listed under the Endangered Species Act..... 14
- 3.5 Cultural and Socio-economic Interests 14
- 3.6 Climate Change 16
- 4.0 Environmental Consequences 16
 - 4.1 Proposed Action 16
 - 4.1.1 Bald eagle..... 16
 - 4.1.2 Golden eagle 18
 - 4.1.3 Migratory Birds..... 18
 - 4.1.4 Species Listed under the Endangered Species Act 18
 - 4.2 Alternative 1 – No Action 19
 - 4.2.1 Bald eagle..... 19
 - 4.2.2 Golden eagle 19
 - 4.2.3 Migratory Birds..... 19
 - 4.2.4 Species Listed under the Endangered Species Act 19
 - 4.3 Comparison of Effects of Alternatives..... 19
 - 4.4 Cumulative Effects..... 21
- 5.0 Mitigation and Monitoring..... 22
 - 5.1 Voluntary mitigation 22
 - 5.2 Monitoring immediately post-construction..... 22
 - 5.3 Staff and subcontractor training 23
 - 5.4 Post-permit operations staff monitoring..... 23
 - 5.5 Five-year post-permit issuance monitoring and reviews..... 23
- List of Preparers 24
- References..... 25

List of Tables

Table 1. Birds of Conservation Concern in Project vicinity and Project area based on eBird and Applicant Bird and Bat Risk Assessment. 13

Table 2. Comparison of alternatives for Thunder Ranch Wind..... 20

List of Figures

Figure 1. Project Layout 3

Figure 2. Project Groundcover..... 4

Figure 3. Water Features..... 5

Figure 4. 2016-2017 Nest Survey Area 12

Figure 5. Project Location within the Central Flyway Eagle Management Unit..... 15

Appendices

[Appendix A: Eagle Conservation Plan for Thunder Ranch Wind.....](#) A

[Appendix B: Eagle Risk Assessment.....](#) B

[Appendix C: Tribal Coordination.....](#) C

[Appendix D: Section 7 Biological Evaluation.....](#) D

List of Acronyms and Abbreviations

APLIC	Avian Power Line Interaction Committee
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
CFR	Code of Federal Regulations
EA	Environmental Assessment
ECP	Eagle Conservation Plan
EIS	Environmental Impact Statement
EMU	Eagle Management Unit
EOP	Eagle Observation Point(s)
ESA	Endangered Species Act
GE	General Electric
IPaC	Information for Planning and Consultation
ITP	Incidental Take Permit
km ²	square kilometer(s)
LAP	Local Area Population
lbs.	pounds
m	meter(s)
mi ²	square miles
MW	megawatt(s)
NEPA	National Environmental Policy Act
O&M	Operations and Maintenance
PEIS	Programmatic Environmental Impact Statement
WIRF	Wildlife Incident Reporting Form

1.0 Introduction

This Environmental Assessment (EA) has been prepared to analyze the environmental consequences of the U.S. Fish and Wildlife Service (Service) issuing an incidental take permit (ITP) for the take of bald eagles (*Haliaeetus leucocephalus*) associated with the proposed project, Thunder Ranch Wind (or, the Project) pursuant to the National Environmental Policy Act (NEPA) (42 United States Code [U.S.C.] §§ 4321–4347). Issuance of an ITP by the Service for take that is incidental to otherwise lawful activities under the Bald and Golden Eagle Protection Act (Eagle Act; 16 U.S.C. §§ 668–668d and 50 Code of Federal Regulations (CFR) § 22.26) constitutes a discretionary Federal action that is subject to the NEPA. This EA assists the Service in ensuring compliance with the 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 (EIS). This EA evaluates the effects of alternatives for our decision regarding whether to issue an ITP for eagles.

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 2009) as “consistent with the goals of maintaining stable or increasing breeding populations in all eagle management units and the persistence of local populations throughout the geographic range of each species.”

Thunder Ranch Wind Project, LLC (the Applicant), is requesting Eagle Act take coverage for operational activities associated with the Project. The Applicant has requested a 30-year ITP for bald eagles under the Eagle Act for Thunder Ranch Wind, located in Garfield, Kay, and Noble counties, Oklahoma, which was constructed in 2017. The Applicant’s Eagle Conservation Plan (ECP; Appendix A; Stantec 2017d) is the foundation of the ITP application for the Project.

The Applicant is requesting an ITP for the take of 48 eagles over the 30-year lifespan of the Project. This EA evaluates whether issuance of the eagle ITP would have significant impacts on the existing human environment. “Significance” under the NEPA is defined by 40 CFR 1508.27, and requires short- and long-term consideration of both the context of a proposal and its intensity.

This proposed action (i.e., issuance of an ITP) 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; USFWS 2016a). Accordingly, this EA tiers from the 2016 PEIS.

Project-specific information not considered in the PEIS (USFWS 2016a) is considered in this EA as described below.

1.1 Purpose and Need

This action is needed in order to issue a decision on an eagle ITP application for Thunder Ranch Wind. 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 (USFWS 2016a) has a full list of authorities that apply to this action (PEIS Section 1.6, pages 7-12), which are incorporated by reference here.

1.3 Background

1.3.1 Project Area

The Project is located in Garfield, Kay, and Noble Counties, in Oklahoma, between U.S. Highway 177 near Marland and State Highway 74 near Billings (Figure 1). The Project area is 87,014.7 acres (approximately 136 square miles (mi²). The Project consists of 120 turbines that generate a nameplate capacity of 300 megawatts (MW) of energy. A total of 109 turbines are GE (General Electric) 2.5 MW with a hub height of 90 meters (m) and a maximum rotor blade tip height (blade in 12 o'clock position) of 148 m. The remaining 11 turbines are GE 2.3 MW with a hub height of 80 m and a maximum rotor blade tip height of 138 m. All turbines have a rotor diameter of 116 m and a rotor swept area of 10.6 square kilometers (km²).

Project infrastructure in addition to turbines includes:

- An approximately 15-mile, 345-kilovolt transmission line that connects the substation to an interconnection point 6 miles east and 1 mile south of the city of Red Rock.
- 4 permanent un-guyed metrological towers, each 350 feet tall;

Groundcover in the Project area is predominantly cultivated cropland (54.0%), with large grassland components (37.2%) where cattle are grazed (Figure 2). The Project is located to the north of Sooner Lake (1 mile from the Project area) and in the vicinity of 3 rivers, the Salt Fork Arkansas River (Salt Fork; less than 1 mile from the Project boundary) to the north, Arkansas River (2.5 miles from the Project boundary) to the east, and Red Rock Creek in the southeast, including partially within the Project area (Figure 3). Approximately 463 linear miles of tributaries of these rivers run through the Project area. The overhead transmission line was constructed near Red Rock Creek where it intersects the Project area. There are 2,122 National Wetlands Inventory (NWI) wetland, freshwater pond, and riverine features within the Project area, which incorporate 2,099.0 acres in total (Figure 3).

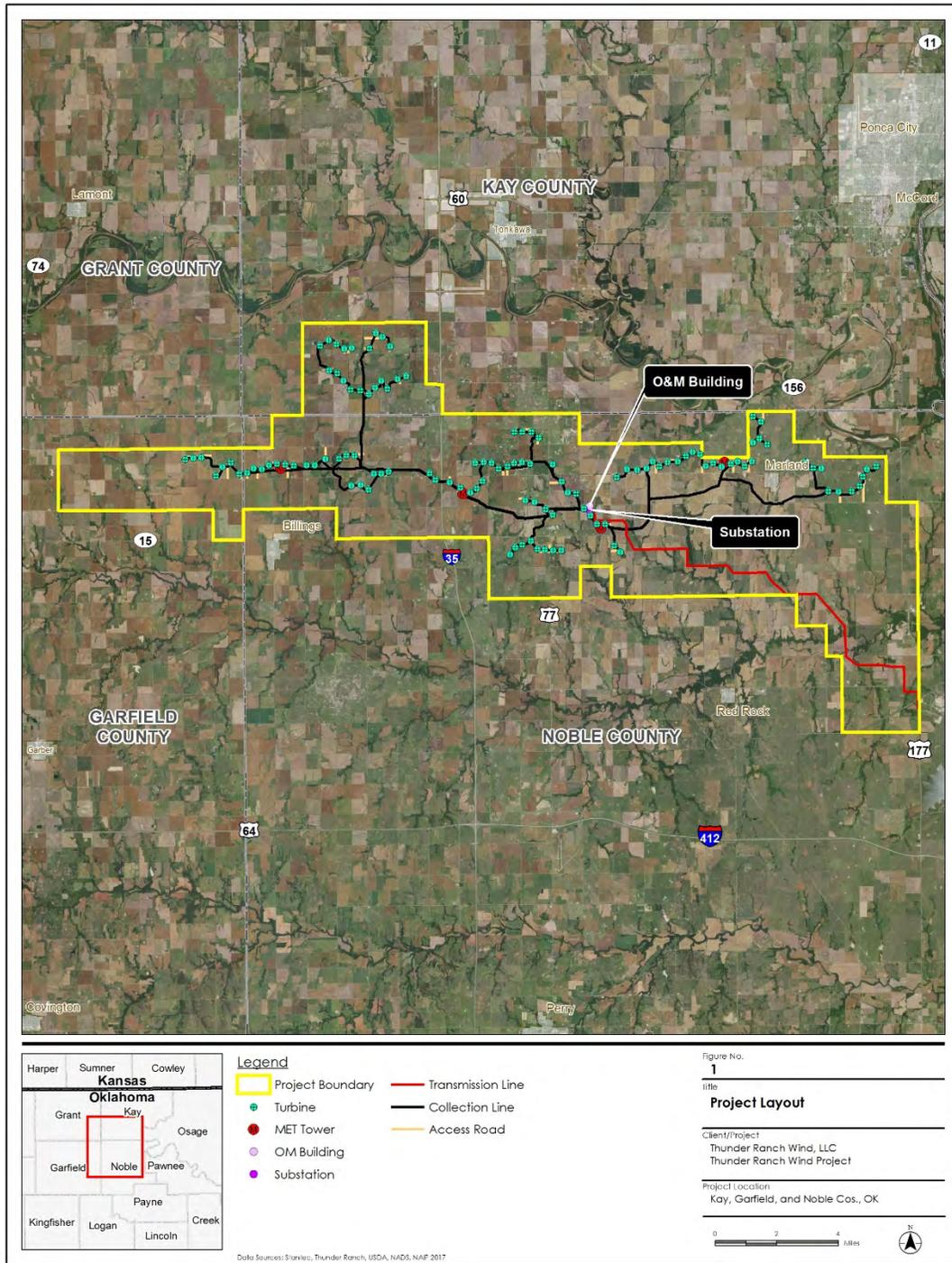


Figure 1. Project Layout

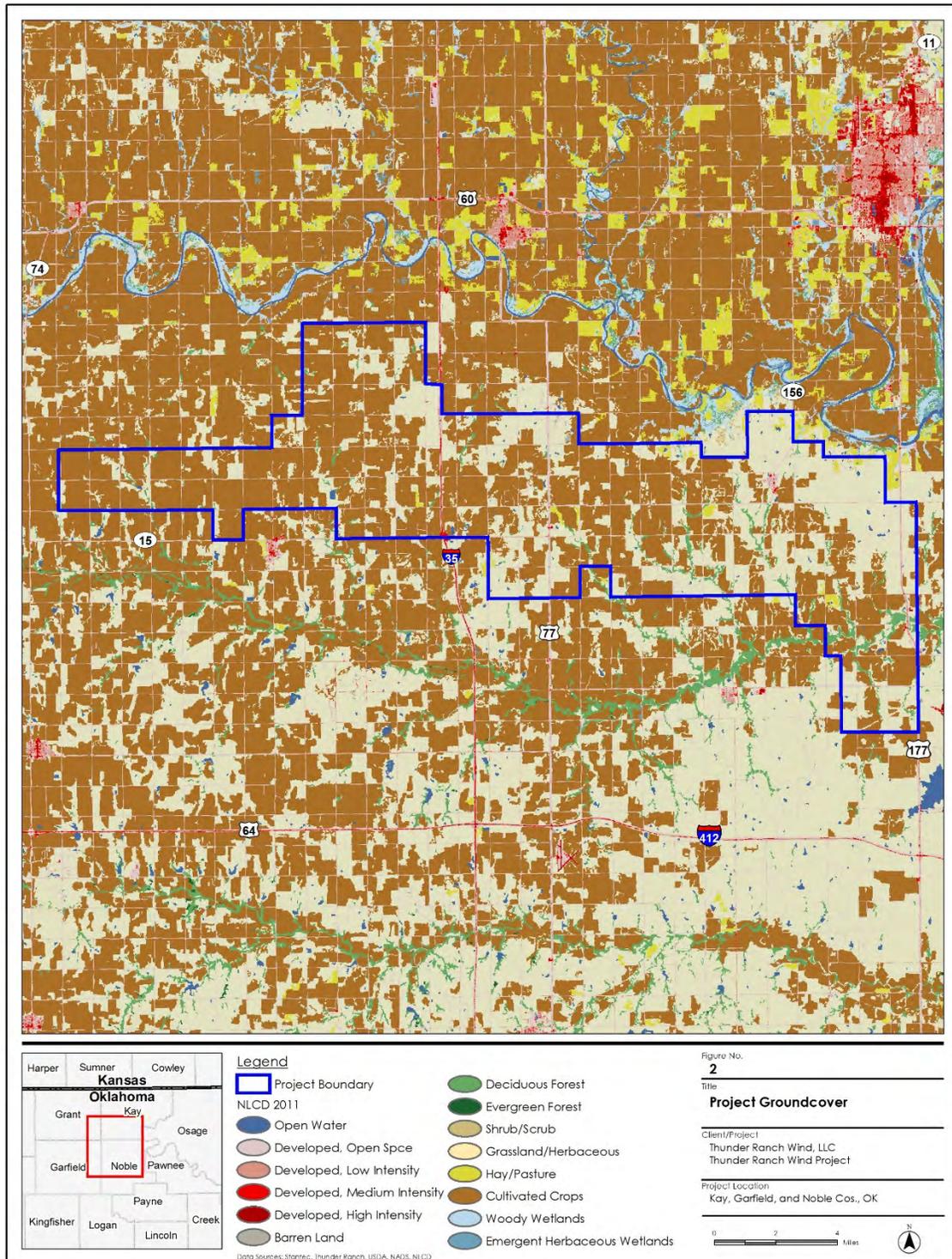


Figure 2. Project Groundcover

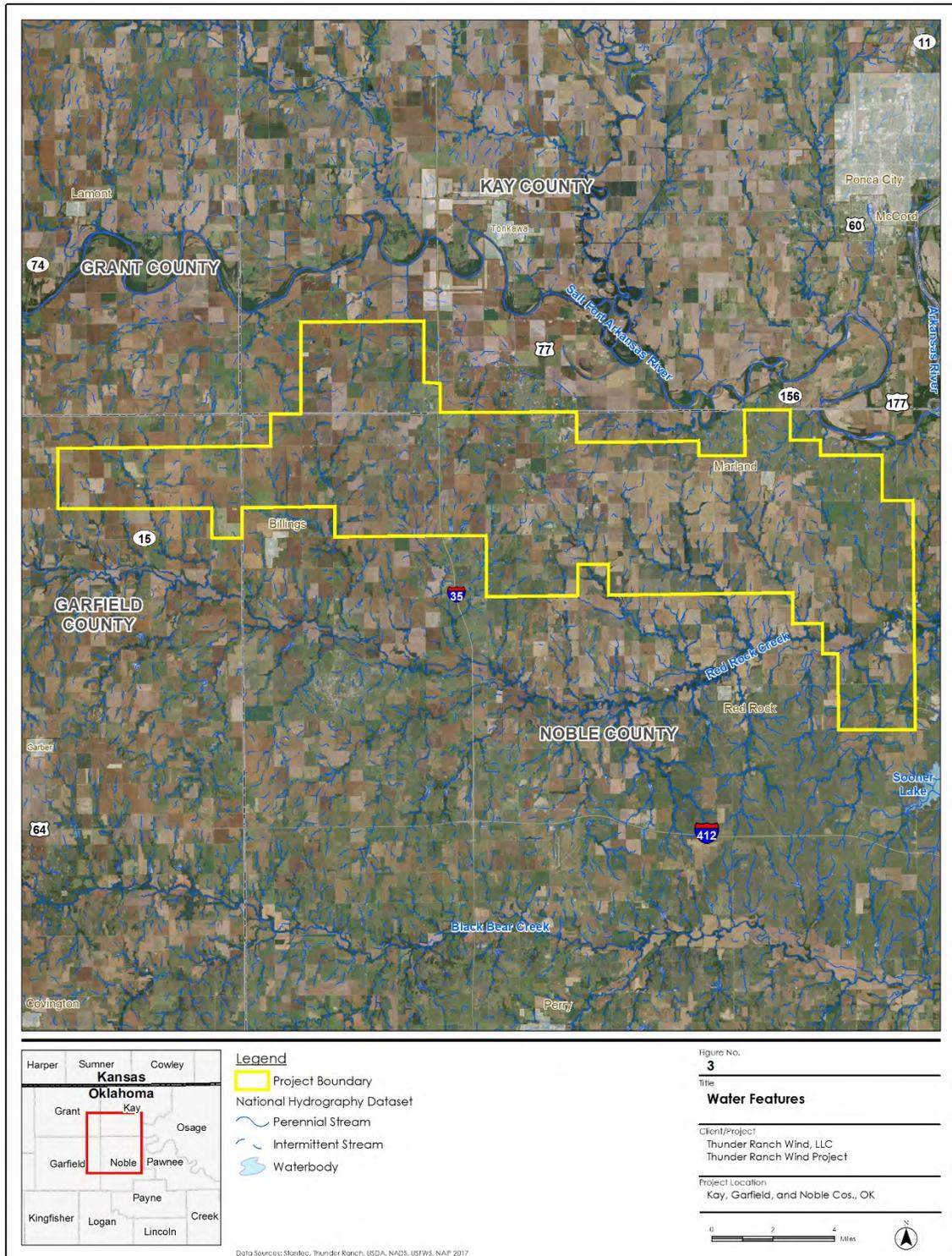


Figure 3. Water Features

1.3.2 Eagle Information and Surveys to Date

The Project is within the range of the bald eagle and the winter range of the golden eagle (*Aquila chrysaetos*). However, the Project is not anticipated to take or otherwise impact golden eagles due to their rarity in Central Oklahoma (Kochert *et al.* 2002). Data from eBird do not indicate any golden eagle sightings in the Project area during any month of the year since 1900¹; the nearest golden eagles have been sighted near Lake McMurry, approximately 40 miles southeast of the Project area, as recently as 2015 (eBird 2018, accessed December 19, 2018). The Applicant's ECP does not address golden eagles since take is not expected (Appendix A; Stantec 2017d).

The Applicant conducted three surveys to estimate eagle activity within the Project area, including a desktop Eagle Risk Assessment (ERA: 2016), two years of eagle use surveys performed monthly in the Project area (spanning 2015-2017; Stantec 2016b, 2017e), and two aerial eagle nest surveys (2016-2017; Stantec 2016a, 2017a). A total of 61 eagle minutes were observed within the Project area over a two-year period, among 40 eagle observation points. Aerial nest surveys indicated that an estimated 22 bald eagle breeding territories were located within 10 miles of the Project boundary. Further details about survey results can be found in Section 3.1.

1.4 Scoping, consultation and coordination

This EA incorporates by reference the scoping performed for the PEIS (Chapter 6, page 175), including tribal coordination and consultation. Therefore, no additional public scoping was conducted.

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. The ECP is included in Appendix A; Stantec 2017d.

1.5 Tribal coordination

Tribal consultation is a critical component of the issuance of any permit. Tribal considerations addressed in the PEIS are incorporated here by reference (USFWS 2016a, Chapter 3, page 118). On May 22, 2019, the Service sent a letter to all Region 2 Tribes informing them of our review of the ITP application and requesting any views, comments, or concerns regarding the proposed ITP authorizing incidental take of Bald Eagles at the Project. This letter was accompanied by a handout providing additional information on the Project, history, mitigation, and eagle take permit rules

¹ eBird data can be accessed here:

<https://ebird.org/map/goleag?scrollwheel=true&draggable=true&mapType=roadmap>. Full citation information is available in the References section.

(Appendix C). Consultation between the Service and the Tribes is an ongoing process and will proceed in parallel with the completion of this document.

2.0 Proposed Action and Alternatives

2.1 Proposed Action

We propose to issue a 30-year ITP authorizing the take of up to 48 bald eagles (an average of 1.6 annually), with associated conditions as allowed by regulation. The Applicant would implement all measures required by other agencies and jurisdictions to conduct the activity at this site, applicant-committed measures and the conservation commitments described in the Applicant's ECP, summarized in Table 2 (Appendix A; Stantec 2017d). Avoidance and minimization measures can be found in Section 7 of the ECP (Appendix A; Stantec 2017d) and are summarized below:

2.1.1 Avoidance and Minimization Measures (Appendix A; Section 7)

The Applicant has completed the following:

- Minimization of roads, power lines, fences, and other Project infrastructure;
- Relocation of Project boundaries away from the Arkansas River, siting of proposed turbine locations to avoid wetlands, streams, ponds, and other bodies of water and at least 2.1 miles from any known bald eagle nest;
- Use of metrological towers that are free-standing rather than dependent on guy-wires; and
- Burial of all collection lines and use of bird diverters on transmission lines to avoid collisions with birds in accordance with Avian Power Line Interaction Committee (APLIC) standards (APLIC 2012).

2.1.2 Post-Construction Monitoring (Appendix A; Section 8)

The Applicant will engage in post-construction monitoring, including:

- A minimum of two years of fatality monitoring monthly at each turbine location by an independent, third-party monitor who will report results to the Service;
- An additional two years of monthly operations staff monitoring;
- Annual monitoring reports submitted to the Service during the duration of fatality monitoring and summary reports provided to the Service at five-year intervals;
- Reporting of any bald eagles found dead or injured within Project boundaries; and
- Implementation of a Wildlife Incident Reporting Form process.

Further information on Applicant proposed post-construction monitoring can be found in Section 5.0.

2.1.3 Adaptive Management (Appendix A; Section 8)

Over the course of the 30-year lifespan of the Project, the Applicant and the Service have agreed to implement adaptive management protocols if eagle take is in excess of conservative predictions, as outlined in the ECP (Appendix A; Stantec 2017d, Section 8.3). Three adaptive management categories have been identified that summarize Project triggers and responses for eagle take:

Level 1: triggered by one bald eagle fatality within a 12-month period. Level 1 responses include:

- Continued implementation of the ECP;
- Assessment of the cause and/or contributing factors to eagle fatalities and whether management responses are warranted.

Level 2: triggered by two bald eagle fatalities within a 12-month period. Level 2 responses include:

- Level 1 responses;
- Completion of a site evaluation and/or additional site monitoring to better understand Project risk to eagles;
- Implementation of additional livestock carcass removal or landowner outreach if livestock attractants are identified as a contributing factor to eagle risk;
- Ongoing consultation between the Service and Thunder Ranch to identify further management actions or longer-term implementation plans;
- Costs not in excess of \$10,000 per year.

Level 3: triggered by three or more bald eagle fatalities within a 12-month period. Level 3 responses include:

- Levels 1 and 2 responses;
- Implementation and testing of additional mitigation measures to avoid further excessive take (e.g., light, noise, or drone deterrent systems);
- Costs not in excess of \$30,000 per year.

2.2 Alternative 1: No Action

Under the No-Action Alternative, we would take no further action on the Applicant's ITP application. In reality, the Service must take action on the ITP application, and determine whether to deny or issue the ITP. We consider this alternative because the NEPA and Service policy require 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 ITP. Under the No-Action Alternative, the Project would 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.

Should the Project result in take of bald eagles under the No-Action Alternative, the Applicant would be in violation of the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA prohibits unpermitted take of eagles. Take is defined as “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb” (50 CFR 22.3).

2.3 Other Alternatives

The Service considered one additional alternative based on communication with the project proponent 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. 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.

2.3.1 Alternative 2: Deny Permit

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

Our ITP issuance regulations contained within 50 CFR 13.21(b) set forth a variety of circumstances that disqualify an applicant from obtaining an ITP. None of the disqualifying factors or circumstances denoted in 50 CFR 13.21 apply to Thunder Ranch Wind. We next considered whether the Applicant meets all issuance criteria for the type of permit being issued. For an eagle ITP, those issuance criteria are found in § 22.26(f). The Applicant meets all the regulatory issuance criteria and required determinations (50 CFR 22.26) for eagle ITPs (USFWS 2012).

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 ITP is not a reasonable option. Therefore, this alternative—denial of the ITP—was eliminated from further consideration.

3.0 Affected Environment

This section describes the current status of the environmental resources and values that are affected by the Proposed Action and alternative.

3.1 Bald Eagle

A species description of the bald eagle can be found in the PEIS (USFWS 2016a; Section 3.2, page 44). The Applicant conducted three types of surveys to evaluate baseline eagle presence within the Project area, as described in the Applicant's ECP (Appendix A; Stantec 2017d). An ERA desktop evaluation was performed in 2016 to evaluate known nests or suitable habitat for eagle usage (Appendix B; Stantec 2016c). Eagle use surveys were performed for 24 months to document eagle presence within the Project area. Additionally, eagle nest surveys were performed twice (in 2016 and 2017) by helicopter to evaluate eagle and raptor nesting within the Project boundaries. The survey methods and results are summarized below.

3.1.1 *Eagle Risk Assessment*

In spring of 2016, Stantec Consulting Services Inc (Stantec) completed a desktop Stage 1 ERA on behalf of the Applicant, based on publicly available sources, especially eagle distribution data and life history characteristics (Appendix B; Stantec 2016c). The Applicant performed a LAP analysis with a buffer size of 43 miles (note: the LAP analysis was updated by the Service in March 2019 with a buffer size of 86 miles following the 2016 revisions to the Eagle Rule [USFWS 2016c]. See Section 4.1.1). The assessment indicated that suitable habitat for breeding, migrating, and wintering bald eagles exists within the LAP analysis area, in areas associated with water features and the Salt Plains National Wildlife Refuge (33 miles northwest of the Project area). The ERA identified potential nesting areas within the LAP analysis area along the Arkansas River and within the Salt Plains National Wildlife Refuge. Bald eagles use the refuge for communal roosting habitat. Other important eagle-use areas include the Arkansas River, Salt Fork, Sooner Lake, and possibly Red Rock Creek. These areas provide potential suitable habitat due to the availability of superstructure trees and nearby food sources. The ERA did not identify suitable nesting or communal roost habitat within the Project area; however, its proximity to the Arkansas River, Salt Fork, and Red Rock Creek increase the likelihood that bald eagles will be found within the Project's boundaries. The ERA concluded that the Project likely meets the criteria for Category 2 – High to Moderate Risk to Eagles. Thus, the Applicant entered a Stage 2 Assessment.

3.1.2 *Eagle Use Surveys*

Eagle use surveys were conducted in the Project area from October 2015 until September 2017, with one survey each month (ECP, Appendix A; Stantec 2017d, Section 5.1). In October of 2015, 36 eagle observation points (EOP) were selected on public roads within 800 m of a proposed turbine location with the greatest accuracy possible. Thirty-six (36) points adequately represent 30% of the Project area, as recommended by the ECPG. The final locations of the EOP were adjusted in the field to ensure visibility and accessibility for surveyors. After meeting with the Service in August 2016, the Applicant added four additional survey points to accommodate areas of grassland inaccessible by roadways. The 40 EOP were surveyed monthly through September 2017. More information regarding EOP placement can be found in Section 5.1.1 of the Project's ECP (Appendix A; Stantec 2017d).

Each EOP was surveyed for one hour each month to estimate eagle use. Surveys were conducted within a plot encompassing an 800-m radius circle around the survey point. Surveys were conducted during daylight hours in all weather conditions. Surveyors recorded eagle observations including time of observation, minutes flying within or outside of the 800-m plots or otherwise visible, flight direction, eagle age and flight behavior. In total, 61 eagle flight minutes were observed across all points, all of which occurred between October and March, as might be expected for wintering eagle populations.

3.1.3 Eagle Nest Surveys

Two years (2016-2017) of aerial eagle nest surveys were completed for the Project following recommended methods from the ECPG (Appendix A; Stantec 2017d, Section 5.2; USFWS 2013). The ECPG recommends using a 10-mile buffer around the Project area as the Eagle Nest Survey Area. The Applicant survey included this buffer and additional areas. Surveys focused on particular areas with suspected suitable bald eagle nesting habitat (such as areas proximate to the Salt Fork, Arkansas River, Sooner Lake, and Red Rock Creek). Areas within the Eagle Nest Survey Area that were not considered prime bald eagle nesting habitat were surveyed using 1-mile transects.

For each eagle nest, surveyors identified the active status of the nest (if possible), species using the nest, and number of chicks or eggs present in the nest. Nests were determined to be “occupied” if one or more adults were present at the nest or in close proximity. Nests were determined to be “in-use” if breeding activity was observed in the nest (such as the presence of eggs, chicks, fledglings or adults incubating). Nests where no activity was observed were recorded as “unknown.”

In 2016, a total of 18 bald eagle nests were identified. Of these, 9 were located within a 10-mile buffer of the Project area (Figure 4; note that two nests outside of 10-mile buffer in Pawnee County are overlapping). In addition, six bald eagles were observed during aerial surveys that were not obviously associated with a nest. In 2017, a total of 31 bald eagle nests were identified. Of these, 15 were located within a 10-mile buffer of the Project area (6 new nests since the 2016 survey; Figure 4). In addition, 76 bald eagles were observed flying within the survey area. Based on the Applicant ECP, there are an estimated 22 bald eagle breeding territories within 10 miles of the Project boundary. The closest, which is near the confluence of the Salt Fork and Arkansas Rivers, is 2.1 miles away from Project turbines.

Raptor nest surveys were conducted concurrently with the eagle nest surveys in both 2016 and 2017 using transects spaced 0.5 mile apart. Transect locations were shifted slightly between years to accommodate for Project boundary changes.

All surveys were conducted by helicopter by two biologists and a pilot. Surveys were conducted during March of 2016 and 2017 under favorable weather conditions (i.e., moderate to low wind speeds, good visibility, and no precipitation).

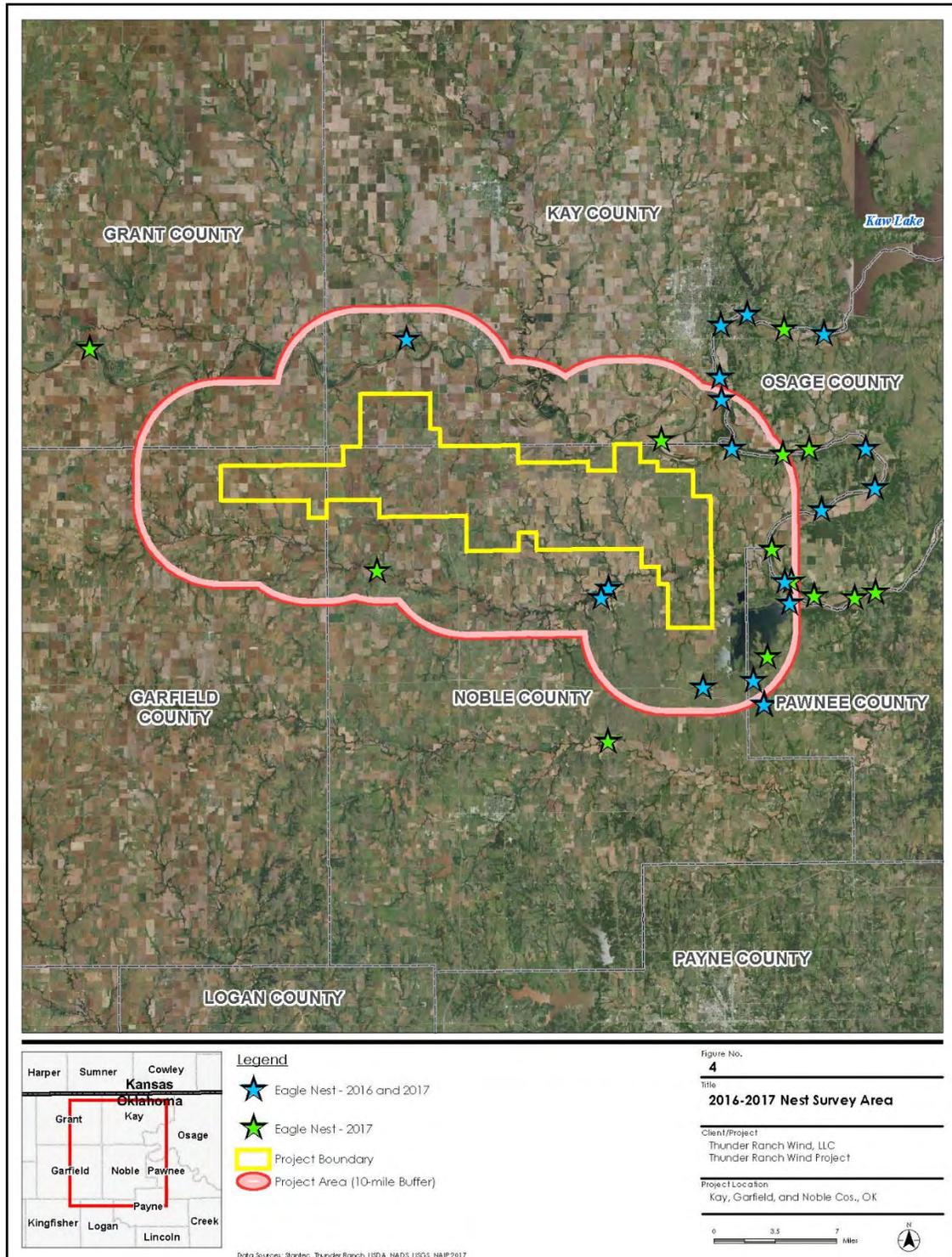


Figure 4. 2016-2017 Nest Survey Area

3.2 Golden Eagle

Data from eBird indicate that there have been no golden eagle sightings within the Project area (eBird 2018, accessed December 19, 2018). No golden eagles were observed in eagle use or eagle nest surveys (Stantec 2016; Stantec 2017b).

3.3 Migratory Birds

General effects of ITP issuance on migratory birds were considered in the PEIS (USFWS 2016a; Section 2.5, page 97); these considerations are incorporated by reference here.

The Project is located within the Central Flyway migration corridor and the Central Mixed Grass Prairie Bird Conservation Region (BCR) 19 and Oaks and Prairies BCR 21 (Figure 5). BCR are ecologically distinct regions with similar bird communities and habitats (NABCI 2000). The Service's Birds of Conservation Concern (BCC) report identifies "species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing" under the Endangered Species Act (ESA; USFWS 2008). A total of 31 distinct BCC species have been identified within BCR 19 and 21. A search of eBird indicated that up to 23 BCC species (including short-billed dowitcher; see Table 1) have been sighted in Garfield, Kay, and Noble counties within the past 15 years (eBird 2019, accessed May 13, 2019). The Applicant conducted migratory bird surveys in fall of 2015, spring of 2016, fall of 2016, and spring of 2017. A total of 20 bird observation points were surveyed 4 times within each season. Surveys documented a total of 6,520 bird of 82 species (Stantec 2017a). A total of 11 BCC were found within the Project area. A summary of BCC species, presence in the vicinity of the Project, and presence within the Project area is included in Table 1.

Table 1. Birds of Conservation Concern in Project vicinity and Project area based on eBird and Applicant Bird and Bat Risk Assessment.

Common name	Scientific name	Present in Garfield, Kay, and/or Noble Counties ¹
Bald eagle	<i>Haliaeetus leucocephalus</i>	Yes ²
Bell's vireo	<i>Vireo bellii</i>	Yes ²
Black rail	<i>Laterallus jamaicensis</i>	No
Buff-breasted sandpiper	<i>Tryngites subruficollis</i>	Yes
Cassin's sparrow	<i>Peucaea cassinii</i>	No
Chestnut-collared longspur	<i>Calcarius ornatus</i>	Yes
Harris's sparrow	<i>Zonotrichia querula</i>	Yes ²
Henslow's sparrow	<i>Ammodramus henslowii</i>	No
Hudsonian godwit	<i>Limosa haemastica</i>	Yes
Lark bunting	<i>Calamospiza melanocorys</i>	Yes
Lesser prairie-chicken	<i>Tympanuchus pallidicinctus</i>	No
Little blue heron	<i>Egretta caerulea</i>	Yes
Loggerhead shrike	<i>Lanius ludovicianus</i>	Yes ²
Long-billed curlew	<i>Numenius americanus</i>	Yes

Common name	Scientific name	Present in Garfield, Kay, and/or Noble Counties ¹
Marbled godwit	<i>Limosa fedoa</i>	Yes
McCown's longspur	<i>Rhynchophanes mccownii</i>	No
Mississippi kite	<i>Ictinia mississippiensis</i>	Yes ²
Mountain plover	<i>Charadrius montanus</i>	No
Orchard oriole	<i>Icterus spurius</i>	Yes ²
Peregrine falcon	<i>Falco peregrinus</i>	Yes
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	Yes ²
Scissor-tailed flycatcher	<i>Tyrannus forficatus</i>	Yes ²
Short-billed dowitcher	<i>Limnodromus griseus</i>	Possible ³
Smith's longspur	<i>Calcarius pictus</i>	Yes ²
Snowy plover	<i>Charadrius nivosus</i>	Yes
Solitary sandpiper	<i>Tringa solitaria</i>	Yes
Sprague's pipit	<i>Anthus spragueii</i>	Yes
Swainson's hawk	<i>Buteo swainsoni</i>	Yes ²
Swainson's warbler	<i>Limnithlypis swainsonii</i>	No
Swallow-tailed kite	<i>Elenoides forficatus</i>	No
Upland sandpiper	<i>Bartramia longicauda</i>	Yes ²

¹ Based on a search of eBird data within Garfield, Kay, and Noble Counties conducted on May 13, 2019.

² Also sighted during Project avian surveys (Stantec 2017c).

³ eBird results indicate an indeterminate sighting of either short-billed or long-billed dowitcher in Noble County.

3.4 Species Listed under the Endangered Species Act

A review of Federally endangered resources within the Project area through the USFWS Information for Planning and Consultation (IPaC) website indicates that six threatened or endangered species (including four birds, one fish, and one beetle species) have ranges that include Garfield, Kay, and Noble counties. These species have been analyzed through an Intra-Service Section 7 Biological Evaluation (See Appendix D).

3.5 Cultural and Socio-economic Interests

Cultural and socio-economic interests are considered in the PEIS (USFWS 2016a; Section 3.8, page 133) and are incorporated by reference here. Since the Project is already operational, no additional ground disturbance or other impacts will occur. Thus, no non-tribal cultural and socio-economic interests outside of those addressed in the PEIS are expected to occur with the issuance of the ITP associated with Thunder Ranch.

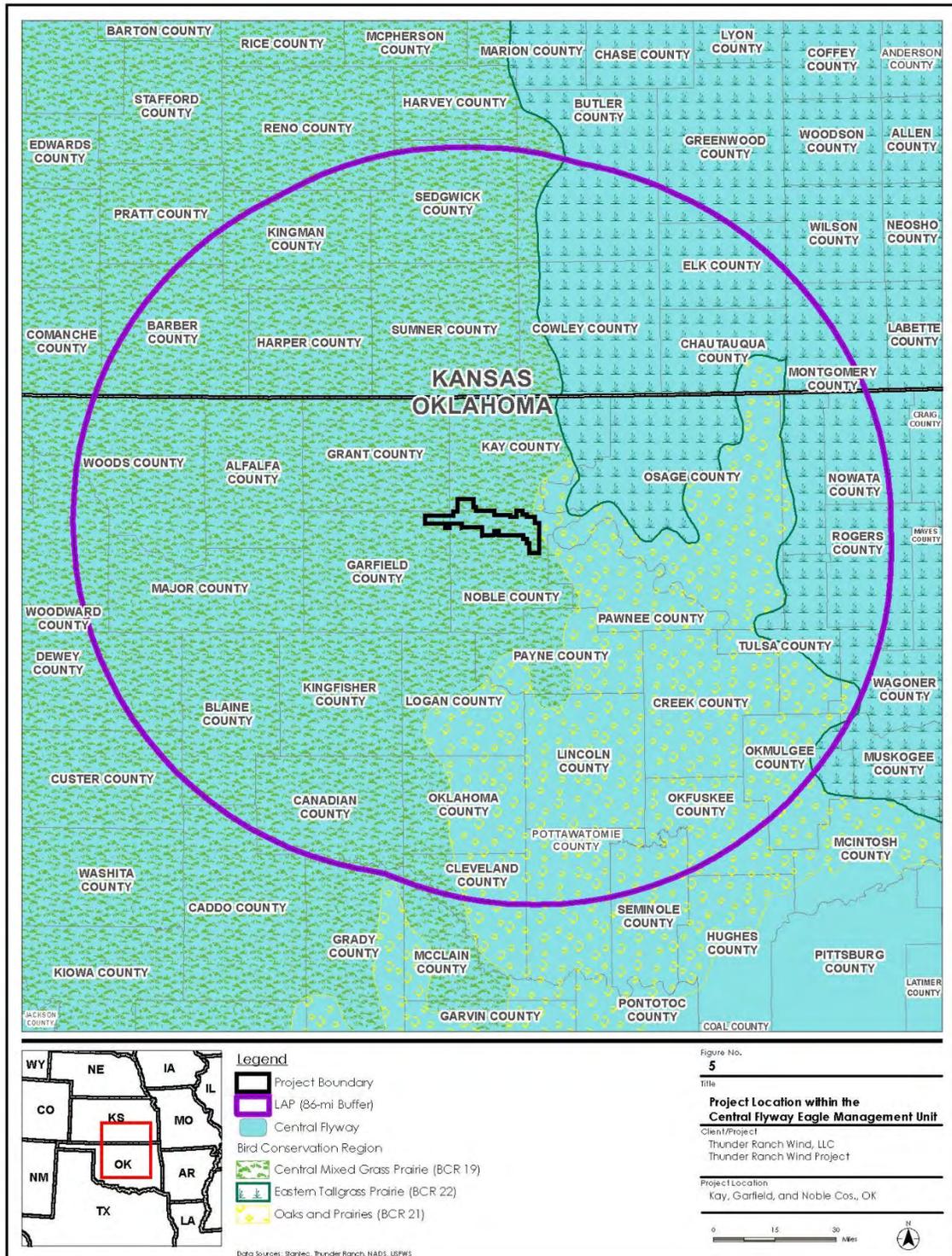


Figure 5. Project Location within the Central Flyway Eagle Management Unit

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 ITP. Tribal consultation is ongoing. At present, no known tribal issues have arisen regarding Thunder Ranch Wind.

3.6 Climate Change

Climate change was considered in the PEIS (USFWS 2016a; Section 3.9, page 144) and is incorporated by reference here.

4.0 Environmental Consequences

This section summarizes the effects on the environment of implementing the Proposed Action and an alternative to the action.

A discussion of overall effects of the eagle incidental take 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 that may result from the issuance of an eagle ITP for this specific project.

4.1 Proposed Action

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" (USFWS 2016b) We also used our ERA (Appendix B; Stantec 2016c; USFWS 2013), and Cumulative Effects Analysis (USFWS 2013) to quantify eagle fatality risk and cumulative local population level effects.

4.1.1 *Bald eagle*

Under the Proposed Action, conservation measures and adaptive management contingencies identified by the Applicant would be fulfilled, based on the Applicant's ECP (Appendix A; Stantec 2017d; Sections 7 and 8). The Service estimates that 1.6 bald eagles may be taken annually, totaling 48 over the life of the ITP (i.e., 30 years). This prediction is based on a conservative approach that is expected to overestimate annual and cumulative take at the outset of the ITP. We anticipate the prediction would decrease as the Applicant incorporates project-specific monitoring data into the prediction as part of the ITP's adaptive management process. Adaptive management is the process by which recurrent discussions are made regarding issues such as direct eagle take and eagle nest disturbance. The Applicant's proposed conservation measures include adaptive management that could result in additional monitoring and operational adjustments. More information about the Applicant's proposed adaptive management is in Section 2.1.6 of this document and Section 8.3 of the ECP (Appendix A; Stantec 2017d).

4.1.1.1 Direct eagle take

Take of bald eagles has the potential to affect the larger bald eagle population. Accordingly, the 2016 PEIS analyzed the cumulative effects of permitting take of bald eagles in combination with ongoing unauthorized sources of human-caused eagle mortality and other present or foreseeable future actions affecting bald eagle populations. As part of the analysis, the Service determined sustainable limits to permitted take within each EMU. The take that would be authorized by this ITP does not exceed the EMU take limit, so it will not significantly impact the EMU eagle population. The avoidance and minimization measures that would be required under the ITP, along with the additional adaptive management measures, are designed to further ensure that the ITP is compatible with the preservation of the bald 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 the amount of take that can be authorized while still maintaining the LAP of eagles (i.e., LAP analysis). In order to issue an ITP, 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 ITP application as part of our application review.

We, therefore, considered cumulative effects to the LAP surrounding the Project to evaluate whether the take to be authorized under this ITP, together with other sources of permitted take and unpermitted eagle mortality, may be incompatible with the persistence of the Project LAP. We incorporated data provided by the Applicant, our data on other eagle take authorized and permitted by the Service, and other reliably documented unauthorized eagle mortalities to estimate cumulative impacts to the LAP. The scale of our analysis is an 86-mile radius around the project site. We conducted our cumulative effects analysis as described in the Service's ECPG (USFWS 2013).

We derive the size of the LAP's Bald Eagle population by multiplying the estimated eagle density of the EMU by the area of the LAP (81 FR 91498, Dec. 16, 2016; USFWS 2016b). Using this method, the Project LAP has approximately 228 bald eagles (USFWS Cumulative Effects Tool, run March 13, 2019). Using this estimate, the 5% take threshold for the Project's LAP is 11.4 (i.e., 12) individual bald eagles. Estimated take for the Project is 1.6 (i.e., 2) individual bald eagles annually. The take that would be authorized by this ITP does not exceed 5% of the LAP, so it would not significantly impact local area eagle populations.

In the 2016 eagle demographics report (USFWS 2016b), the Service estimated the bald eagle population of the Central Flyway EMU to be 1,163 eagles. Permitted take for bald eagles is 6% of the EMU, which equals 70 eagles in the Central Flyway. Predicted take for the Project is well below 6%.

This Project meets the PEIS tiering criteria (USFWS 2016a; see Sections 1.1 and 2.3.1). The Service believes that take levels below the 5% threshold of any individual LAP and below the 6% threshold of any individual EMU do not have a significant impact on bald eagle populations and

are not inconsistent with the BGEPA. The Project is predicted to take 1.6 bald eagles annually, effectively 2 bald eagles per year (48 bald eagles over the permit term). The Project's take of 1.6 bald eagles annually is below the 5% threshold of the LAP of 12 bald eagles and the 6% threshold of the EMU of 70 bald eagles. This estimate of take is likely conservative; however, adaptive management actions would be triggered if at least one eagle is taken within one year. The Service intends to use post-construction fatality monitoring data to reevaluate take considerations for the remainder of the Project's duration.

4.1.1.2 Eagle nest disturbance

All known bald eagle nests are greater than two miles from Project infrastructure. During construction, no disturbance activities occurred within 660 ft. of an eagle nest (see *National Bald Eagle Management Guidelines*, USFWS 2007). During the operation of the Project, if any new nest is constructed within two miles of the Project area, the Service and the Applicant will coordinate to determine the best course of action.

4.1.2 Golden eagle

Take of golden eagles was analyzed in the PEIS in a similar manner to that of bald eagles. The PEIS concluded that although golden eagles can sustain take levels of around 10%, current unmitigated take levels were already approximately 10%. Thus, the Service concluded that the appropriate take rate for golden eagles is zero (USFWS 2016a; Section 3.3.2). Based on pre-construction eagle use surveys conducted at the Project, during which no golden eagles were observed, take of golden eagles at the Project is expected to be zero.

4.1.3 Migratory Birds

The PEIS considered the effects of ITP issuance on migratory bird populations and concluded that no direct adverse impacts were expected. Regardless of issuance of an ITP, the Project's BBCS (Stantec 2017b) will be used as guidance. In addition, the Service concluded that conservation measures set forth in an ECP accompanying an ITP were likely to have positive effects on migratory birds because they would address mortality issues that affect species in addition to eagles. A more detailed description of the effects of migratory birds was considered in the PEIS (USFWS 2016a; Section 2.5, page 97); these considerations are incorporated by reference here.

4.1.4 Species Listed under the Endangered Species Act

The PEIS addresses threatened and endangered species issues (USFWS 2016a; Section 1.8.2.5, page 15) as a topic that was considered but dismissed from further analysis. However, it states that "any effects on endangered or threatened species or critical habitat that may occur as a result of developing and implementing ITP conditions required for a specific project will be analyzed at the individual project level, as appropriate" (USFWS 2016a). For this Project, six threatened or endangered species were identified by an IPaC review and could potentially occur within the

Project area. Effects to species were summarized in the Intra-Service Section 7 Biological Evaluation (Appendix D).

4.2 Alternative 1 – No Action

Although the Service would take no action on the ITP application under the No Action Alternative, the Project would continue to operate without authorization for 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 Proposed Action. Under this alternative, direct impacts of Thunder Ranch Wind on the eagle population are anticipated to be 48 eagles over the 30-year life of the project (1.6 eagles per year over 30 years). No adaptive management measures would be triggered should take exceed that level.

The No Action 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 ITP to the applicant. However, the effects of a No Action Alternative will be considered for the issuance of an ITP.

4.2.1 *Bald eagle*

Take under the No Action Alternative is predicted to be 48 eagles over 30 years, or 1.6 eagles per year. All eagle take under the No Action Alternative would be unmitigated take, since take would occur on a Project that lacks an ITP.

4.2.2 *Golden eagle*

Take of golden eagles under the No Action Alternative is predicted to be zero.

4.2.3 *Migratory Birds*

Under the No Action Alternative, the Project's BBCS will be used as guidance.

4.2.4 *Species Listed under the Endangered Species Act*

Six threatened or endangered species were identified by an IPaC review and could potentially occur within the Project area. Effects to listed species were summarized in the Intra-Service Section 7 Biological Evaluation (Appendix D).

4.3 Comparison of Effects of Alternatives

The following table compares the effects of the Proposed Action and No Action Alternative.

Table 2. Comparison of alternatives for Thunder Ranch Wind.

	Proposed Action – Issue Permit	Alternative 1 – No Action
Bald Eagle Take Levels	48 eagles over 30 years	48 eagles over 30 years
Avoidance and Minimization	<ol style="list-style-type: none"> 1. Movement of Project boundary seven miles west to avoid habitat associated with the Arkansas River 2. Siting of turbines at least 2.1 miles away from eagle nests and away from wetlands, streams, ponds, and other water bodies 3. Enforcement of slow driving speeds during construction 4. Management of waste and disposal throughout construction and operations phases 	<ol style="list-style-type: none"> 1. Movement of Project boundary seven miles west to avoid habitat associated with the Arkansas River 2. Siting of turbines at least 2.1 miles away from eagle nests and away from wetlands, streams, ponds, and other water bodies 3. Enforcement of slow driving speeds during construction 4. Management of waste and disposal throughout construction and operations phases
Compensatory Mitigation	None required	None provided
Adaptive Management	<ol style="list-style-type: none"> 1. If one detected fatality occurs in one year, assess cause or contributing factors and whether a management response is warranted/feasible 2. If two detected eagle fatalities in one-year, complete site evaluation, implement additional livestock carcass removal, consultation to revise management actions 3. If three detected eagle fatalities in one year, implement and test additional deterrents to eagles (e.g. line, noise, or drone deterrent systems) <p>Coordination or other measures if eagle nest is constructed within 660 ft of Project infrastructure</p>	None

	Proposed Action – Issue Permit	Alternative 1 – No Action
Data Collected by Service	Annual monitoring report of fatalities; reporting of injured eagles; information on the effects of specific, applied, conservation measures	None
Company Liability for Bald Eagle Take	No (if in compliance with permit conditions)	Yes

4.4 Cumulative Effects

This section evaluates cumulative effects on eagles as required by NEPA (CFR § 1508.8) and BGEPA’s permitting regulations. As part of its permit application review process (50 CFR § 22.26 (f)(1) and Service 2016), the Service is required to evaluate and consider effects of ETPs on eagle populations at three scales: (1) the EMU, (2) local area, and (3) project area. The Service’s evaluation also considers cumulative effects. Most of the cumulative effects of ETPs on national and regional eagle populations were analyzed in the PEIS, which this Draft EA tiers to. Therefore, the EA’s cumulative effects analysis is focused on other known permitted take within the LAP and EMU.

As described in the PEIS, there are other anthropogenic sources of eagle mortality in addition to industrial-scale wind projects, such as lead-poisoning, electrocutions and traffic collisions, which to-date have been shown to have higher mortality levels for bald eagles than wind projects. The exact number of bald eagles taken by these other anthropogenic sources within the LAP is unknown. As of March 2019, the Service has issued ITPs for the take of 2.9 bald eagles that overlap with the Project’s LAP. Including the take that would be authorized by the issuance of this ITP, total take for the Project’s LAP is 3.52 bald eagles. Analysis of cumulative effects in the PEIS considered poaching, trapping, poisoning, climate change, habitat loss and fragmentation, energy production, powerlines, collisions, and disease (USFWS 2016a, Section 4.1). In our review of known bald 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, Section 4.1). As described in the PEIS, the LAP and EMU take thresholds were designed to incorporate these other sources of baseline take, so that the permitted thresholds (which this Project meets) would still meet BGEPA’s preservation standard.

Under either the Proposed Alternative or the No Action Alternative, the cumulative effects of issuing an ITP would be the same, as either alternative would result in the take of 48 bald eagles over the 30-year ITP term and the other sources of eagle mortality would also be the same under either alternative.

5.0 Mitigation and Monitoring

The Proposed Action incorporates measures to minimize and avoid to the maximum degree practicable, as required by regulation. To ensure that regional eagle populations are maintained consistently with the preservation standard, our regulations require that any take that cannot practicably be avoided and is above EMU take limits must be offset by compensatory mitigation. In this case, authorized take remains below the EMU take thresholds and no compensatory mitigation is needed to meet the Eagle Act preservation standard.

5.1 Voluntary mitigation

The Project's take of 1.6 bald eagles annually is below the 5% threshold of the Local Area Population (LAP; 11.4) and the 6% threshold of the Eagle Management Unit (EMU) of 70 bald eagles. Therefore, compensatory mitigation is not required for the Project. However, the Applicant intends to implement voluntary mitigation in order to conserve bald eagle populations. These measures cannot be explicitly quantified or tied to a numerical benefit, and as such would not count as involuntary mitigation measures according to the Service's definitions. According to the ECP (Appendix A; Stantec 2017d, Section 7.2), under the Proposed Action, the Applicant would donate \$20,000 over a five-year period for use by one or more of the following organizations:

- a local, non-profit environmental organization dedicated to lead abatement, which includes public education on lead's effects on eagles and other wildlife and the production of non-toxic fishing tackle and ammunition;
- a local eagle rehabilitation center dedicated to rescue, treatment, and release of sick or injured bald eagles;
- a local conservation fund where contributions are used to retrofit power poles to avoid eagle electrocutions, habitat protection and/or enhancement, or removal of road kill carcasses to discourage eagle use of the area and avoid or reduce eagle collisions;
- local non-profit organization which conducts scientifically rigorous research investigating the effects of wind development on eagles and ways to reduce eagle-turbine collisions at wind facilities.

5.2 Monitoring immediately post-construction

Based on the Applicant's ECP, monitoring includes post-construction fatality studies to evaluate Project impacts on eagles and other birds (Appendix A; Stantec 2017d, Section 8). The Applicant contracted with an independent, third-party to complete formal post-construction eagle fatality monitoring for the first two years (December 2017-November 2019) of Project operations, especially during the highest risk period for eagles at the Project site (i.e., November 1 through February 28). In addition, a qualified biologist conducted visits to all project turbines to search turbine pads and associated roads. These searches will be conducted every two weeks during the winter months (December through February) and conducted monthly throughout the remainder of the year (May through November). The Applicant will report these data (reports and raw data) to the Service annually for two years post-construction.

5.3 Staff and subcontractor training

On-site training for Thunder Ranch staff was implemented during the first year of operations and additional training will be provided as needed for on-site personnel. Training emphasizes the proper procedures for reporting eagle and other avian or wildlife incidents in the Project area. These procedures include a Wildlife Incident Reporting Form (WIRF) process, which standardizes actions and information used by the Applicant and associated subcontractors in response to wildlife injuries or fatalities within the Project area. All Project employees are trained in WIRF completion and vigilant eagle and wildlife monitoring while traversing the Project site.

5.4 Post-permit operations staff monitoring

After the permit issuance, the Applicant will implement operations staff monitoring for at least two years every five years. Thunder Ranch personnel or contractors will visit each operating turbine and associated roads and pads on a monthly basis to conduct a roadside survey of turbines and their immediately vicinity. The frequency and number of turbines monitored may be reduced if deemed appropriate by the Service after at least two years of monitoring. The Service will be notified within three business days of each incidence of an injured or dead eagle within the Project.

The Applicant will provide to the Service a summary report detailing eagle injury or fatality data. The Applicant will provide summary reports on a five-year basis, based on check-in periods established in the ITP.

5.5 Five-year post-permit issuance monitoring and reviews

With the issuance of the permit, the Service will require 1-2 years of independent, third-party monitoring (i.e., standardized carcass searches, searcher efficiency trials, and carcass removal trials) every five years. At five-year intervals, the Service will review the eagle fatality data and other pertinent information, as well as information provided by the Applicant and independent third-party monitors, assessing whether the Applicant is in compliance with the terms and conditions of the Permit and has implemented applicable adaptive management measures as needed and specified in the ITP, and ensuring eagle take has not exceeded the amount authorized within that time frame. The Service will update fatality predictions, authorized take levels and compensatory mitigation, as needed, for future years of the 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 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 or minimization measures, modifying adaptive management conditions, modifying monitoring requirements, and suspending or revoking the ITP.

The Service is not aware of any other measures or requirements relating to eagles or other wildlife imposed on the Project by other agencies or jurisdictions. Under the Proposed Action, the Applicant would consider adaptive management actions throughout the 30-year lifespan of the Project as part of the Service's and Thunder Ranch's commitment to mitigate risks to eagles, other avian species, and wildlife, and with cultural and economic concerns and climate change in mind. If adaptive management conditions should be triggered, site evaluations and monitoring will be

conducted, attractants will be removed, and, if necessary and available, deterrent systems will be installed to better reduce risks to eagles. More information about adaptive management triggers can be found in Section 2.1.3.

List of Preparers

Name	Project Role
U.S. Fish and Wildlife Service	
Kristin Madden	Deputy Chief, Migratory Birds, Southwest Region
Corrie Borgman	Migratory Bird Biologist, Southwest Region
Kirsten Cruz-McDonnell	Migratory Bird Biologist, Southwest Region
Kammie Kruse	Migratory Bird Biologist, Southwest Region
Stantec Consulting Services Inc.	
Terry VanDeWalle	EA Manager, EA Preparation
Amy Flansburg	EA Preparation

References

- Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines, State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.
- eBird. 2018. eBird: An online database of bird distribution and abundance. eBird, Ithaca, New York. Available: <http://www.ebird.org>.
- eBird. 2019. eBird: An online database of bird distribution and abundance. eBird, Ithaca, New York. Available: <http://www.ebird.org>.
- Kochert, M. N., Steenhof, K., McIntyre, C. L., and E. H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*), version 2.0. The Birds of North America (A. F. Poole and F. B. Gill, editors). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bna.684> Accessed December 19, 2018.
- North America Bird Conservation Initiative. 2008. Bird conservation region descriptions, a supplement to the North American Bird Conservation Initiative Bird Conservation Regions Map. U.S. NABCI Committee. Online <https://pubs.er.usgs.gov/publication/5200241> . Accessed December 20, 2018.
- Stantec Consulting Services Inc. (Stantec). 2016a. 2016 Aerial Eagle and Raptor Nest Survey. Submitted to Thunder Ranch Wind Project, LLC on June 10, 2016.
- Stantec. 2016b. Interim Report (October 2015-September 2016) for Eagle-Use Surveys at the Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma. Submitted to Thunder Ranch Wind Project, LLC on October 21, 2016.
- Stantec. 2016c. Stage 1 Eagle Risk Assessment. Submitted to Thunder Ranch Wind Project, LLC on August 1, 2016.
- Stantec. 2017a. 2017 Aerial Eagle and Raptor Nest Survey. Submitted to Thunder Ranch Wind Project, LLC on March 27, 2017.
- Stantec. 2017b. Bird and Bat Conservation Strategy. Submitted to Thunder Ranch Wind Project, LLC on July 26, 2017.
- Stantec. 2017c. Bird and Bat Risk Assessment. Submitted to Thunder Ranch Wind Project, LLC on July 27, 2017.
- Stantec. 2017d. Eagle Conservation Plan. Submitted to Thunder Ranch Wind Project, LLC on December 14, 2017.
- Stantec. 2017e. Final Report for Eagle-Use Surveys (October 2015- September 2017) at the Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma. Submitted to Thunder Ranch Wind Project LLC on December 1, 2017.

- U.S. Fish and Wildlife Service (USFWS). 2007. National bald eagle management guidelines. Available online at <https://www.fws.gov/southdakotafieldoffice/NationalBaldEagleManagementGuidelines.pdf>
- USFWS. 2008. Birds of Conservation Concern 2008. United States Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, VA.
- USFWS. 2009. Final Environmental Assessment; Proposal to Permit Take as Provided Under the Bald and Golden Eagle Protection Act. Department of Interior, Division of Migratory Bird Management. April 2009.
- USFWS. 2012. U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines. Available: http://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf.
- USFWS. 2013. Eagle Conservation Plan Guidance. Module 1: Land-based Wind Energy Development. Version 2. April.
- USFWS. 2014. Endangered and Threatened Wildlife and Plants Threatened Species Status for the Rufa Red Knot (*Calidris canutus rufa*); Final Rule. U.S. Fish and Wildlife Service. Federal Register 79: 73706-73748.
- USFWS. 2016a. Programmatic Environmental Impact Statement for the Eagle Rule Revision.
- USFWS. 2016b. Population Demographics and Estimation of Sustainable Take in the United States, 2016 update.
- USFWS. 2016c. Eagle Permits; Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests. United States Department of the Interior, Fish and Wildlife Service. December 16, 2016.

Appendix A: Eagle Conservation Plan for Thunder Ranch Wind



Eagle Conservation Plan

Thunder Ranch Wind Project,
Garfield, Kay, and Noble
Counties, Oklahoma



Prepared for:
Thunder Ranch Wind Project, LLC
100 Brickstone Square
Andover, MA 01810

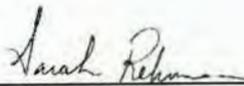
Prepared by:
Stantec Consulting Services Inc.
6800 College Blvd, Suite 750
Overland Park, Kansas 66211

Stantec Project #193703991

December 14, 2017

Sign-off Sheet

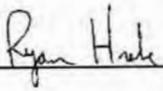
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Prepared by 
(signature)

Sarah Rehme, Wildlife Biologist/GIS Technician

Reviewed by 
(signature)

Josh Flinn, Project Manager/Wildlife Biologist

Approved by 
(signature)

Ryan Hrabe, Program Director/Biologist

Table of Contents

ABBREVIATIONS	III
1.0 INTRODUCTION	1.1
1.1 PURPOSE.....	1.1
1.2 CORPORATE APPROACH.....	1.1
1.3 BALD EAGLE DESCRIPTION.....	1.3
2.0 REGULATORY FRAMEWORK	2.5
2.1 APPLICABLE LAWS AND REGULATIONS	2.5
2.1.1 Bald and Golden Eagle Protection Act	2.5
2.1.2 Migratory Bird Treaty Act	2.6
2.2 APPLICABLE GUIDANCE DOCUMENTS	2.6
2.2.1 Eagle Conservation Plan Guidance	2.6
2.2.2 Land-Based Wind Energy Guidelines.....	2.8
2.3 CONSULTATION HISTORY	2.9
3.0 PROJECT DEVELOPMENT AND DESCRIPTION	3.13
3.1 PROJECT INFRASTRUCTURE	3.13
3.2 PROJECT HABITAT AND TOPOGRAPHY	3.19
4.0 INITIAL SITE ASSESSMENT (ECPG STAGE 1)	4.29
5.0 SITE-SPECIFIC SURVEYS AND ASSESSMENT (ECPG STAGE 2)	5.35
5.1 EAGLE-USE.....	5.35
5.1.1 Methods.....	5.35
5.1.2 Results.....	5.40
5.2 EAGLE NESTS	5.43
5.2.1 Methods.....	5.43
5.2.2 Results.....	5.48
6.0 PREDICTING EAGLE FATALITIES (ECPG STAGE 3)	6.53
6.1 EAGLE TAKE PREDICTION	6.53
6.2 CUMULATIVE IMPACTS ANALYSIS FOR LOCAL AREA POPULATION	6.56
7.0 AVOIDANCE AND MINIMIZATION OF RISKS AND MITIGATION (ECPG STAGE 4)	7.57
7.1 AVOIDANCE AND MINIMIZATION MEASURES.....	7.57
7.1.1 Design Phase	7.57
7.1.2 Construction Phase	7.58
7.1.3 Operations Phase	7.58
7.2 VOLUNTARY MITIGATION	7.58
8.0 CALIBRATION AND UPDATING OF THE FATALITY PREDICTION AND CONTINUED RISK ASSESSMENT (ECPG STAGE 5)	8.61

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Table of Contents

December 14, 2017

8.1	POST-CONSTRUCTION MONITORING.....	8.61
8.2	OPERATIONS STAFF MONITORING, TRAINING, AND REPORTING.....	8.62
	8.2.1 Operations Staff Monitoring	8.62
	8.2.2 Training.....	8.63
8.3	ADAPTIVE MANAGEMENT	8.63
	8.3.1 Direct Eagle Take.....	8.63
	8.3.2 Eagle Nest Disturbance	8.64
9.0	LITERATURE CITED	9.67

LIST OF TABLES

Table 2-1	Comparison of the WEG Tiers and the ECPG Stages	2.8
Table 2-2	Summary of Agency Consultation for Thunder Ranch Wind Project	2.9
Table 3-1	Project Habitat and Expected Impacts	3.25
Table 5-1	Eagle-Minutes per Survey Point	5.40
Table 6-1	USFWS's Collision Risk Model Inputs and Outputs for Thunder Ranch Wind Project	6.54
Table 6-2	Thunder Ranch's LAP Take Calculations	6.55
Table 8-1	Adaptive Management Framework for Thunder Ranch Wind Project	8.64

LIST OF FIGURES

Figure 3-1	Project Location.....	3.15
Figure 3-2	Project Features	3.17
Figure 3-3	National Land Cover Dataset.....	3.21
Figure 3-4	Water Features.....	3.23
Figure 3-5	Project Topography	3.27
Figure 4-1	ERA Scope and Referenced Data Locations.....	4.31
Figure 5-1	Eagle Observation Point Locations.....	5.37
Figure 5-2	Eagle Minutes Per Observation Point October 2015 – September 2017	5.41
Figure 5-3	Eagle-Minutes per Survey Month.....	5.43
Figure 5-4	Eagle and Raptor Nest Survey Areas.....	5.45
Figure 5-5	Aerial Nest Survey Flight Paths	5.49
Figure 5-6	Bald Eagle Nest Locations.....	5.51

LIST OF APPENDICES

APPENDIX A	PHOTOGRAPHS	A.71
APPENDIX B	EAGLE TAKE ESTIMATE MODEL RESULTS.....	B.77
APPENDIX C	WILDLIFE INCIDENT REPORTING FORM (WIRF)	C.81
APPENDIX D	MEETING NOTES	D.85

Abbreviations

APLIC	Avian Power Line Interaction Committee
BBCS	Bird and Bat Conservation Strategy
BGEPA	Bald and Golden Eagle Protection Act
CFR	Code of Federal Regulations
CI	confidence interval
CRM	Collision Risk Model
DWP	Density Weighted Proportion
E	endangered
ECP	Eagle Conservation Plan
ECPG	Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2
EGPNA	Enel Green Power North America, Inc.
EOP	eagle observation point
ERA	Eagle Risk Assessment
FR	Federal Register
ft	foot
ft ²	square foot
GIS	geographic information system
ITP	Incidental Take Permit
km	kilometer
km ²	square kilometer
m	meter
m ²	square meter

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Abbreviations

December 14, 2017

met	meteorological
mi	mile
mi ²	square mile
MBTA	Migratory Bird Treaty Act
MW	megawatt
ODWC	Oklahoma Department of Wildlife Conservation
Project	Thunder Ranch Wind Project
Stantec	Stantec Consulting Services Inc.
Sutton Center	George Miksch Sutton Avian Research Center
T	threatened
Thunder Ranch	Thunder Ranch Wind Project, LLC
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
WEG	Land-based Wind Energy Guidelines, Version 2
WIRS	Wildlife Incident Reporting System

1.0 INTRODUCTION

Thunder Ranch Wind Project, LLC (Thunder Ranch), which is developing the Thunder Ranch Wind Project (Project) in Garfield, Kay, and Noble counties, Oklahoma, has prepared this Eagle Conservation Plan (ECP) as part of Thunder Ranch's environmental due diligence activities to adhere to applicable laws and regulations during the siting, construction, and operation of the Project. The Project is located within the range of the Bald Eagle (*Haliaeetus leucocephalus*) and has the potential to impact this species. The Project is also within the winter range of the Golden Eagle (*Aquila chrysaetos*) but is not expected to impact Golden Eagles due to their rarity in Central Oklahoma (ODWC 2011). The U.S. Fish and Wildlife Service (USFWS) recommends wind project developers follow the Eagle Conservation Plan Guidance (ECPG) to comply with the regulatory requirements of the Bald and Golden Eagle Protection Act (BGEPA) and avoid unintentional "take" of eagles at the wind facility. This ECP was prepared following the ECPG to the extent possible and in consultation with the USFWS to address the Project's potential impact on Bald Eagles.

1.1 PURPOSE

The purpose of this ECP is to establish measures to ensure the Project's compliance with BGEPA and other applicable regulations. This ECP will (1) outline the development process of the Project in regard to eagles, (2) summarize the results of Thunder Ranch's site-specific eagle surveys, (3) evaluate the risk to eagles as a result of Project construction and operation, (4) provide a framework for eagle conservation and post-construction monitoring plans, and (5) provide the necessary information to support an application for a Bald Eagle incidental take permit (ITP), if necessary.

The operation of the Project is proposed to help fill the need for a more diverse national energy portfolio and a reduction in greenhouse gases that includes a higher percentage of energy produced from renewable sources. Operation of the Project will generate electricity using no fuels or water and with zero air emissions. Additionally, the Project will not generate any waste that would require discharge to environmental resources.

1.2 CORPORATE APPROACH

The Enel Group (the parent company of Enel Green Power North America, Inc. [EGPNA] and owner of the Project) and Thunder Ranch respect the environment and have taken a voluntary and pro-active global position in policies of environmental sustainability. This is important to ensuring ecofriendly, reasonably priced, continuous, and secure energy supplies to Enel Group's customers. For this purpose, the Enel Group uses best available technologies and is committed to continuous improvement. In 2009, together with 59 other chief executive officers of power companies from 27 of Euroelectric's countries, Enel Group signed a declaration where it pledged to become carbon-neutral by 2050.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Introduction

December 14, 2017

In 2009, Enel Green Power (Enel) was officially presented to the international finance community. The company was set up to manage and develop the Enel Group's renewable portfolio. Enel actively contributes to efforts to reduce the impacts of global climate change. The environment, climate change combat, and sustainable development are a major consideration in Enel's activities and in consolidating the Enel Group's leadership in the energy market. In particular, the environmental policy is founded on three basic principles and aims at achieving 10 strategic targets.

Principles:

- Safeguard the environment
- Improve and promote the environmental features of products and services
- Create corporate value

Strategic Objectives:

- Apply internationally recognized environmental management systems to its entire operation
- Optimize integration of installations and buildings into the landscape, while conserving biodiversity
- Mitigate environmental impacts by applying the best available technologies and the best practices in building, operating, and decommissioning its installations
- Provide leadership in renewables and low-emission electricity generation
- Use energy, water, and raw materials efficiently
- Optimize management of waste and liquid releases
- Develop innovative technologies for the environment
- Communicate Enel's environmental management efforts to the public at large and institutions
- Provide environmental awareness, training, and education to employees
- Promote environmentally sustainable practices among suppliers and contractors

These principles and targets have been endorsed by the Chief Executive Officer and General Manager of the Enel Group. The Enel Group makes sustainable development throughout the world an integral part of its business strategy; EGPNA has a long-term investment in advancing renewable energy in the United States and Canada using these same ideals. The need for clean and commercially viable energy is at an all-time high. EGPNA's portfolio of clean energy technology (i.e., wind, solar, hydro, biomass, and geothermal energy) is facilitating the growth of renewable energy as demands on North American energy markets continue to expand.

1.3 BALD EAGLE DESCRIPTION

The second largest bird of prey in North America, the adult Bald Eagle has a brown body with a distinctive white head and tail and with a yellow bill and feet. Juvenile Bald Eagles are covered with dark brown feathers mixed with white feathers (Buehler 2000). The Bald Eagle was listed as endangered under the Endangered Species Act (ESA) in 1978, but in 1999 the species had recovered sufficiently for USFWS to propose removing it from the ESA (DOI 2007). It was officially delisted in 2007, though the Bald Eagle is still protected under BGEPA and Migratory Bird Treaty Act (MBTA; see Sections 2.1.1. and 2.1.2). Both breeding and wintering Bald Eagle populations occur in Oklahoma.

Bald Eagles breed throughout most of the subarctic Alaska and Canada, with breeding populations associated with aquatic habitats (coastal areas, rivers, lakes, and reservoirs) throughout much of the Lower 48 States. Breeding Bald Eagles are very territorial and typically nest in large, mature trees with an open branch structure in areas near reservoirs or large rivers, and rarely near smaller ponds, lakes, or creeks (Buehler 2000; Reinking 2004). Nests are usually less than 1.2 kilometer (km) or 0.8 miles (mi) from a water source with suitable foraging opportunities and generally greater than 500 meters (m) or 1,640 feet (ft) away from human disturbance (Buehler 2000). Bald Eagle nests are large (4-6 ft in diameter or more, and 3 ft or deeper), made of large sticks, and lined with grasses and other soft vegetation (USFWS 2007b).

The migration patterns of Bald Eagles are complex and are dependent on the age of the individual (immature or adult), the location of the breeding site (north vs. south, interior vs. coastal), the climate of the breeding site, and the availability of food. Bald Eagles migrate alone, although they will congregate with other eagles at feeding and roost sites, which are generally associated with aquatic foraging areas (within 10 km [6 mi] of the foraging area; Buehler 2000). Migrating Bald Eagles will pass over unsuitable, human-developed habitat, but they will also follow traditional migration pathways. Stopover sites during migration have abundant food resources such as fish and waterfowl concentrations or the presence of large mammals as carrion. Most stopover sites also have traditional communal roost sites, which are often clumps of mature deciduous trees in riparian areas protected from human disturbance (Buehler 2000). During the winter, Bald Eagle communal roosts are generally located in open and accessible large deciduous or coniferous trees (Buehler 2000). Communal roost trees are between 15 to 60 m (49 to 197 ft) in height, are associated with aquatic foraging areas, and are located away from houses and roads. Communal roost locations are also selected because of their ability to protect eagles from prevailing winter winds (Buehler 2000).

The distribution of Bald Eagles across the landscape is most related to the availability of food. Nest locations are also tied to the location of foraging areas. The Bald Eagle's primary prey is fish, but they are opportunistic feeders. During the winter, they are frequently found near large bodies of water and large rivers where the water is more likely to stay at least partially free of ice throughout the winter (Buehler 2000; USFWS 2007b). Bald Eagles will also feed on wild and domestic carrion along roads, in landfills, and at feedlots (USFWS 2007b). Large carcasses can potentially be fed on for many days (Buehler 2000).

2.0 REGULATORY FRAMEWORK

There are two federal regulations and two guidance documents relevant to this ECP. The applicable regulations are the Bald and Golden Eagle Protection Act (16 United States Code [USC] §668-668d) and the Migratory Bird Treaty Act (16 USC §703 et seq.). The two guidance documents applicable to this ECP are the *USFWS Land-Based Wind Energy Guidelines* (USFWS 2012) and the *Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2* (USFWS 2013).

2.1 APPLICABLE LAWS AND REGULATIONS

2.1.1 Bald and Golden Eagle Protection Act

The BGEPA was first passed in 1940 and provides protection to the Bald Eagle and Golden Eagle (as amended in 1962). The BGEPA prohibits the "take, possession, sale, purchase, barter, offer to sell, transport, export, or import of any bald or golden eagle (dead or alive) including any part, nest, or egg, unless allowed by permit" (16 USC §668a; 50 Code of Federal Regulations [CFR] §22). In the BGEPA, "take" means to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb" (50 CFR §22.3). "Disturb" means "to agitate or bother a bald or golden eagle 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" (50 CFR §22.3). The BGEPA provides civil and criminal penalties for persons who violate these regulations without a permit from the USFWS.

In September 2009, the USFWS established rules (50 CFR §22.26 and §22.27) authorizing limited take of Bald or Golden Eagles and their nests through take permits (hereafter referred to as the 2009 Eagle Permit Rule). As part of the 2009 Eagle Permit Rule, the USFWS established thresholds of take under which a regional population of eagles would maintain stable or increasing eagle populations. Under the 2009 Eagle Permit Rule, take permits had a duration of five years. These take thresholds were determined individually within Eagle Management Units (EMUs; USFWS 2009). In December 2016, the USFWS revised the 2009 Eagle Permit Rule to allow for eagle take permits of longer duration (up to 30 years) and other associated modifications to 50 CFR Parts 13 and 22. These modifications took effect January 17, 2017 and included new take thresholds, changes to how sustainable take is calculated on a project by project basis, new EMUs, survey requirements, etc. (81 Federal Register [FR] 91494, Dec. 16, 2016; hereafter referred to as the 2016 Eagle Rule Revisions).

Under the 2016 Eagle Rule Revisions, take limits for permits issued by the USFWS under the BGEPA must not exceed the cumulative take thresholds established within an EMU and within the local area population (LAP), or the proposed take must be mitigated. The Project is located within the Central Flyway EMU. An eagle ITP can be issued when the take is associated with, but not the purpose of, an otherwise legal activity and where the take "cannot practicably be avoided" (50

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Regulatory Framework

December 14, 2017

CFR §22.26). Under the 2009 Eagle Permit Rule, the LAP for Bald Eagles was defined as a 43-mi buffer around a given project; in the 2016 Eagle Rule Revisions, the LAP was updated to include an 86-mi buffer around a project. The 2016 Eagle Rule Revisions set a Bald Eagle take threshold of 5% of the 86-mi LAP and 6% of the EMU population (81 FR 91494, Dec. 16, 2016).

Under the 2016 Eagle Rule Revisions, the USFWS can issue an eagle ITP for a maximum duration of 30 years with a review of the permit every 5 years. At each 5-year review, the USFWS will reassess the project's eagle fatality rate, effectiveness of measures to reduce take, the appropriate level of compensatory mitigation, and the eagle population status. The 5-year review will include an update of a project's take limit and modifications to compensatory mitigation measures, as necessary, to achieve the requirements of BGEPA's preservation standards, i.e., that permits are "consistent with the goals of maintaining stable or increasing breeding populations in all [EMUs] and the persistence of local populations" (50 CFR §22.3).

2.1.2 Migratory Bird Treaty Act

The MBTA is a joint agreement between the United States, Canada, Mexico, Japan, and Russia to ensure the protection of a shared migratory bird resource. All migratory birds and raptors, including eagles, in North America are protected under the MBTA (16 USC §703 et seq.). The MBTA prohibits the take, kill, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior (16 USC §703). The word "take" is defined by the MBTA as any act that pursues hunting, wounding, killing, or capturing migratory birds (50 CFR §10.12). Bald and Golden Eagles are protected under the MBTA.

2.2 APPLICABLE GUIDANCE DOCUMENTS

2.2.1 Eagle Conservation Plan Guidance

The USFWS issued the ECPG in 2013 to assist wind developers in their efforts to adhere to the BGEPA. The ECPG details the USFWS's approach to the issuance of eagle incidental take permits for wind facilities under the 2009 Eagle Permit Rule and provides guidance on the development of ECPs. Adherence to the ECPG is voluntary, but the USFWS has developed the ECPG to assist wind-facility developers with regulatory compliance regarding eagle take, avoidance and minimization of unintentional eagle take, and provide the information to support an eagle take permit application (USFWS 2013). In the 2016 Eagle Rule Revisions, the USFWS requires permittees use USFWS-endorsed survey methods with minimum survey requirements (see Section 5.0). Permittees who follow the ECPG will meet these minimum requirements; however, the ECPG was not incorporated by reference into the 2016 Eagle Rule Revisions, and therefore, compliance with the ECPG is not necessary to receive an eagle ITP. This ECP has been prepared in accordance with the ECPG to the extent possible.

The ECPG describes a five-stage approach for siting new wind facilities:

- **Stage 1** is the preliminary site evaluation, which includes the landscape-level screening of one or more potential project sites (Section 4.0).

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Regulatory Framework

December 14, 2017

- **Stage 2** includes site-specific surveys to assess the potential risk of the proposed project to eagles (Section 5.0).
- In **Stage 3**, the USFWS and the project developer or operator use the data from Stage 2 to predict the project's risk to eagles (Section 6.0).
- In **Stage 4**, in coordination with the USFWS, the wind developers identify conservation measures, and compensatory mitigation, as necessary, to be used to avoid or minimize potential risks to eagles to the extent practical (Section 7.0).
- In **Stage 5**, if the USFWS issues a take permit, the project operator conducts post-construction monitoring to evaluate the effectiveness of the conservation measures and/or compensatory mitigation (Section 8.0).

The ECPG also outlines the USFWS's process for evaluating the level of risk to eagles at a given wind project, and thus the need for an eagle ITP. A project's potential risk to eagles is evaluated based on the following areas:

Project Footprint – the boundary that encompasses the wind project inclusive of the hazardous area around all turbines and any associated infrastructure, including utility lines, out-buildings, roads, etc. (USFWS 2013, pg. 12)

Project Area – the area that includes the Project Footprint plus a 10-mile buffer, which is a conservative approximation of the largest recorded Golden Eagle breeding territory size (USFWS 2013, pg. 12).

Local Area Population (LAP) – refers to the eagle population within a distance from the Project Footprint equal to the species median natal-dispersal distance (86 mi for Bald Eagles) (81 FR 91494, Dec. 16, 2016; USFWS 2013, pg. iv).

A project's risk to eagles is based on proximity of the Project Footprint to important eagle-use areas¹ or migration concentrations sites and the project's annual eagle fatality estimate in relation to the population size of the LAP. Should a project be considered high risk to eagles without the opportunity to mitigate impacts, the USFWS recommends that the project not be constructed or should be substantially redesigned. An eagle ITP is recommended for projects with a moderate to high risk to eagles and the opportunity to mitigate impacts. Projects that pose a low risk to eagles do not require or warrant an eagle ITP (USFWS 2013). The USFWS encourages wind developers to coordinate with the USFWS concerning a project's risk to eagles and the decision to pursue an eagle ITP or not.

¹ The USFWS defines these as "an eagle nest, foraging area, or communal roost site that eagles rely on for breeding, sheltering, or feeding, and the landscape features surrounding such nest, foraging area, or roost site that are essential for the continued viability of the site for breeding, feeding, or sheltering eagles" (USFWS 2009; 50 CFR §22.3).

2.2.2 Land-Based Wind Energy Guidelines

The USFWS developed the WEG to assist wind project developers by providing a structured process for evaluating and addressing wildlife conservation concerns at all stages of land-based wind energy development (USFWS 2012). Adherence to the WEG is voluntary and is meant to facilitate communication among wind energy developers and federal, state, and local conservation agencies. The WEG includes a five-tiered process for assessing potential adverse effects to species of concern and their habitats. The five tiers are:

- **Tier 1** – Preliminary Site Evaluation
- **Tier 2** – Site Characterization
- **Tier 3** – Field Studies and Impact Prediction
- **Tier 4** – Post-construction Studies to Estimate Impacts
- **Tier 5** – Other Post-construction Studies and Research

The WEG's tiers are different than the ECPG's stages, but the stages fit within the tiers, as shown in Table 2-1. The Project's Bird and Bat Risk Assessment (Stantec 2017c) and Bird and Bat Conservation Strategy (BBCS; Stantec 2017b) were prepared to address the WEG with regards to birds and bats.

Table 2-1 Comparison of the WEG Tiers and the ECPG Stages

Land-Based Wind Energy Guidelines Tiers	Eagle Conservation Plan Guidance Stages
Tier 1. Preliminary evaluation or screen of potential sites	Stage 1. Site assessment
Tier 2. Site characterization (landscape scale)	
Tier 3. Field studies to document site wildlife and habitat and predict project impacts	Stage 2. Site-specific surveys and assessments
	Stage 3. Predicting eagle fatalities
	Stage 4. Avoidance and minimization of risk using best management practices and compensatory mitigation
Tier 4. Post-construction studies to estimate impacts	Stage 5. Calibration and updating of the fatality prediction and continued risk assessment
Tier 5. Other post-construction studies and research	

Sources: USFWS 2012, 2013

2.3 CONSULTATION HISTORY

Thunder Ranch initiated consultation with the USFWS and Oklahoma Department of Wildlife Conservation (ODWC) in December 2015, and consultation has been ongoing. Thunder Ranch's consultation with the USFWS and ODWC is summarized in Table 2-2.

Table 2-2 Summary of Agency Consultation for Thunder Ranch Wind Project

Type of Consultation	Date	Parties Involved	Notes
Letter from Thunder Ranch to USFWS	12/10/2015	Thunder Ranch USFWS-Tulsa Office	Request for information on sensitive species/habitats; no response letter received
Letter from Thunder Ranch to ODWC	12/10/2015	Thunder Ranch ODWC	Request for information on sensitive species/habitats
Letter from ODWC to Thunder Ranch	12/18/2015	Thunder Ranch ODWC	ODWC response; ODWC provides initial information on sensitive species/habitats; mentions the Project's proximity to Kaw Lake, Great Salt Plains Lake, and Sooner Lake/occurrence of wintering Bald Eagles at these locations
In-Person Meeting	1/28/2016	Thunder Ranch Stantec USFWS-Tulsa Office ODWC	Stantec presented eagle-use survey results to date; USFWS request a livestock carcass removal system be implemented during Project operations; Stantec describes planned future surveys (continued eagle-use surveys, spring 2016 eagle nest survey, continued migratory bird and raptor migration surveys); ODWC suggested Thunder Ranch make note of prairie dog colonies incidentally observed at the Project during other surveys
Conference Call and Web Presentation Meeting	6/16/2016	Thunder Ranch Stantec USFWS-Tulsa Office ODWC	Stantec presented eagle-use survey and nest survey results to date; USFWS requested Thunder Ranch open consultation with the regional USFWS office in Albuquerque, NM (Region 2) in regard to eagle use at the Project
In-Person Meeting	8/12/2016	Thunder Ranch Stantec USFWS-Region 2 Office USFWS-Tulsa Office ODWC	Stantec presented the Stage 1 ERA, eagle-use surveys, and nest survey results to date; Stantec requested information on USFWS's eagle take estimation model/future eagle survey methods/duration of future eagle surveys/proposed changes to the Eagle Permit Rule/ECP preparation
E-Mail Correspondence	1/20/2017	Stantec USFWS-Region 2 Office USFWS-Tulsa Office	USFWS provided guidance on using local survey data for calculating eagle density estimates

Type of Consultation	Date	Parties Involved	Notes
In-Person Meeting	2/3/2017	Thunder Ranch Stantec USFWS–Region 2 Office USFWS–Tulsa Office ODWC	Stantec and Thunder Ranch updated participants on survey results to date and construction timeline, and requested information of specifics on the 2016 Eagle Rule Revisions through a series of questions pertaining to the Project
E-Mail Correspondence	3/15/2017	Thunder Ranch Stantec USFWS–Region 2 Office USFWS–Tulsa Office ODWC	USFWS provided answers to the questions posed during the 2/2/2017 meeting, including guidance on survey effort, calculating eagle density estimates, and compensatory mitigation
Conference Call	3/31/2017	Thunder Ranch Stantec USFWS–Region 2 Office USFWS–Tulsa Office ODWC	Stantec provided results of the 2017 eagle nest surveys; Participants discussed calculating LAP Bald Eagle population; Thunder Ranch described their voluntary micro-siting efforts; Further discussion regarding 2016 Eagle Rule Revisions

In two letters, both dated December 10, 2015, Thunder Ranch requested the USFWS and ODWC to provide comment on sensitive species or habitats that may be impacted by Project construction and operation. In regard to eagles, their response letter dated December 18, 2016, ODWC noted Bald Eagles occur in high densities at Kaw Lake during the winter; Bald Eagles will congregate at the Kaw hydroelectric dam, where they can find open water and prey on fish during cold weather when other water bodies are frozen over. Kaw Lake is approximately 12.5 mi northeast of the Project. ODWC also noted Great Salt Plains Lake (33 mi northwest of the Project) and Sooner Lake (1 mi southeast from the current Project boundary) are also significant stopover areas for waterfowl, shorebirds, and eagles. ODWC recommended Thunder Ranch bury the Project's transmission line if possible or follow the Avian Power Line Interaction Committee (APLIC) guidance for reducing avian collisions with power lines (APLIC 2012).

The USFWS did not provide a written response to Thunder Ranch's initial letter, but USFWS representatives have been present at all agency consultation meetings regarding the Project. On January 28, 2016, Thunder Ranch and Stantec met with the USFWS Tulsa, Oklahoma, office and ODWC. Regarding eagles, Stantec presented the methods and results of the eagle-use surveys completed to date (October 2015 – January 2016; see Section 5.1.2), and outlined the methods for the planned eagle nest survey in spring 2016 (see Section 5.2). The USFWS asked if Thunder Ranch planned to remove livestock carcasses during Project operations; livestock carcasses have the potential to attract foraging eagles. Thunder Ranch confirmed they were aware of the potential for carcasses to attract eagles and would implement a plan to manage livestock carcasses near Project turbines.

On June 16, 2016, Thunder Ranch and Stantec conducted a conference call with the USFWS Tulsa Field Office and ODWC to present an update on the Project. Stantec presented the results of the eagle-use surveys to date (October 2015 – May 2016) and the spring 2016 eagle nest survey. ODWC requested Thunder Ranch share the locations of eagle nests found during the

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Regulatory Framework

December 14, 2017

nest survey to be incorporated into a Bald Eagle telemetry study conducted by ODWC and the U.S. Geological Survey. Thunder Ranch agreed to share the data at the request of those directly in charge of the study. The representatives from the USFWS Tulsa office requested Thunder Ranch share the results of the Project's eagle surveys with the USFWS Region 2 office in Albuquerque, New Mexico, and recommended Thunder Ranch solicit input regarding eagles and the Project.

On August 12, 2016, Thunder Ranch and Stantec met with personnel from the USFWS Region 2 office and ODWC in Albuquerque, New Mexico. Prior to the meeting, the USFWS and ODWC were provided with copies of the Project's Stage 1 Eagle Risk Assessment (ERA; see Section 4.0). Stantec presented an overview of the ERA results, the results of the eagle-use surveys to date (October 2015 – July 2016), and the spring 2016 eagle nest survey. The USFWS recommended Thunder Ranch add eagle-use survey points to the eastern portion of the Project near the Salt Fork Arkansas River (Salt Fork) and the Arkansas River. They also suggested a second winter of eagle-use surveys would be beneficial and eagle nests observed in 2016 should be revisited in 2017. Stantec solicited information and guidance from the USFWS regarding the USFWS's eagle take estimation model (see Section 6.1), eagle-use survey methods, proposed changes to the 2009 Eagle Permit Rule, and the development of this ECP.

On February 3, 2017, Thunder Ranch and Stantec met with USFWS Region 2 personnel and ODWC at the USFWS Tulsa Field Office. The purpose of the meeting was to provide an update of survey effort and results, provide an update of the construction schedule, and to solicit information from the USFWS regarding the 2016 Eagle Rule Revisions. Thunder Ranch posed a series of questions pertaining to the development of an ECP, recommended survey effort, take calculations, LAP calculations, compensatory mitigation, and future monitoring requirements. During the meeting, it was agreed that:

- The 2-years of pre-construction surveys requirement could be waived by the USFWS, as the facility had completed one full year and two winters of surveys documenting that Bald Eagle presence in the project area is highest during the winter and an additional summer survey was not anticipated to materially influence take estimates;
- Take calculations can be run without a full 2-years of data;
- Collecting eagle use data during construction may produce inconclusive results;
- The number of eagles in the Project LAP based on calculations made using the Central Flyway EMU eagle density is too low; therefore, an alternative analysis should be used based on local data;
- Additional nest monitoring and eagle use surveys are not required after construction; and
- The next meeting should occur in March.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Regulatory Framework

December 14, 2017

On March 31, 2017, Stantec hosted a conference call with Thunder Ranch, USFWS Region 2 personnel, and ODWC to present the results of the 2017 aerial eagle nest survey, provide an update on construction schedule, discuss calculations for LAP using active nesting pair data, and to discuss updates to the ECP. Stantec presented figures showing the locations of new eagle nests observed during the spring 2017 nest survey, which included one nest within 2 miles of 2 of the Project turbines. Thunder Ranch described their voluntarily micro-siting efforts to avoid constructing the turbines in proximity to the nest. The USFWS informed Thunder Ranch that their revised current recommendation is to not use local data for LAP calculations due to concerns about inconsistencies with implementation of the eagle take permit program; therefore, Service staff recommended the use of the old Region 2 Lower Mississippi 2009 EMU population estimates to derive the LAP number. It is commonly acknowledged that bald eagle populations have considerably increased since 2009. Further, Service staff indicated it would be difficult to obtain a waiver for anything less than 2 years of monitoring. The next meeting was scheduled to occur after a draft ECP is submitted to the USFWS.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
Project Development and Description
December 14, 2017

3.0 PROJECT DEVELOPMENT AND DESCRIPTION

The Project is located in Garfield, Kay, and Noble counties, Oklahoma, and its boundary incorporates approximately 87,000 acres (136 mi²). It is located between U.S. Highway 177 near Marland, Oklahoma, and State Highway 74 near Billings, Oklahoma, and is bisected north to south by Interstate 35. The Project's boundary is shown in Figure 3-1. Previous Project boundaries relevant to the discussions in this ECP are also shown in Figure 3-1. The Project consists of 120 turbines that will generate a nameplate capacity of 300 megawatts of electricity. Construction began in March 2017, and the Project is expected to become operational before the end of 2017.

In 2015, the Project developer evaluated potential wind project sites throughout the state of Oklahoma using an internal geographic information systems (GIS)-based model that integrates questions from the USFWS WEG Tier 1-Preliminary Site Evaluation and incorporates publicly available data. Among other things, the model screens potential sites for significant risks to environmental resources, including wildlife species and habitat; and its results help inform site selection decisions. Based on the Project developer's internal evaluation, Thunder Ranch was determined to be a suitable wind project site with low risk to environmental resources.

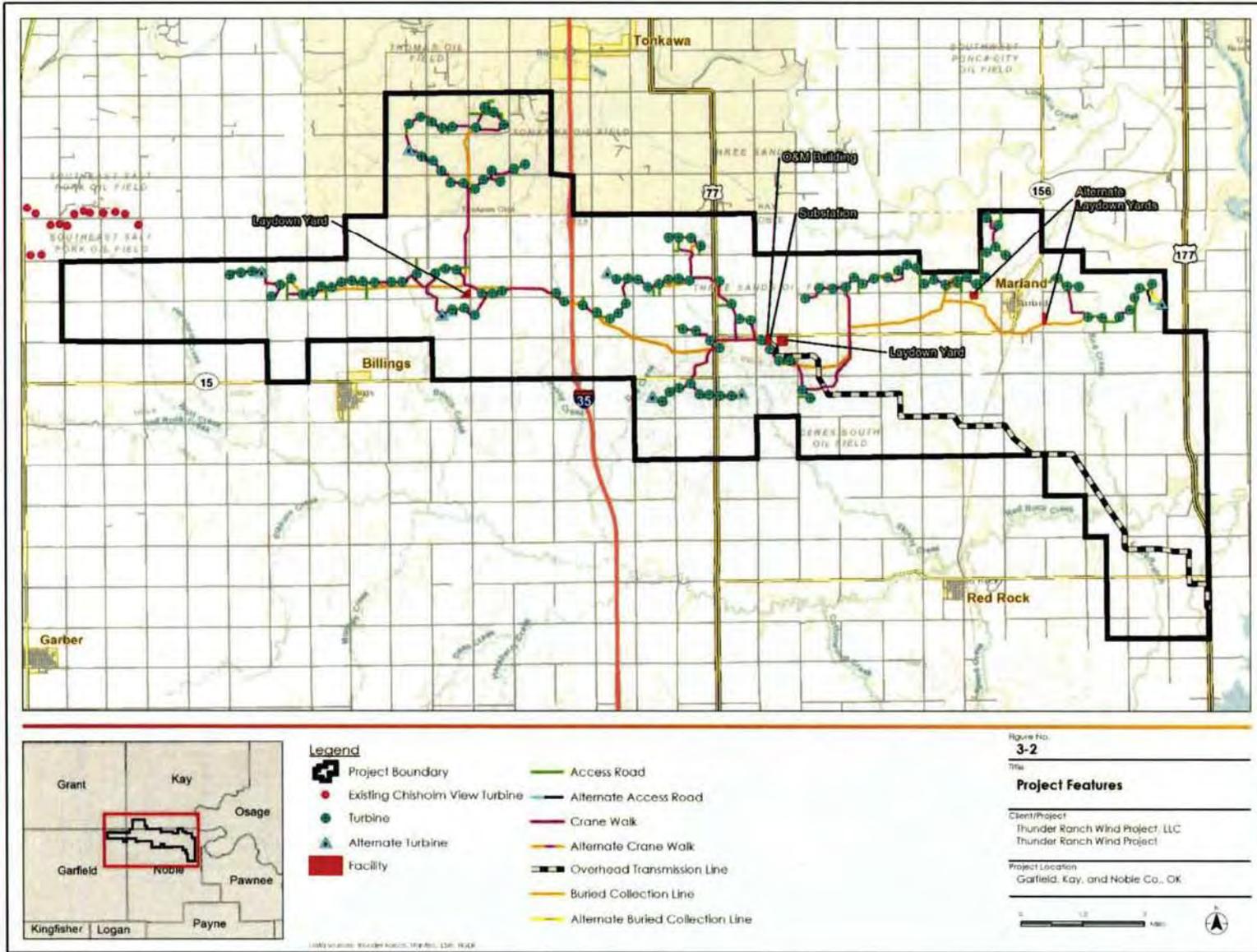
3.1 PROJECT INFRASTRUCTURE

Project construction will consist of the erection of 120 wind turbine generators and associated electrical collection lines, access roads, crane paths, transmission line, and support facilities. The proposed locations of Project infrastructure are shown in Figure 3-2. Project infrastructure will consist of the following:

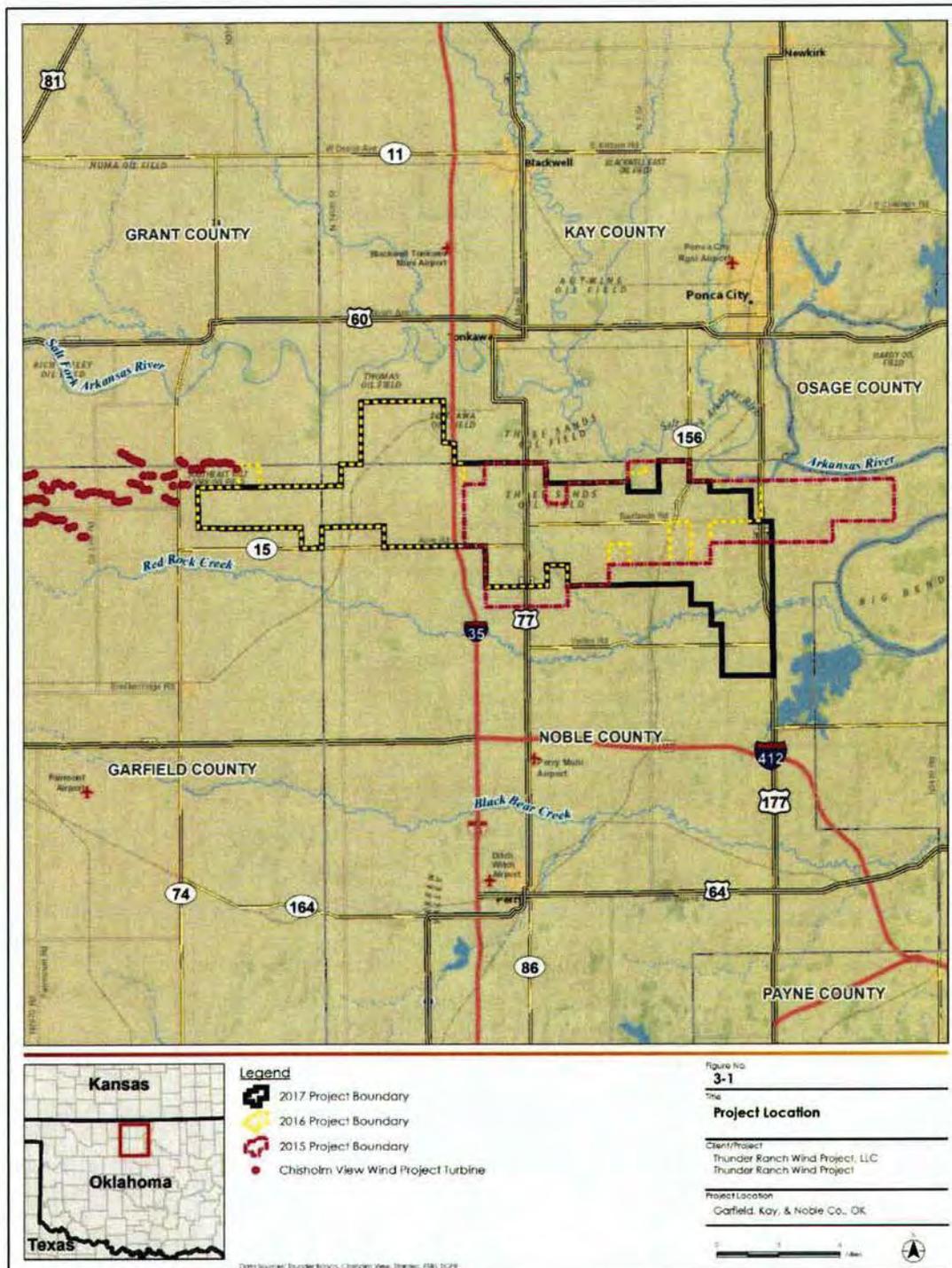
- 109 GE 2.5 megawatt (MW) turbines and 11 GE 2.3 MW wind turbines. The 2.5 MW turbines have a nacelle height of 90 m above the ground and a maximum rotor blade tip height of 148 m. The 2.3 MW turbines have a nacelle height of 80 m and a maximum rotor blade tip height of 138 m. Both types of turbines have a rotor diameter of 116 m and a rotor swept area of 10.6 square kilometers (km²),
- One Operations and Maintenance (O&M) Building located on approximately 2.5 acres, about 6 miles (mi) west of Marland, Oklahoma, on State Highway 156.
- Approximately 32 miles of private access roads, approximately 16 ft in width, will be constructed to connect the wind turbines with public roads. Access roads will allow equipment and vehicle access for construction and subsequent maintenance of the facilities.
- One new electrical substation will be located on approximately 5 acres and will be adjacent to the new O&M Building.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
 Project Development and Description
 December 14, 2017



EAGLE CONSERVATION PLAN
 Thunder Ranch Wind Project, LLC
 Project Development and Description
 December 14, 2017



EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
Project Development and Description
December 14, 2017

- An approximately 15-mi, overhead, 345-kilovolt transmission line that will connect the Project's substation with an interconnection located about 6 mi east and 1 mi south of Red Rock, Oklahoma.
- Approximately 124 miles of underground electrical collection lines, which will deliver the electricity generated by the turbines to the Project's substation. Where practical, the underground collection system will be installed along the same right-of-way corridor as the access roads.
- 4 permanent un-guyed meteorological (met) towers. Towers will be 350 ft tall and painted with red and white candy-stripe markings.
- 2 temporary laydown yards from where construction operations will be coordinated. Two of the laydown yards will be approximately 12 acres and one will be approximately 28 acres.
- Approximately 41 mi of temporary crane paths to allow the construction cranes, which assemble the wind turbines, to move from turbine pad to turbine pad.

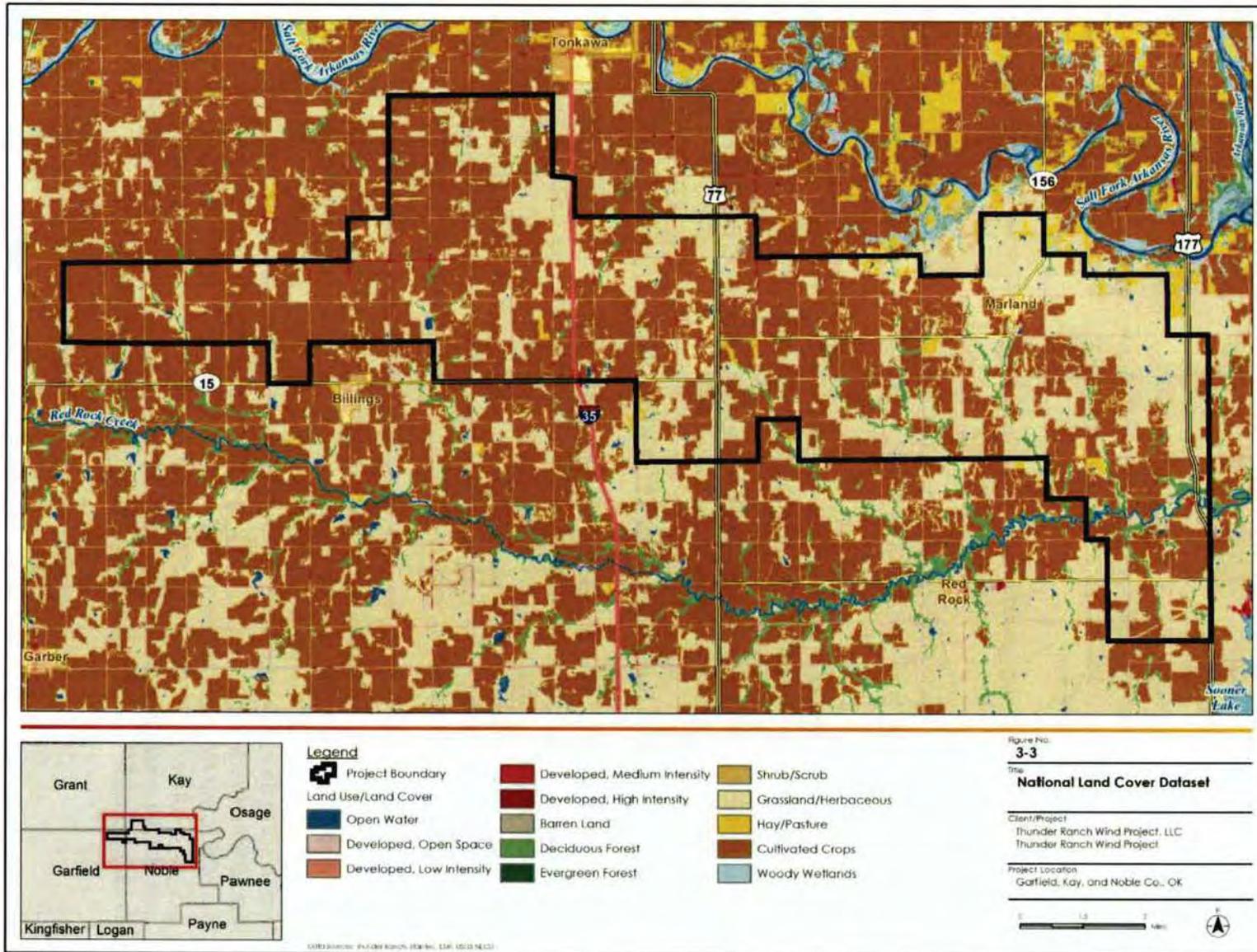
The land cleared for temporary features related to Project construction will be restored to native vegetation or cropland when construction is complete.

3.2 PROJECT HABITAT AND TOPOGRAPHY

The Project boundary incorporates approximately 87,000 acres predominately consisting of cultivated crops and grassland/herbaceous land cover. Land cover within the Project boundary is listed in Table 3-1. Project land use and land cover is shown in Figure 3-3. Cultivated crops within the Project region are primarily winter wheat, grain sorghum, alfalfa, and soybean (Omernik and Griffith 2014). Grasslands within the Project are grazed for cattle production. Photographs of representative habitat within the Project are provided in Appendix A.

Streams within the Project boundary are tributaries of two rivers, the Salt Fork Arkansas River (Salt Fork) and Red Rock Creek. Water features within the Project are shown in Figure 3-4. The Salt Fork is less than 1 mile from the Project's northern boundary at its closest point, and Red Rock Creek passes through the southeast portion of the Project where the overhead transmission line is proposed to be constructed. Both of these rivers are tributaries of the Arkansas River, which is approximately 2.5 miles east of the Project's eastern boundary at its closest point. There are approximately 463 linear miles of streams within the boundary. The Project's southeast boundary is approximately 1 mile from Sooner Lake, a 4,930-acre reservoir. There are also 1,001 National Wetlands Inventory (NWI) wetlands within the Project boundary, ranging in size from 0.02 acres to 364.8 acres and incorporating 1,184 acres within the boundary (USFWS 1985).

EAGLE CONSERVATION PLAN
 Thunder Ranch Wind Project, LLC
 Project Development and Description
 December 14, 2017



EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
 Project Development and Description
 December 14, 2017

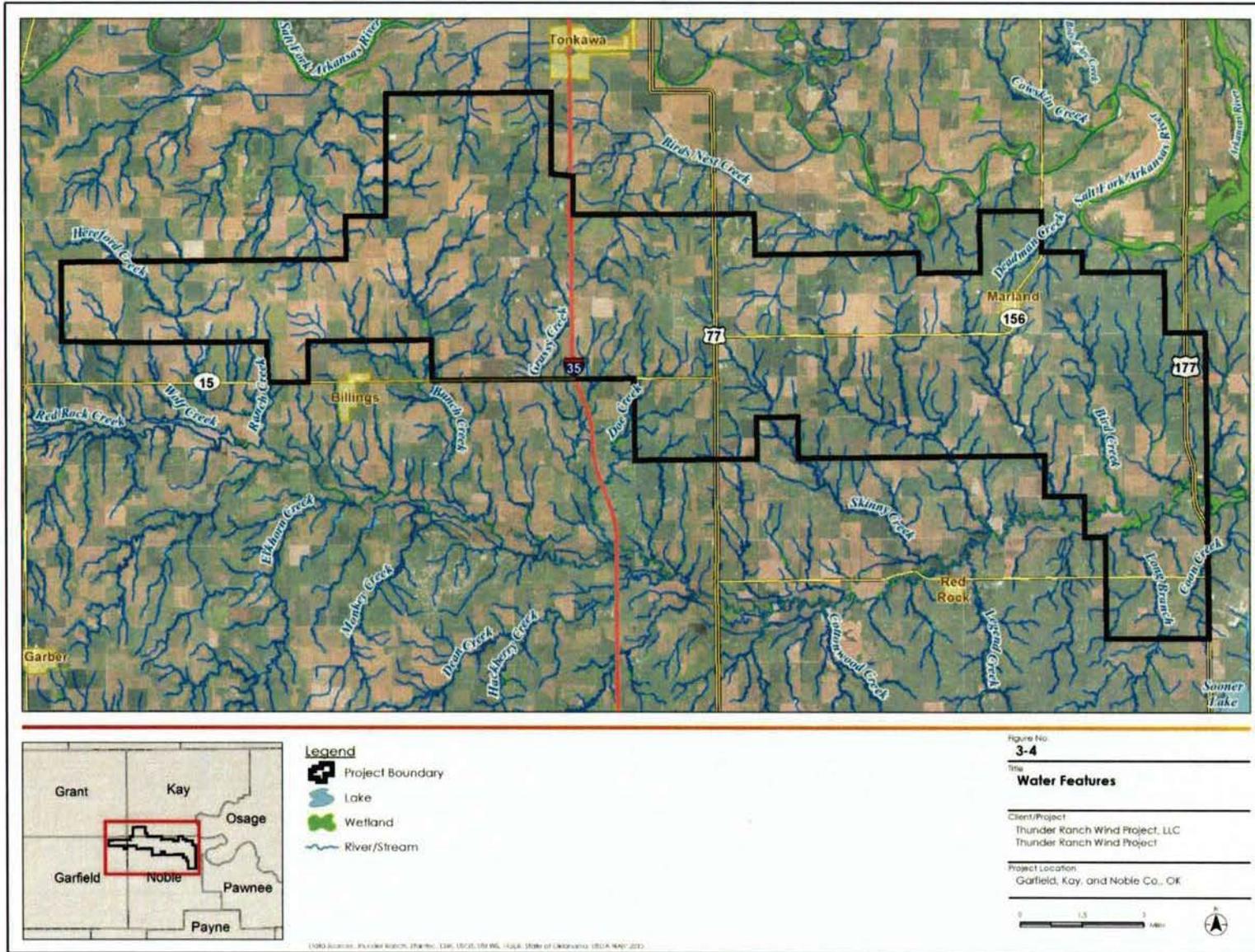


Table 3-1 Project Habitat and Expected Impacts

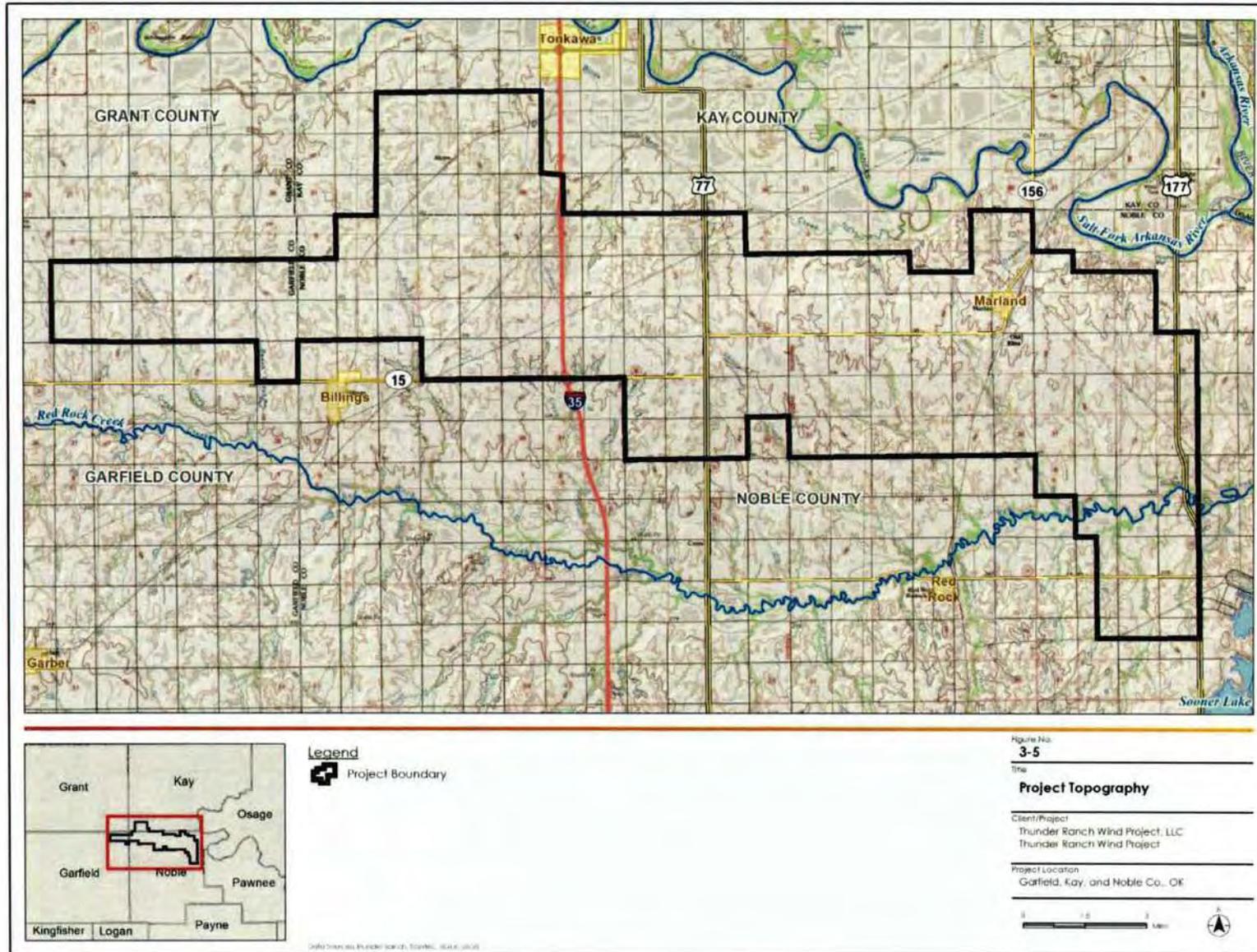
Habitat	Acres within Project	Proportion of Project
Cultivated Crops	47,008.6	54.0%
Grassland/Herbaceous	32,487.6	37.3%
Developed Land	4,533.2	5.2%
Deciduous Forest	1,961.2	2.3%
Pasture/Hay	596.0	0.7%
Open Water	331.6	0.4%
Shrub/Scrub	53.6	0.1%
Barren Land	31.4	0.04%
NWI Wetlands	1,184.3	1.4%
Evergreen Forest	2.0	0.002%
River/Stream	462.7 linear miles	--

Sources: USGS 2016; Homer et al. 2015; USFWS 1985.

Project topography is characterized by gently rolling hills with higher elevations within the majority of the boundary and lower elevations in the vicinity of the rivers to the north (Salt Fork), east (Arkansas River), and south (Red Rock Creek). There is a difference of 365 ft between the highest and lowest elevations within the boundary. Project topography is shown in Figure 3-5.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
 Project Development and Description
 December 14, 2017



EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
Initial Site Assessment (ECPG Stage 1)
December 14, 2017

4.0 INITIAL SITE ASSESSMENT (ECPG STAGE 1)

As part of Stage 1 assessments, Stantec completed an Eagle Risk Assessment (ERA) for the Project in spring 2016 based on information obtained from publicly available data sources, GIS desktop analyses, and by comparing Project features and geography with eagle distributions and life-history characteristics (Stantec 2016d). The purpose of the ERA was to determine whether the Project is within the vicinity of areas known or likely to be used by eagles and to determine the relative spatiotemporal extent and type of eagle use. The ERA provided a preliminary Stage 1 evaluation of the potential risk to eagles from the construction and operation of the Project, and is summarized below. A copy of the Project's Stage 1 ERA is provided in Appendix B.

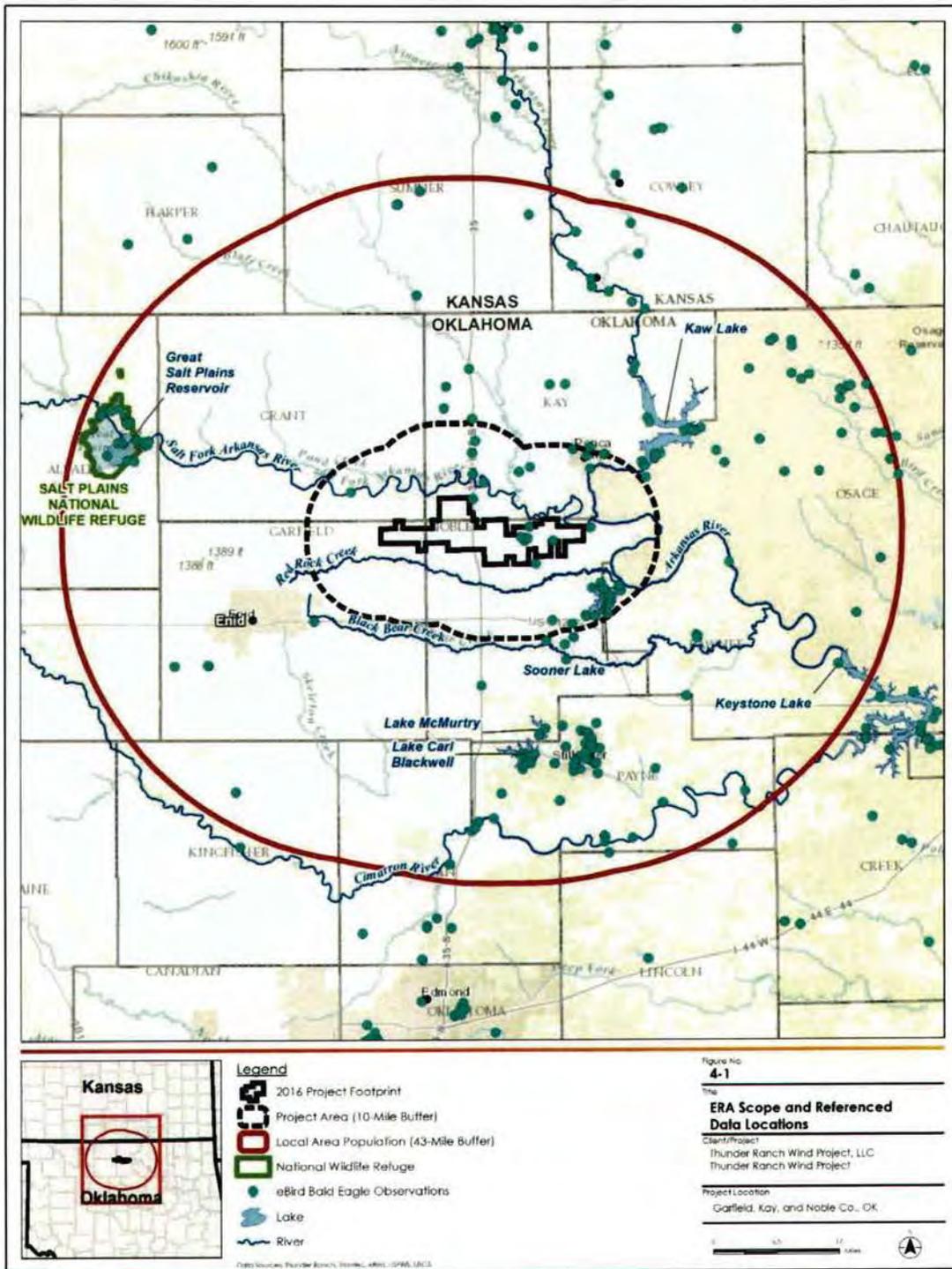
The ERA was prepared in accordance with Appendix B of the ECPG (USFWS 2013) prior to the 2016 Eagle Rule Revisions (see Section 2.1.1); therefore, in the ERA Stantec evaluated Bald Eagles at the Project using a 43-mi LAP. Stantec used the 2016 Project boundary for the Project Footprint, a 10-mi buffer around the 2016 boundary for the Project Area, and 43-mi buffer around the 2016 boundary for the Bald Eagle LAP as shown in Figure 4-1.

Based on the complete assessment (see Appendix B), suitable habitat for breeding, migrating, or wintering Bald Eagles occurs within the 43-mi LAP at the Arkansas River (approximately 3 mi from Project infrastructure), Sooner Lake (<1 mi from Project infrastructure), Kaw Lake (approximately 13 mi northeast), Lake Carl Blackwell (24 mi south), the Cimarron River (30 mi south), Keystone Lake (35 mi southeast), and Salt Plains National Wildlife Refuge (33 mi northwest). Bald Eagles occur in the highest concentrations around major waterbodies with reliable food sources, as demonstrated by the distribution of eBird Bald Eagle sightings from 2011-2016 within the 43-mi LAP (Figure 4-1). Based on limited publicly available information on Bald Eagle nesting locations in Oklahoma, the ERA identified potential nesting areas within the 43-mi LAP along the Arkansas River and at Salt Plains National Wildlife Refuge. In the LAP, Bald Eagle communal roosting habitat occurs at Salt Plains National Wildlife Refuge in large cottonwood trees (USFWS 2014), and potential communal roosting habitat likely occurs at Sooner Lake and Kaw Lake (see Figure 4-1).

Within the Project vicinity, important eagle-use areas included the Arkansas River, Salt Fork, Sooner Lake, and potentially Red Rock Creek. The ERA concluded these areas provide potential suitable nesting habitat due to the availability of superstructure trees and proximity to preferred food sources. In the Project vicinity, communal roost habitat may occur along the Arkansas River, Salt Fork, and Red Rock Creek (see Figure 4-1).

The ERA did not identify substantial suitable nesting or communal roost habitat within the Project Footprint; however, Bald Eagle occurrence within the Project Footprint was deemed probable due to the proximity of the Arkansas River, Salt Fork, and Sooner Lake. Domestic livestock carrion (e.g., cattle carcasses) associated with ranching within the Project Footprint were identified as a

EAGLE CONSERVATION PLAN
 Thunder Ranch Wind Project, LLC
 Initial Site Assessment (ECPG Stage 1)
 December 14, 2017



EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
Initial Site Assessment (ECPG Stage 1)
December 14, 2017

potential food source. Waterbodies within the Project Footprint included small intermittent streams and small farm ponds used for watering livestock (see Section 3.2). Publicly available information obtained for the ERA did not indicate the presence of habitats supporting abundant sources of prey for eagles within the Project Footprint. The small water features within the Project Footprint are not typically used by Bald Eagles for nesting; therefore, the probability of nesting in the Project Footprint was deemed low. The ERA identified communal roost habitat as also limited within the Project Footprint.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Site-Specific Surveys and Assessment (ECPG Stage 2)

December 14, 2017

5.0 SITE-SPECIFIC SURVEYS AND ASSESSMENT (ECPG STAGE 2)

Following methods detailed in the ECPG, Stantec has designed and implemented site-specific surveys to assess the potential risk of the Project to eagles. Thunder Ranch plans to complete two years of site-specific eagle surveys, including:

- **Eagle-Use Surveys:** October 2015 – September 2017 (Stantec 2017d)
- **Eagle Nest Surveys:** March 2016 and March 2017 (Stantec 2016a, 2017a)

Two years of eagle-use surveys were completed monthly from October 2015 through September 2017. Two years of aerial eagle nest surveys have been completed. The purpose of these surveys was to collect the information necessary to calculate a prediction of annual eagle fatalities for the Project (Section 6.1) and to identify important eagle use areas or concentration sites with the potential to be affected by the Project (Section 6.2). At agency meetings, the USFWS was updated on the survey results to date, and the USFWS representatives had the opportunity to comment on survey methods and recommend alterations, if needed (see Section 2.3). Eagle-use survey methods also adhered to the minimum standards required in the 2016 Eagle Rule Revisions: (1) surveys were conducted separately from small bird surveys, (2) trained biologists conducted the surveys, (3) surveys were distributed across daylight hours, and (4) surveys were conducted in all weather conditions except when visibility was less than 800 m horizontally or 200 m vertically.

5.1 EAGLE-USE

5.1.1 Methods

Eagle-use surveys at the Project were initiated in October 2015. The eagle observation points (EOPs) were initially developed for a 366-MW project layout. This layout generally corresponds with the 2016 Project boundary. Using ArcGIS software, Stantec buffered the proposed turbine locations by 1 kilometer (km) (USFWS 2013, p. 57), which was 243,924,865 square meters (m²). To achieve the ECPG's recommendation of a minimum spatial coverage of at least 30% of this area (USFWS 2013, p. 54), Stantec calculated 36 EOPs (each with an 800-meter radius circular survey plot [2,010,619 m²]) were necessary to cover 30% of the 1-km buffered turbine area (73,177,459 m²). Due to land access restrictions, Stantec randomly distributed the 36 EOPs (EOP-01 through EOP-36) on public roads within 800 meters (m) of a proposed turbine location to the extent possible. The locations of the 36 EOPs are shown in Figure 5-1. During the first site visit, field biologists shifted points as necessary to achieve the best visibility possible in all directions from the EOP and to provide the surveyor with a safe observation position for the duration of the survey. The 36 EOPs were surveyed monthly from October 2015 through September 2016.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
Site-Specific Surveys and Assessment (ECPG Stage 2)
December 14, 2017

During the August 12, 2016 agency meeting, after seeing a map of the EOP locations, the USFWS representatives requested Thunder Ranch add survey points in the eastern portion of the Project where there are tracts of grassland without public roads (see Figure 3-3). After the completion of the first year of eagle-use surveys in September 2016, Stantec added four EOPs to these grasslands where land access was not previously granted. The location of the four additional EOPs (EOP-37 through EOP-40) are also shown in Figure 5-1. At the recommendation of the USFWS, Stantec continued to survey the original 36 EOPs along with the 4 additional EOPs starting in October 2016; although the turbine layout had changed by September 2016, the 40 EOPs were representative of the habitats expected to be impacted by Project infrastructure. The 40 EOPs were surveyed monthly from October 2016 through September 2017.

Each month, each EOP was surveyed for 1 hour within a survey plot encompassing an 800-m radius circle around the survey point and up to 200 m above ground level within the circle (USFWS 2013, p. 54, 56). Surveys were conducted during daylight hours in all weather conditions, except when visibility was less than 800 m horizontally and/or 200 m vertically (USFWS 2013, p. 56). The time of day in which a given EOP was surveyed was alternated among surveys to reduce bias (USFWS 2013, p. 55). Surveyors recorded eagle observations on hardcopy datasheets, which included time of observation, number of eagle-minutes, direction of flight, eagle age (immature, adult, or unknown), and behavior (USFWS 2013, p.57). Behavior included gliding, soaring (circling), continuous flapping, flapping-gliding, kiting/hovering, stooping/diving at prey, stooping/diving antagonistically, being mobbed, undulating/territorial flight, and perched. Weather conditions were also recorded at the beginning and end of each 1-hour survey period.

Observers recorded the number of minutes the eagle spent flying within the survey plot (eagle-minutes), rounded up to the nearest whole minute (e.g., if an eagle flew within the plot for 25 seconds, 1 eagle-minute was recorded) (USFWS 2013, p. 56). For eagles flying within the survey plot, surveyors drew the flight path of the eagle in relation to landmarks within the survey plot on the datasheet (USFWS 2013, p. 56). Surveyors used maps of each survey plot depicted on a 2015 aerial photograph to define the extent of the survey plot in relation to landmarks on the landscape. Each flight path was marked with an individual identifier to link the flight path with the other data recorded on the datasheet for that eagle. The presence of perched eagles within the survey plot was also documented, but eagle minutes were only recorded if the eagle flew during the survey time period. Eagles observed outside of the survey plot were also recorded, but eagle-minutes were only recorded for eagles flying within the survey plots.

Observers photographed the habitat around each EOP and birds observed during the survey, when possible (see Appendix A). Observers documented other sightings, including threatened or endangered species, and notes of interest as applicable. Both the paper datasheets and scanned copies of the datasheets were electronically stored after the completion of each site visit.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
Site-Specific Surveys and Assessment (ECPG Stage 2)
December 14, 2017

5.1.2 Results

From October 2015 through September 2017, surveyors logged 912 survey hours and documented 61 eagle-minutes. During the first year of surveys, 40 eagle-minutes were recorded, and 21 eagle-minutes were recorded in the second year of surveys. All eagles observed were Bald Eagles, and no Golden Eagles were observed at the Project. Eagle-minutes were recorded at 14 EOPs, with between 1 and 12 eagle-minutes per EOP. Eagle-minutes to date per EOP are shown in Figure 5-2 and summarized in Table 5-1. Nine of the EOPs with eagle-minutes were in the eastern third of the Project, four were in the central portion of the Project, and one was on the western boundary. The EOP with the most eagle-minutes (EOP-09) is located on the east-central portion of the Project. The east-central portion of the Project contains tracts of grassland in proximity to the Salt Fork and Arkansas Rivers.

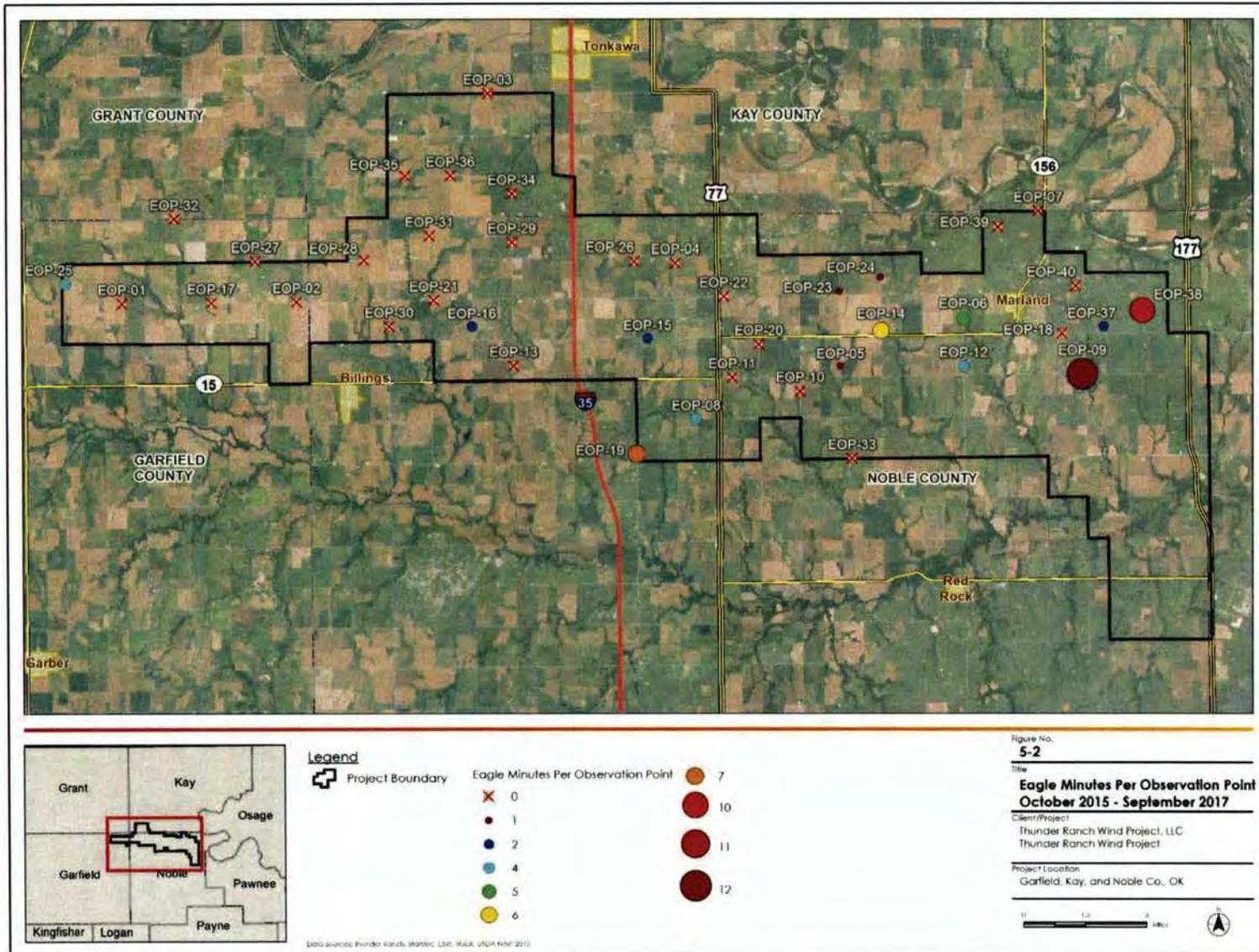
Table 5-1 Eagle-Minutes per Survey Point

Survey Point	Eagle-Minutes
EOP-05	1
EOP-06	5
EOP-08	4
EOP-09	12
EOP-12	4
EOP-14	6
EOP-15	2
EOP-16	2
EOP-19	7
EOP-23	1
EOP-24	1
EOP-25	4
EOP-37	2
EOP-38	10
Total	61

All eagle-minutes were recorded from December through March. Eagle-minutes per survey month are displayed in Figure 5-3. The most eagle-minutes were recorded in December, included 22 minutes in 2015 and 7 minutes in 2016. In Oklahoma, Bald Eagles breed from December through late May and egg-laying occurs between December and February (Reinking 2004; USFWS 2007b). The increase in Bald Eagle activity observed at the Project in December, January, and February may be associated with the departure of winter-resident Bald Eagles for their breeding areas further north and the activity of breeding-residents as they establish nesting territories. However, once egg-laying is completed and adults are tending

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
 Site-Specific Surveys and Assessment (ECPG Stage 2)
 December 14, 2017



EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Site-Specific Surveys and Assessment (ECPG Stage 2)

December 14, 2017

nests by March, eagle activity at the Project decreased (Figure 5-3). Eagle-minutes were also documented in October (3 minutes in 2015), when winter-resident Bald Eagles would be expected to occur in the Project Area. Observers also recorded Bald Eagles within the Project which did not fly within survey plots and therefore did not log eagle-minutes. Incidental Bald Eagle observations were recorded during surveys conducted within the months between November through April. Both adult (breeding age with a white head and tail) and immature Bald Eagles were observed within the Project.

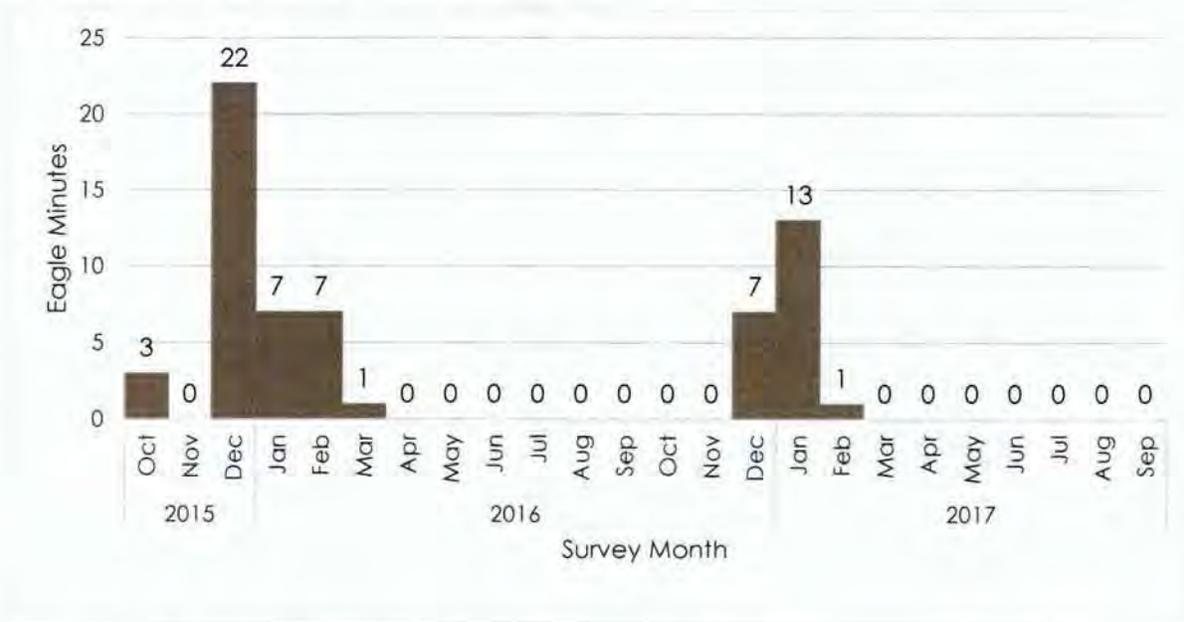


Figure 5-3 Eagle-Minutes per Survey Month

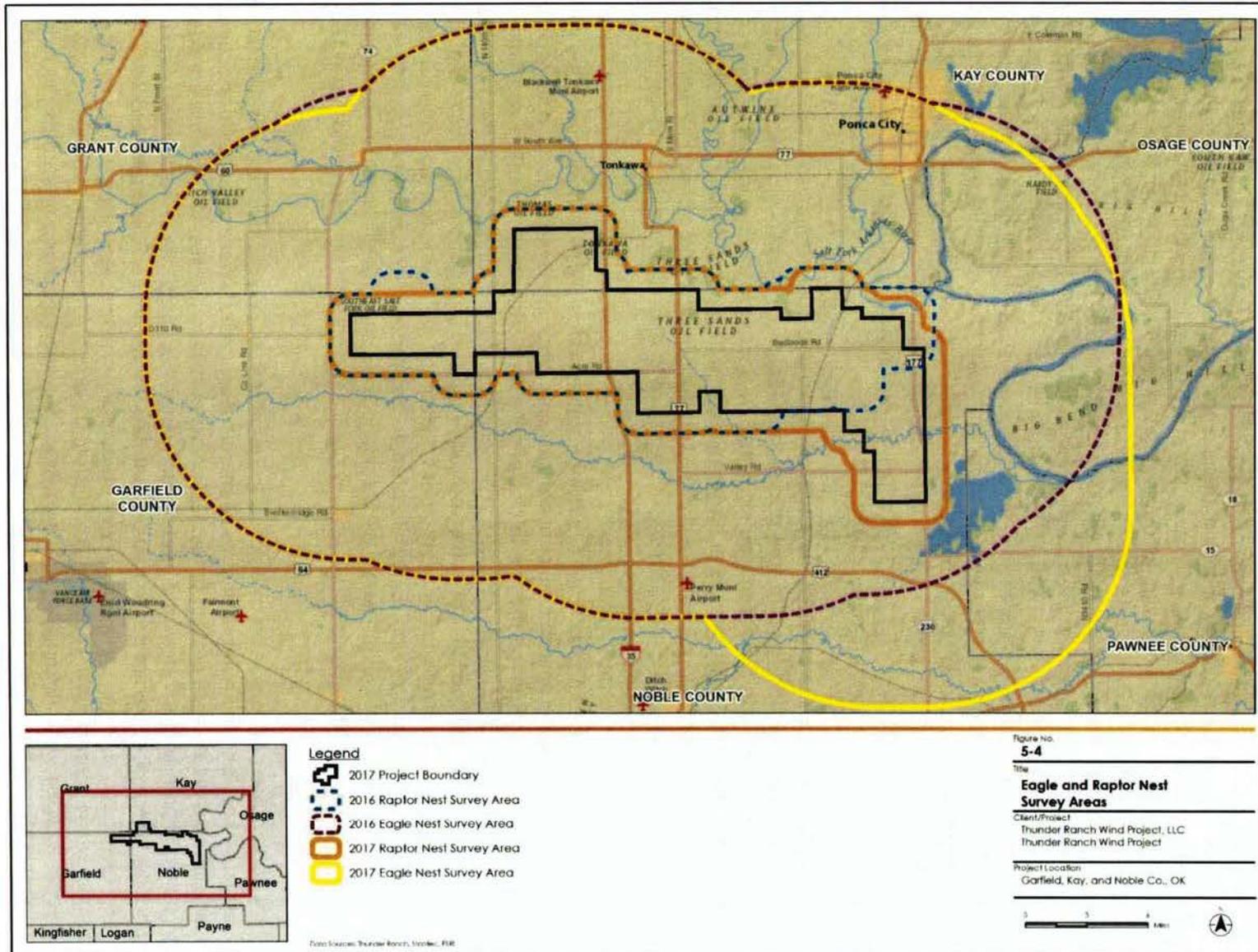
5.2 EAGLE NESTS

5.2.1 Methods

Two years of aerial eagle nest surveys have been completed for the Project following methods recommended in the ECPG (Stantec 2016a, 2017a). The ECPG recommends projects without information of the size of eagle territories in the region use a 10-mile buffer for the first survey (USFWS 2013, pg. 12). Stantec did not have information on the distribution of eagle nests in the Project's vicinity; therefore the 2016 survey was conducted within the 2016 Project boundary and a 10-mile buffer around the boundary (2016 Eagle Nest Survey Area). Although the 2016 surveys provided sufficient information distribution of eagle nests near the Project, Thunder Ranch surveyed a 10-mile buffer again in 2017. The 2017 survey was conducted within the 2017 boundary and 10-mile buffer (2017 Eagle Nest Survey Area). The eagle nest survey areas are shown in Figure 5-4.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
 Site-Specific Surveys and Assessment (ECPG Stage 2)
 December 14, 2017



EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Site-Specific Surveys and Assessment (ECPG Stage 2)

December 14, 2017

Observers searched the Eagle Nest Survey Areas by focusing on areas with suitable Bald Eagle nesting habitat, such as the Salt Fork, Arkansas River, Sooner Lake, and Red Rock Creek. Portions of the Eagle Nest Survey Areas outside of these areas were surveyed by following transects spaced 1 mile apart as necessary to cover the entire survey area. The raptor nest surveys were also conducted concurrently with the eagle nest surveys. In 2016, the raptor nest survey was conducted within the 2016 Project boundary and a 1-mile buffer (2016 Raptor Nest Survey Area) by systematically flying transects spaced 0.5 mi apart. In 2017, the raptor nest survey was conducted along transects spaced 0.5 mi apart within the 2017 Project boundary and a 1-mile buffer (2017 Raptor Nest Survey Area). The raptor nest survey areas are shown in Figure 5-4. Transects were used for the raptor nest survey because suitable raptor nesting habitat is more abundant and uniformly distributed throughout the Project than Bald Eagle nesting habitat, requiring a systematic approach. In addition, narrowly spaced transects were necessary because raptor nests are smaller than eagle nests. The results of the raptor nest surveys are available in the *2016 Aerial Eagle and Raptor Nest Survey* report and the *2017 Aerial Eagle and Raptor Nest Survey* reports (Stantec 2016a, 2017a).

A helicopter was used to conduct the surveys, with one biologist positioned in the front left seat and a second biologist in the rear right seat of the helicopter. The pilot was experienced in wildlife surveys and also assisted in locating nests. Preflight planning included a review of Oklahoma Breeding Bird Atlas records (Reinking 2004), topographic maps, and satellite imagery. The timing of the survey was determined based on the primary nesting period for Bald Eagles in Oklahoma and was scheduled to be conducted prior to when the trees in north-central Oklahoma begin producing leaves.

The surveys were conducted under favorable weather conditions (i.e., moderate to low wind speeds, good visibility, and no precipitation). Additionally, surveys were only conducted under safe operating conditions per the pilot's discretion; conditions which prevented safe flight included an 800 ft cloud ceiling, 3-mile visibility or less, sustained winds greater than 35 miles per hour, thunderstorms, and ice. The survey protocol required precautions to minimize disturbance to nesting birds, such as limiting the time spent near an active nest to less than one minute and staying near the nest only long enough to observe and record the number of eggs/chicks and record the location of the nest with a global positioning system (GPS). The survey methodology called for nests to be approached cautiously and from a safe distance to avoid flushing eagles or raptors.

For each eagle nest, observers attempted to identify the activity status of the nest, the species using the nest, and the number of eggs or chicks present. Nests were considered "occupied" if one or more adults were present at the nest or in proximity to the nest. Nests were considered "active" if breeding activity was detected at the nest (i.e., eggs, chicks, fledglings, or incubating adults). These occupied or active nests are termed "in-use" in the 2016 Eagle Rule Revisions (81 FR 91494, Dec. 16, 2016). If no activity was observed at a suspected nest, then the nest's activity status was recorded as "unknown." Only nests large enough to potentially be Bald Eagle nests were recorded within the Eagle Nest Survey Area. Surveyors recorded nest status information on hard copy data sheets and on a GPS unit.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Site-Specific Surveys and Assessment (ECPG Stage 2)

December 14, 2017

5.2.2 Results

Stantec completed the aerial eagle surveys on March 16-18, 2016 and on March 5 and 7-9, 2017. In 2016, aerial surveys were conducted in conjunction with the same surveys conducted for a proposed wind energy development facility adjacent to the Project to the west; a portion of the 2016 Eagle Nest Survey Area was surveyed using the 0.5 mile transects to accommodate a raptor nest survey for the adjacent project. Flight paths for the 2016 and 2017 aerial nest surveys are shown in Figure 5-5.

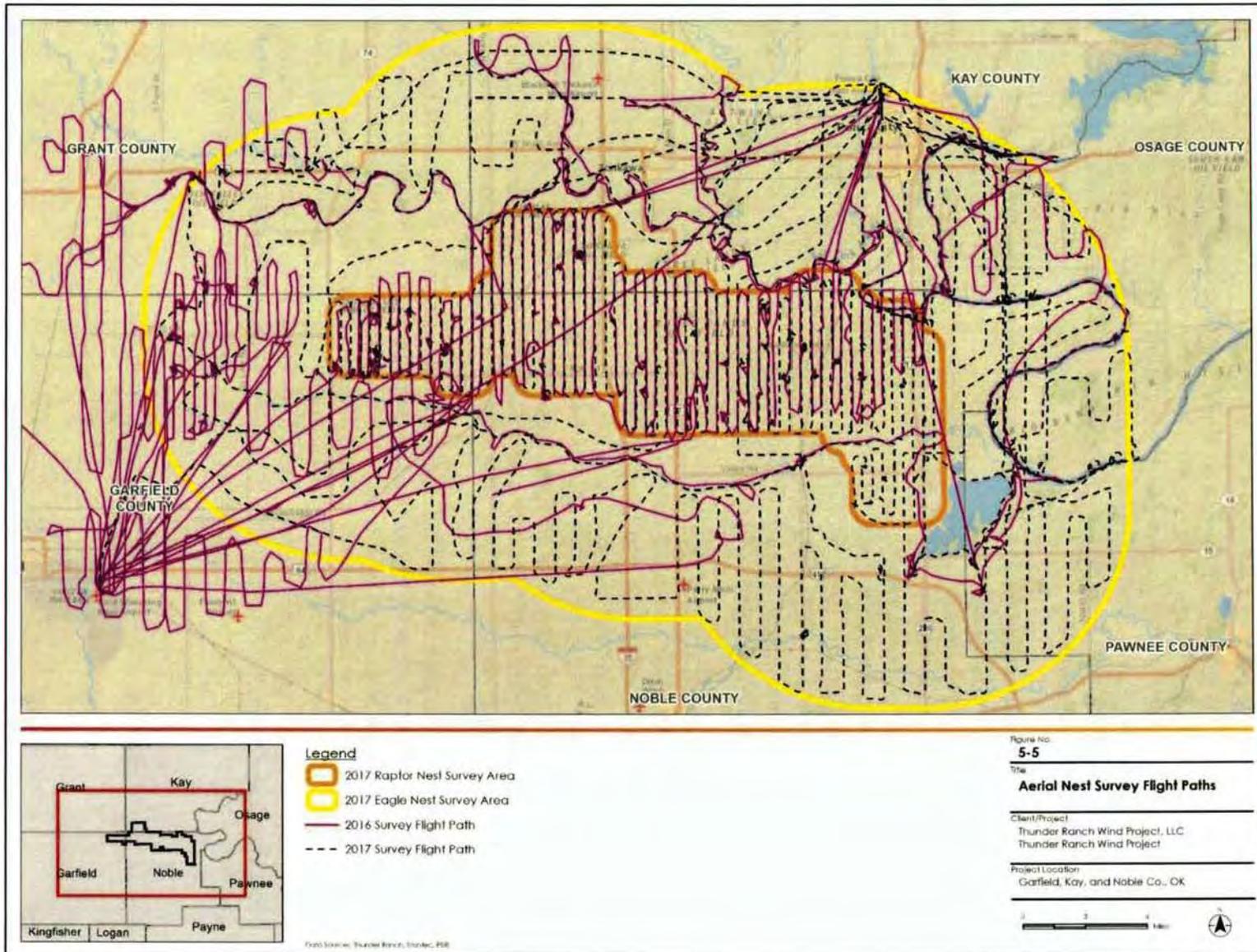
In 2016, Stantec documented 18 Bald Eagle nests, 14 of which were within the 2016 Eagle Nest Survey Area and 4 were incidentally observed less than 1.5 mi outside of the survey area. Of the 18 nests, 11 were active, 5 were of unknown status, and 2 were inactive. One of the inactive nests (EN-18) was the artificial nest platform maintained by the George Miksch Sutton Avian Research Center (Sutton Center) at Sooner Lake. The Sutton Center provided a live video feed of this nest on their website (Sutton Center 2016); however, no eagles nested on the platform for the 2016 breeding season. The other inactive nest (EN-13) was within 200 ft of an active Bald Eagle nest. The locations of eagle nests observed during the aerial surveys are shown in Figure 5-6. During the 2016 aerial survey, Stantec observed six Bald Eagles not associated with nests, including four on the Arkansas River, one on Red Rock Creek, and one at Sooner Lake.

In 2017, Stantec recorded 31 Bald Eagle nests, 29 of which were within the 2017 Eagle Nest Survey Area including 17 active nests, 3 occupied, and 9 nests of unknown status (Figure 5-6). One active Bald Eagle nest (EN-02) and 1 Bald Eagle nest of unknown status (EN-30) were incidentally observed less than 1 mile outside of the 2017 Eagle Nest Survey Area. All the nests observed in 2016 were relocated in 2017. During the 2017 aerial survey, 74 Bald Eagles were incidentally observed along the Arkansas River, including 5 adults and 15 subadults flying together at the eastern bend in the river between EN-07 and EN-08 (Figure 5-6). Additionally, two Bald Eagles were observed at Sooner Lake and one was observed on the Salt Fork.

It is probable nests where no breeding activity was observed in proximity to active nests are alternate nests for the same Bald Eagle pair (e.g., EN-17 could be an alternate nest for the pair using EN-16). Bald Eagle pairs will build and maintain multiple nests within their territory and may alternate among these between breeding seasons (Buehler 2000). Based on the locations of active nests in 2016 and 2017, there are an estimated 22 Bald Eagle territories within 10 mi of the Project boundary. The closest nest to Project turbines is EN-29, which is located on the Salt Fork near its confluence with the Arkansas River (Figure 5-6). Project turbines are 2.1 mi from this nest; therefore, Project construction and operations are not anticipated to disturb nesting Bald Eagles.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
Site-Specific Surveys and Assessment (ECPG Stage 2)
December 14, 2017

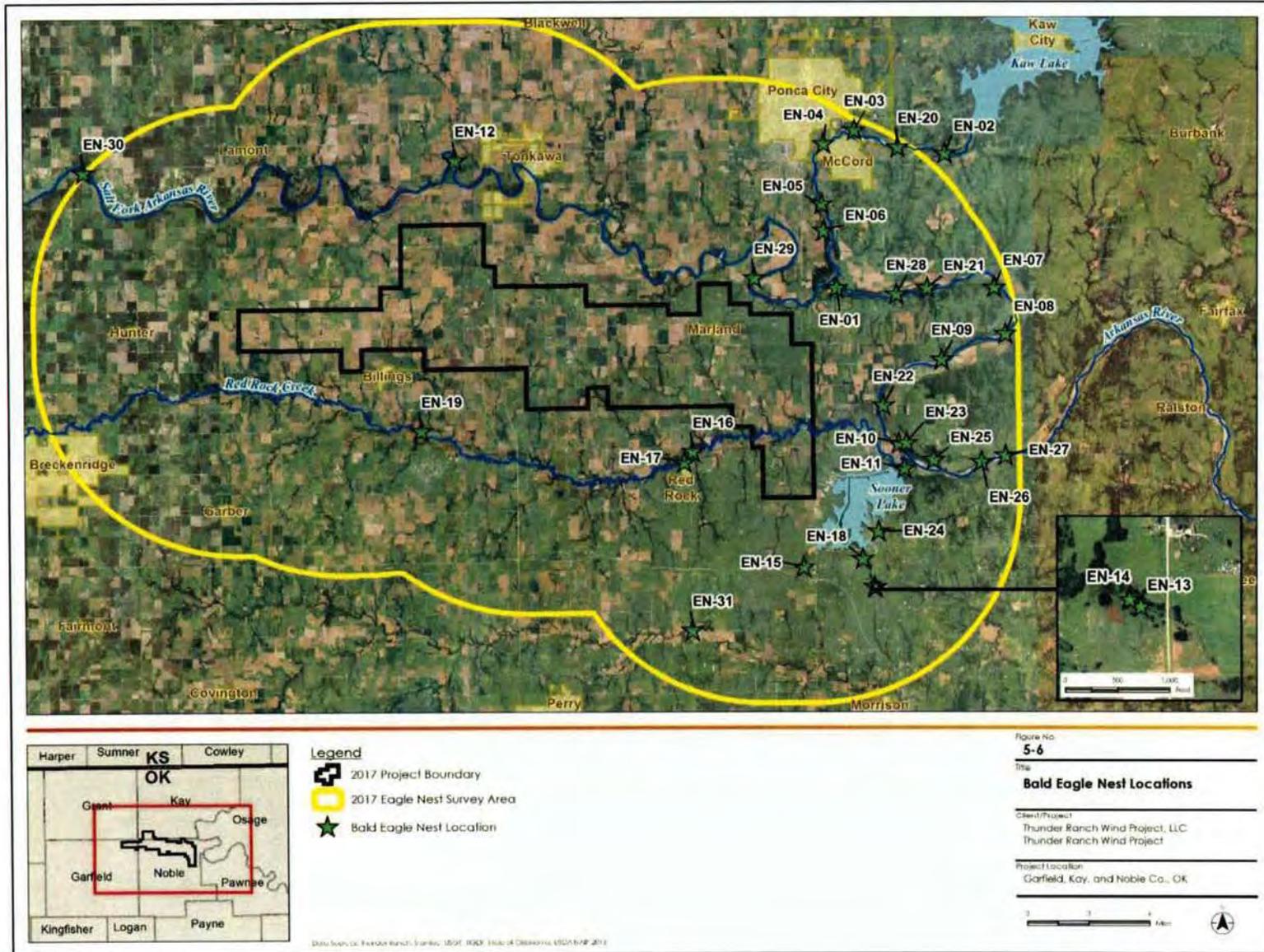


EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Site-Specific Surveys and Assessment (ECPG Stage 2)

December 14, 2017



EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Predicting Eagle Fatalities (ECPG Stage 3)

December 14, 2017

6.0 PREDICTING EAGLE FATALITIES (ECPG STAGE 3)

In Stage 3 of the ECPG, site-specific data collected during Stage 2 are used to estimate an annual eagle fatality rate for the Project using a collision risk model (CRM) developed by the USFWS for the Eagle Permit Rule.

6.1 EAGLE TAKE PREDICTION

The USFWS has developed the CRM to predict the annual eagle fatality rate at a project based on pre-construction eagle occurrence and abundance data collected through eagle-use surveys (see Section 5.1). The CRM relies on a defined relationship between eagle exposure (the Stage 2 data), collision probability, and fatalities (verified during post-construction monitoring during Stage 5, Section 8.0).

Factors affecting turbine-blade strike risk for eagles, especially Bald Eagles, are poorly known. Elements believed to contribute to eagle collision risk are (1) abundance of eagles exposed to collision, (2) characteristics that contribute to high-risk flight behavior near turbines (including topography, season, and wind currents), and (3) circumstances that distract eagles from detecting the turbine (e.g., active foraging, or interactions with other birds) (USFWS 2013). Inputs for the CRM are based on limited Golden Eagle data. The USFWS acknowledges that this makes the model very conservative for Bald Eagle take prediction, but supportive data for Bald Eagles are even more limited than those for Golden Eagles. The CRM is the method by which the USFWS sets ITP thresholds for both eagle species. The USFWS uses the 80th quantile (upper 80% confidence limit) of the CRM fatality probability distribution as the predicted annual fatality rate for a project, a risk-averse approach. The model and its parameters are described in detail in Appendix D of the ECPG (USFWS 2013).

Stantec used data from all eagle-use surveys for the Project (October 2015 – September 2017) as inputs to run the CRM in PROGRAM R Version 3.2.2 (©The R Foundation for Statistical Computing 2015). This is the most appropriate approach, though Stantec also ran two other iterations of the CRM, one using the first year of data (October 2015 – September 2016) and the other using the second year of data (October 2016 – September 2017). Table 6-1 provides the inputs and outputs of the CRM for each iteration. A printout of the model code and its inputs are provided in Appendix C. Based on data from both years combined, the predicted annual fatality rate (80th quantile) of Bald Eagles at the Project is 1.6 eagles. However, the predicted fatality rate based on second year of data was about twice as great as that based on the first year of data (Table 6-1).

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
 Predicting Eagle Fatalities (ECPG Stage 3)
 December 14, 2017

Table 6-1 USFWS's Collision Risk Model Inputs and Outputs for Thunder Ranch Wind Project

Input	Model Iteration		
	Year 1 (Oct'15-Sep'16)	Year 2 (Oct'16-Sep'17)	Both Years Pooled (Oct'15-Sep'17) ^b
Number of Turbines	120	120	120
Turbine Rotor Radius (km)	0.058	0.058	0.058
Duration of Point Count (hours)	1	1	1
Number of Eagle Minutes	40	21	61
Number of Point Counts Conducted (Total Survey Hours)	432	480	912
Day Light Hours within Effective Survey Period ^a	4,450.304	4,450.304	4,450.304
Output	Year 1 Fatality Rate Prediction	Year 2 Fatality Rate Prediction	Overall Annual Fatality Rate Prediction
80th Quantile	2.3	1.1	1.6
Mean (Average)	1.5	0.7	1.1
Standard Deviation	1.0	0.5	0.7

^a Coordinates N36.56054, W97.32119

As discussed in Section 2.1.1, the 2016 Eagle Rule Revisions require the USFWS to ensure proposed eagle take for an ITP to not exceed 6% of the EMU or 5% of the LAP (81 FR 91494, Dec. 16, 2016). As a result, a site-specific LAP evaluation is part of an ITP application. As part of their development of the 2016 Eagle Rule Revisions, the USFWS calculated Bald Eagle populations within multiple regions including the EMUs that were part of the 2009 Eagle Permit Rule and the new EMUs that are part of the 2016 Eagle Rule Revisions (USFWS 2016). However, the USFWS used data collected in 2009 for their Bald Eagle population estimates. According to the 2016 Eagle Rule Revisions, project developers should calculate their LAP Bald Eagle population using the 2009 population estimates (USFWS 2016) and the new EMUs. Using these numbers, Thunder Ranch's LAP has an estimated 36 Bald Eagles. During the February 2, 2017 meeting, the USFWS agreed an LAP population of 36 Bald Eagles was too conservative, considering that in 2016 Thunder Ranch documented 11 active nests (representing at least 22 breeding adults) within 10 mi of the Project alone (see Sections 2.3 and 5.2.2). The USFWS initially recommended Thunder Ranch use site-specific data from the aerial nest surveys to calculate the LAP Bald Eagle population, however, in a subsequent email, the USFWS recommended Thunder Ranch use the data from the 2009 Eagle Permit Rule and its EMU Bald Eagle density (Region 2 Lower Mississippi EMU). Therefore, both site-specific and Region 2 Lower Mississippi EMU calculations are provided in Table 6-2.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC
Predicting Eagle Fatalities (ECPG Stage 3)
December 14, 2017

Table 6-2 Thunder Ranch's LAP Take Calculations

	Thunder Ranch LAP 2017 Nest Survey Results	Region 2 Lower Mississippi EMU
Area (mi ²)	5,485 ^a	80,094
Bald Eagle Population	92 ^b	589 ^c
Bald Eagle Density (eagles/mi ²)	0.01677	0.0073
Area of LAP (mi ²)	29,358	29,358
LAP Bald Eagle Population	492.4	214.3
5% of LAP Bald Eagle Population (Available Take)	24.6	10.7

^a Area surveyed by Stantec within Thunder Ranch's LAP during the 2017 multi-project aerial eagle nest surveys.

^b Based on two adults per active nest observed by Stantec within the surveyed area during the 2017 multi-project aerial nest surveys.

^c Source: USFWS 2009.

During the spring 2017 aerial eagle nest survey, Stantec surveyed 10-mi buffers around other proposed confidential wind projects in central and north-central Oklahoma and in south-central Kansas. The area surveyed by Stantec for these wind projects as well as for Thunder Ranch includes approximately 19% (5,485 mi²) of the area within Thunder Ranch's 86-mi LAP (29,358 mi²). Within this area, Stantec documented 46 active Bald Eagles nests, including those within Thunder Ranch's Project Area. If there were two adult eagles per nest, then there were 92 adult Bald Eagles in the area surveyed by Stantec. Assuming the same density applied to the whole LAP, the LAP's estimated Bald Eagle density is 492.4 adults. This may be an inflated estimate because Bald Eagle habitat surveyed by Stantec may be higher quality than in many other areas in the LAP. On the other hand, the estimate could be considered conservative because it does not include Bald Eagles within the LAP that are non-breeding adult, pre-breeding age residents, or overwintering individuals. Using Stantec's 2017 conservative population estimate based on nests (492.4 Bald Eagles), 5% of the Project's 86-mi LAP is 24.6 Bald Eagles. Thunder Ranch's predicted annual take of 1.6 Bald Eagles/year is well below this threshold.

At the USFWS's request, the Bald Eagle population numbers for the Region 2 Lower Mississippi EMU were also used to calculate available take for the LAP. The estimated Bald Eagle population for the Region 2 Lower Mississippi EMU in 2009 was 589 Bald Eagles (USFWS 2009). This represents a density of 0.0073 Bald Eagles/mi² for the EMU, which equates to a population estimate of 214.3 Bald Eagles and an available take of 10.7 Bald Eagles (Table 6-2). Thunder Ranch's predicted take of 1.6 Bald Eagles/year is also below this threshold. Moreover, the take represents only 0.1% of the estimated EMU population size (1,163 Bald Eagles in Central Flyway EMU; USFWS 2016). Therefore, potential Bald Eagle take at the Project is within the thresholds set by the USFWS, and Thunder Ranch will not implement compensatory mitigation to offset take of eagles at the Project.

While permitted take must be below 5% of the LAP, it must also be below 6% of the EMU (81 FR 91494, Dec. 16, 2016). According to the USFWS's 2016 eagle demographics report, the conservative estimate of the Bald Eagle population in the Central Flyway EMU is 1,163 eagles

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Predicting Eagle Fatalities (ECPG Stage 3)

December 14, 2017

(USFWS 2016). Permitted take for Bald Eagles is 6% of the EMU's population, which is 70 eagles for the Central Flyway. Thunder Ranch's predicted annual take is below 70 Bald Eagles, and no Bald Eagle ITPs have been issued within the Central Flyway yet. The Project's predicted annual take is below both the 5% threshold of the LAP (calculated using both local data and Region 2 Lower Mississippi EMU data) and the 6% threshold of the Central Flyway EMU.

6.2 CUMULATIVE IMPACTS ANALYSIS FOR LOCAL AREA POPULATION

In the 2016 Eagle Rule Revisions, the USFWS has made the cumulative effects analysis in Appendix F of the ECPG a required component of any eagle ITP application. If a project's predicted take combined with both permitted (i.e., eagle ITPs) and unpermitted sources of take (power line electrocutions, lead poisoning, shooting, etc.) in its LAP exceeds the 5% take threshold, the USFWS will require the permittee to either reduce take risk or mitigate take exceeding the 5% threshold. This analysis will be part of the USFWS's evaluation of Thunder Ranch's ITP application. There are currently no publicly announced Bald Eagle ITPs issued to wind developers within Thunder Ranch's LAP, and EGPNA is not aware of other permits issued by the USFWS for Bald Eagles in the LAP relevant to Thunder Ranch.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Avoidance and Minimization of Risks and Mitigation (ECPG Stage 4)

December 14, 2017

7.0 AVOIDANCE AND MINIMIZATION OF RISKS AND MITIGATION (ECPG STAGE 4)

During Stage 4 of ECP development, based on the information gathered in previous stages, the project developer and the USFWS identify avoidance and minimization measures and, if necessary, compensatory mitigation to reduce the risk to eagles. Avoidance and minimization measures discussed in the following sections include best management practices outlined in the WEG and ECPG. Only recommendations applicable to the Project and eagles are included.

7.1 AVOIDANCE AND MINIMIZATION MEASURES

7.1.1 Design Phase

Based on recommendations in the WEG, Thunder Ranch has incorporated the following best management practices in the design of the Project to reduce potential impacts on eagles:

- Thunder Ranch has minimized, to the maximum extent practicable, roads, power lines, fences, and other infrastructure associated with the Project.
- Thunder Ranch has minimized the number and length of access roads, and used existing roads when feasible.
- Initially, the 2015 Project boundary extended approximately 7 mi further east towards the Arkansas River than the current boundary (see Figure 3-1). Early in Project development, Thunder Ranch recognized the Arkansas River as potential Bald Eagle nesting and foraging habitat and adjusted the Project boundary away from the river to reduce potential risks to eagles. This change is reflected in the 2016 and 2017 Project boundaries in Figure 3-1.
- After the 2016 aerial nest survey, Thunder Ranch micro-sited proposed turbine locations so that all turbines were at least 2.5 mi from known Bald Eagle nests.
- After the 2017 aerial nest survey, Thunder Ranch eliminated two primary turbines from the northeast corner of the Project near EN-29 (which was first observed in 2017 and therefore not part of the 2016 micro-siting described above), and instead selected two alternate turbines located elsewhere in the Project. As a result of this change, the closest turbine to any known Bald Eagle nest is 2.1 mi away. Figure 3-2 shows the Project's layout after the change in primary turbine locations.
- To the extent possible, Thunder Ranch has avoided locating wind turbines within close proximity to wetlands, streams, ponds, and other bodies of water that are likely to attract waterfowl and eagles as foraging areas or roosting areas.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Avoidance and Minimization of Risks and Mitigation (ECPG Stage 4)

December 14, 2017

- Permanent meteorological (met) towers will be free standing, without guy-wires. Guy-wires pose a collision risk to birds, including eagles, and will not be used on the permanent met towers. Guy wires may be used on temporary met towers and will be equipped with bird diverters.
- Thunder Ranch will bury all collection lines. The Project's transmission line will be marked with bird diverters in accordance with the APLIC standards to prevent bird collisions with the transmission line (APLIC 2012).

7.1.2 Construction Phase

Thunder Ranch has also committed to the following best management practices from the WEG to reduce potential risk to eagles during construction:

- Thunder Ranch will use construction and management practices to minimize activities or features (e.g., brush piles) that may attract eagles or their prey to the wind energy facility.
- Thunder Ranch will reduce vehicle collision risk to wildlife by instructing project personnel to drive at appropriate speeds, be alert for wildlife, and use additional caution in low visibility conditions.

7.1.3 Operations Phase

Thunder Ranch is voluntarily committing to implement the following conservation measures for the life of the Project. The effectiveness of these conservation measures will be evaluated on a regular basis (see Section 8.2) and will be part of the Project's overall efforts to reduce potential impacts on bird resources as described in the BBCS (Stantec 2017b). Based on the WEG, during Project operations, Thunder Ranch will:

- Properly manage garbage and waste disposal to avoid attracting wildlife with supplemental food.
- Thunder Ranch will instruct landowners to remove livestock carcasses and dispose of them away from Project infrastructure.
- Conduct periodic on-site training for operation and maintenance staff on eagle and T/E species identification and WIRS protocol (see Section 8.1.1.2).
- Include measures to reduce risk of wildfire and provide a plan of action in case of wildfire in the site operation plan.

7.2 VOLUNTARY MITIGATION

As detailed in Section 6.1, the Project's predicted annual take of 1.6 Bald Eagles/year is below the 5% threshold of the LAP of 25 Bald Eagles and the 6% threshold of the EMU of 70 Bald Eagles.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Avoidance and Minimization of Risks and Mitigation (ECPG Stage 4)

December 14, 2017

Therefore, compensatory mitigation is not required for the Project. However, Thunder Ranch intends to implement voluntarily mitigation to contribute to the preservation of Bald Eagles. Assuming the cost to rehabilitate an eagle is \$2,000, \$20,000 would offset the Project's predicted annual take over a 5-year period. Within the first year of commercial operations, Thunder Ranch will donate \$20,000 for use by:

- a local non-profit environmental organization dedicated to a lead abatement program, which includes educating the public on the negative effects of lead in the ecosystem on eagles and other wildlife and the production of non-toxic (lead-free) fishing tackle and/or ammunition;
- a local eagle rehabilitation center dedicated to rescuing, treating, and releasing sick and injured Bald Eagles back into the wild;
- a local conservation fund where contributions are used to retrofit power poles to reduce eagle electrocutions, habitat protection/enhancement, or road kill carcass removal to reduce eagle/vehicle collisions; and/or,
- a local non-profit organization conducting scientifically rigorous research to understand the effects of wind development on eagles and/or ways to reduce the potential for eagle/turbine collisions at wind facilities.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Calibration and Updating of the Fatality Prediction and Continued Risk Assessment (ECPG Stage 5)

December 14, 2017

8.0 CALIBRATION AND UPDATING OF THE FATALITY PREDICTION AND CONTINUED RISK ASSESSMENT (ECPG STAGE 5)

There is uncertainty regarding the risk of wind energy development to eagles and the factors which contribute to that risk at a given wind energy development site. Given this uncertainty, post-construction monitoring is necessary to evaluate a project's impact on eagles and the validity of the predicted take based on pre-construction monitoring. Thunder Ranch has committed to 2 years of post-construction fatality monitoring for eagles. The results of these assessments will be used to update the Project's fatality prediction (Section 6.0), as necessary.

8.1 POST-CONSTRUCTION MONITORING

Thunder Ranch or its representatives will complete post-construction fatality studies to evaluate the impacts of the Project on eagles, as well as other birds and bats. Post-construction monitoring for other birds and bats is described in Thunder Ranch's BBCS (Stantec 2017b). The goal of this study will be to (1) estimate an annual eagle fatality rate for comparison with the model-based prediction (see Section 6.0) and (2) to determine whether any turbines or strings of turbines account for the majority of eagle fatalities. The fatality study will be sufficiently rigorous to yield a reasonably precise estimate of the annual eagle fatality rate for the Project by including standardized carcass searches and bias correction trials (i.e., searcher efficiency and carcass persistence trials) across all seasons to assess potential temporal variation.

Thunder Ranch will contract with an independent third-party to complete a formal post-construction eagle fatality monitoring study for the first 2 years after the Project goes into operation. Based on eagle use data collected thus far, the highest risk period for eagle fatalities at Thunder Ranch will be November 1 through February 28. Given minimal vegetation cover during this period, eagle carcasses are expected to be highly visible at most of the turbines using road and pad searches. Additionally, eagle carcasses are expected to persist on the landscape for relatively long periods. As such, eagle carcasses detected during monitoring will provide a reliable measure of take.

The two years of monitoring will be completed by a qualified biologist visiting all of the project turbines and conducting visual searches of the turbine pads and roads and visual searches from the turbine pad in the four cardinal directions. Searches will commence during the winter months following declaration of commercial operations, and will occur on a bi-weekly basis during winter months (December through February) and on a monthly basis the remainder of the year (March – November).

Most of the Project turbines are in crop fields or grazed pasture, and the search plots around them should provide good visibility during the winter when eagles are most likely to use the area (Stantec 2017d). When vegetation within the search plot at a turbine exceeds 12 inches in

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Calibration and Updating of the Fatality Prediction and Continued Risk Assessment (ECPG Stage 5)

December 14, 2017

height (likely during June/July), searches will be discontinued at that turbine, but will recommence once the vegetation is removed (e.g., after crops are harvested in November).

A fatality estimator (e.g., Huso et al. 2012 or other appropriate estimator) will be used to calculate the adjusted seasonal and annual fatality rates for Bald Eagles by incorporating the results of the standardized searches and bias correction trials. Results of the eagle carcass surveys will be provided to Thunder Ranch and the USFWS; the USFWS will include the results in their database of results from other eagle permit surveys and these results will be available to the public (81 FR 91494, Dec. 16, 2016).

8.2 OPERATIONS STAFF MONITORING, TRAINING, AND REPORTING

8.2.1 Operations Staff Monitoring

After the first two years, Thunder Ranch will implement operations staff monitoring. Thunder Ranch staff or its contractors will visit each of the operating turbines on a monthly basis and inspect roads, pads and any other cleared area in the immediate vicinity of turbines visible from a vehicle. The frequency and number of turbines visited may be reduced if deemed appropriate after the first two years of operations. Prior to implementing an operations staff monitoring program, operations staff searcher efficiency will be tested by a third-party (e.g., as part of the formal 2-year fatality monitoring program described in Section 8.1).

Any dead or injured eagles found within the project boundary by Thunder Ranch employees or contractors will be recorded, and the location will be reported to the site supervisor. The site supervisor or other designated individual will proceed to the site of the discovery and complete an incident report. Thunder Ranch will notify the USFWS within three business days (or sooner if possible) of discovering any injured or dead eagle at the Project. For each dead or injured eagle, Thunder Ranch will prepare an eagle incident report that will include a description of the find, photographs, and a data sheet that provides such information as: date/time, turbine # and location, physical description of the find (including any obvious injuries and general carcass condition). The carcass or injured animal will not be moved or removed by any individual who does not have the appropriate permits.

Thunder Ranch will provide the USFWS with an annual report after each year of formal fatality monitoring and a summary report for all monitoring on a five-year basis corresponding to permit check-ins. These reports will present estimates of facility-wide eagle fatalities using appropriate statistical estimators if necessary. The Huso method (a Horvitz-Thompson estimator) will likely be used to calculate fatality estimates (Huso et al. 2012). However, an alternative estimator could be used if improved techniques become available and are agreed to by Thunder Ranch and the USFWS (e.g., Evidence of Absence). Annual reports and facility-wide fatality estimates will be provided after the first two years of formal monitoring and on five-year intervals thereafter. Individual eagle incident notifications will continue to be provided throughout the operational life of the Thunder Ranch.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Calibration and Updating of the Fatality Prediction and Continued Risk Assessment (ECPG Stage 5)

December 14, 2017

8.2.2 Training

Training is integral to the successful implementation of this ECP. Thunder Ranch will provide training the first year of operations and additionally as needed for on-site personnel regarding the importance and proper procedures for reporting eagle and other avian and wildlife incidents in the project area.

Thunder Ranch will implement a Wildlife Incident Reporting Form (WIRF) process. The purpose of the WIRF is to standardize the actions and information taken by Thunder Ranch or its subcontractors in response to any wildlife injuries or fatalities observed within the project boundary. All project employees will be trained on how to complete the WIRF and to be vigilant while traversing the project site for signs of dead or injured wildlife.

8.3 ADAPTIVE MANAGEMENT

The Project will have an estimated life-span of 30 years, and over this timeframe, recurrent discussions will need to be made as more information about the Project's effects on eagles is gathered, environmental circumstances change, risk management measures change, etc. Adaptive management is the process by which these recurrent discussions will be made based on the information gathered in the monitoring described above (Sections 8.1 and 8.2). The adaptive management discussed in this ECP includes management of direct eagle take (Section 8.3.1) and eagle nest disturbance (Section 8.3.2).

8.3.1 Direct Eagle Take

The first step to the adaptive management process is to predict eagle take at the Project, as described in Section 6.0. The Project is predicted to take 1.6 Bald Eagles/year, which, in whole numbers, translates to 2 Bald Eagles/year. While this Project's predicted take is likely conservative (see Section 6.1 for discussion), this ECP outlines a series of adaptive management triggers and corresponding actions that will result from varying levels of take, including take exceeding 2 Bald Eagles/year. Take, as discussed throughout the rest of this section, refers to the actual number of eagles observed as fatalities rather than a modeled estimate. This approach to adaptive management based on actual take numbers rather than modeled estimates was based on USFWS guidance during a February 3, 2017 meeting. The notes from the February 3, 2017 meeting are available in Appendix D.

Direct take of eagles through collision with Project infrastructure will be monitored through the fatality studies (Section 8.1) and through reports of incidental carcass observations by Project personnel (Section 8.2). Thunder Ranch will follow the adaptive management framework outlined in Table 8-1. Triggers identified in Table 8-1 are based on actual take numbers rather than modeled estimates.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Calibration and Updating of the Fatality Prediction and Continued Risk Assessment (ECPG Stage 5)

December 14, 2017

Table 8-1 Adaptive Management Framework for Thunder Ranch Wind Project

Level	Trigger	Response	Cost
Level I	1 Bald Eagle fatality in a 12-month period	<ul style="list-style-type: none"> Continue to implement the ECP Assess the cause or likely contributing factor(s) to eagle fatalities, and whether a management response is warranted and/or feasible 	ECP avoidance and minimization measures
Level II	2 Bald Eagle fatalities in a 12-month period	<ul style="list-style-type: none"> Level I adaptive responses Complete a site evaluation and/or additional site monitoring to better understand the nature of risk to eagles Implement additional livestock carcass removal (i.e., remove all carcasses out to 2,000 feet from turbines) or landowner outreach efforts to further minimize potential attractants if livestock is identified as contributing factor Consult with USFWS to determine if additional management actions are needed and/or if a longer-term action plan will be needed to ensure take remains within authorized levels 	Level I plus additional avoidance and minimization measures not in excess of \$10,000/year
Level III	3 or more Bald Eagle fatalities in a 12-month period	<ul style="list-style-type: none"> Level I and Level II adaptive responses As appropriate (based on identified contributing factors) and under consultation with USFWS, temporarily implement and test the effectiveness of additional mitigation measures to avoid or minimize eagle take (e.g., light/noise/drone deterrent systems) 	Level I and II plus additional mitigation measures not in excess of \$30,000/year

Thunder Ranch commits to revisiting this adaptive management plan with the USFWS during the 5-year reviews that are part of a long-term ITP under the Eagle Rule Revisions (81 FR 91494, Dec. 16, 2016). If both parties agree that modifications to Thunder Ranch's avoidance, minimization, or compensatory mitigation as part of adaptive management are warranted, such modification can occur as long as Thunder Ranch continues to meet permit conditions and annual compensation amounts agreed to as part of the ITP terms are not exceeded.

8.3.2 Eagle Nest Disturbance

Project construction and operations are not anticipated to disturb Bald Eagle nests because all known nests are >2 mi from Project infrastructure. However, should eagles build a nest within 660 ft of Project turbines in the future, Thunder Ranch will coordinate with the USFWS. A 660 ft buffer around an active nest is the largest buffer recommended by the *National Bald Eagle Management Guidelines* to prevent nest disturbance (USFWS 2007b), but a smaller buffer may

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Calibration and Updating of the Fatality Prediction and Continued Risk Assessment (ECPG Stage 5)

December 14, 2017

be utilized on a case-by-case basis. The removal of any suspected eagle nests within 660 ft of Project infrastructure will only be conducted in coordination with the USFWS and in compliance with BGEPA except where the nest is a danger to human safety (e.g., nest tree growing into an electrical line causing a fire hazard).

9.0 LITERATURE CITED

- Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, DC
- Buehler, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/506>.
- Department of the Interior (DOI). 2007. RIN 1018-AF21. Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States from the List of Endangered and Threatened Wildlife. July 9, 2007.
- George Miksch Sutton Avian Research Center (Sutton Center). 2016. Live Bald Eagle Nest Camera. <http://www.suttoncenter.org/live-bald-eagle-nest-camera/>. Website accessed July 14, 2016.
- Good, R.E, A. Merrill, S. Simon, K.L. Murray, and K. Bay. 2012. Bat monitoring studies at the Fowler Ridge Wind Farm, Benton County, Indiana, final report, April 1 – October 31, 2011. Prepared for Fowler Ridge Wind Farm. Western EcoSystems Technology, Inc. Bloomington, Indiana, USA.
- Homer, C.G., J.A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N.D. Herold, J.D. Wickham, and K. Megown. 2015. Completion of the 2011 National Land Cover Database for the conterminous United States-Representing a decade of land cover change information. Photogrammetric Engineering and Remote Sensing, v. 81, no. 5, p. 345-354.
- Huso, M., N. Som., and L. Ladd. 2012. Fatality Estimator User's Guide: U.S. Geological Survey Data Series 729, 22 p.
- Oklahoma Department of Wildlife Conservation (ODWC). 2011. Golden Eagle Species Profile. <http://www.wildlifedepartment.com/wildlifemgmt/goldenprofile.htm>. Accessed November 13, 2015.
- Reinking, D.L. (ed.). 2004. Oklahoma Breeding Bird Atlas. Project administered by the George M. Sutton Avian Research Center and the Oklahoma Biological Survey, University of Oklahoma Press, Norman, Oklahoma.
- Stantec Consulting Services Inc. (Stantec). 2017a. 2017 Aerial Eagle and Raptor Nest Survey, Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma.
- Stantec. 2017b. Bird and Bat Conservation Strategy, Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Literature Cited

December 14, 2017

- Stantec. 2017c. Bird and Bat Risk Assessment, Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma.
- Stantec. 2017d. Final Report for Eagle-Use Surveys (October 2015-September 2017) at the Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma.
- Stantec. 2017e. Fall 2016 and Spring 2017 Migratory Bird Surveys, Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma.
- Stantec. 2017f. Fall 2016 and Spring 2017 Raptor Migration Surveys, Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma.
- Stantec. 2016a. 2016 Aerial Eagle and Raptor Nest Survey, Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma.
- Stantec. 2016b. Fall 2015 and Spring 2016 Migratory Bird Surveys, Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma.
- Stantec. 2016c. Fall 2015 and Spring 2016 Raptor Migration Surveys, Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma.
- Stantec. 2016d. Stage 1 Eagle Risk Assessment, Thunder Ranch Wind Project, Garfield, Kay, and Noble Counties, Oklahoma.
- U.S. Fish and Wildlife Service. 2016. Bald and Golden Eagles: Population Demographics and Estimation of Sustainable Take in the United States, 2016 Update. Division of Migratory Bird Management, Washington D.C., USA.
- USFWS. 2014. Salt Plains National Wildlife Refuge, Oklahoma: Habitat. http://www.fws.gov/refuge/Salt_Plains/wildlife_and_habitat/habitat.html. Accessed April 19, 2016.
- USFWS. 2013. Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy Version 2. Division of Migratory Bird Management. April 2013.
- USFWS. 2012. Final Land-based Wind Energy Guidelines. 23 March 2012.
- USFWS. 2009. Final Environmental Assessment; Proposal to Permit Take as Provided Under the Bald and Golden Eagle Protection Act. Department of Interior, Division of Migratory Bird Management. April 2009.
- USFWS. 2007a. Bald Eagle Fact Sheet: Natural History, Ecology, and History of Recovery. Available from: <http://www.fws.gov/midwest/eagle/recovery/biologue.html>. Accessed April 15, 2016.
- USFWS. 2007b. National Bald Eagle Management Guidelines. 25 pp.

EAGLE CONSERVATION PLAN

Thunder Ranch Wind Project, LLC

Literature Cited

December 14, 2017

USFWS. 1985. National Wetlands Inventory Data V1. Data available via *Wetlands Mapper* <http://www.fws.gov/wetlands/Data/Mapper.html>. Updated May 25, 2016.

United States Geological Survey (USGS). 2016. National Hydrography Dataset. Data available via *National Map Viewer* <http://viewer.nationalmap.gov/viewer/nhd.html?p=nhd>.

Appendix A PHOTOGRAPHS

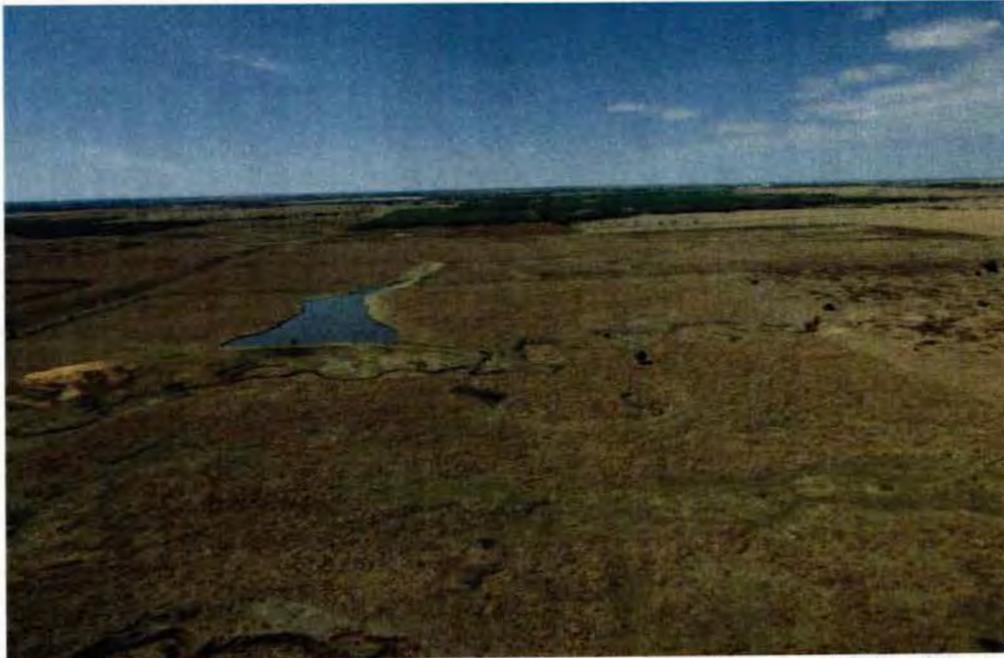


Photo 1: Representative grassland habitat in the Project. Photographed on the east side of the Project facing west on March 16, 2016.



Photo 2: Representative cropland within the Project region. Photographed on the west side of the Project facing west on March 16, 2016. The turbines of Chisholm View Wind Project are visible in the background.

EAGLE CONSERVATION PLAN
Thunder Ranch Wind Project, LLC
Photographs
December 14, 2017



Photo 3: Cropland, woodland, and wetland habitat along the Salt Fork Arkansas River.



Photo 4: Cropland habitat at EOP-29 photographed facing east on December 20, 2015.



Photo 5: Grassland habitat at EOP-09 photographed facing south on September 11, 2016.



Photo 6: Bald Eagle nesting habitat along the Arkansas River near nest EN-01.

EAGLE CONSERVATION PLAN
Thunder Ranch Wind Project, LLC
Photographs
December 14, 2017



Photo 7: An adult Bald Eagle sitting on nest EN-01 on the Arkansas River, March 17, 2016.



Photo 8: Bald Eagle nest EN-27 on the Arkansas River, photographed March 9, 2017.

Appendix B

EAGLE TAKE ESTIMATE MODEL RESULTS

USFWS's Collision Risk Model Results from Program R

Year 1 (Oct. 2015 – Sep. 2016)

Exposure Rate:

	Mean	SD
Overall	0.047	0.00736

Predicted Annual Collision Fatalities:

	Mean	SD	CI50	CI80	CI90	CI95
Overall	1.5	1	1.3	2.3	2.9	3.6

Year 2 (Oct. 2016 - Sep 2017)

Exposure Rate:

	Mean	SD
Overall	0.0227	0.00483

Predicted Annual Collision Fatalities:

	Mean	SD	CI50	CI80	CI90	CI95
Overall	0.74	0.52	0.62	1.1	1.4	1.8

All Years (Oct. 2015 – Sep. 2017)

Exposure Rate:

	Mean	SD
Overall	0.0337	0.00428

Predicted Two-Year Collision Fatalities:

	Mean	SD	CI50	CI80	CI90	CI95
Overall	1.1	0.74	0.95	1.6	2.1	2.5

**Appendix C WILDLIFE INCIDENT REPORTING FORM
(WIRF)**

Example Bird and Bat Reporting Form

SECTION NO. 1 – DISCOVERY DATA

Date Animal Discovered/ Sighted: _____

Animal Status (circle): Injury Fatality Live Sighting
(At-Risk Bird Species)

Number of Animals/Carcasses Observed: _____

Animal/Carcass (circle): Complete Dismembered Feathers
(Complete would indicate a complete and intact carcass or live/injured animal. Dismembered would indicate a missing or amputated wing or other appendage. Feathers would indicate only feathers were found.)

Notified Operations Supervisor (Name): _____

Date: _____ Time: _____

SECTION NO. 2 – LOCATION OF FIND

Structure: _____

(Include turbine number, street name/number, or other landmark feature if no facility is nearby)

Location Remarks: _____

(Include closest turbine number, distance from turbine, and general direction [for ex., 50 feet south of turbine A-1]. Include any other details, such as –found on the road, power lines overhead, etc.)

SECTION NO. 3 – WILDLIFE IDENTIFICATION

Species: _____

(If known, write the species. If not sure, write Unidentified. **If bird observed is listed on the At-Risk Bird Identification Guide, contact biologist to confirm identification.** Refer to **Bird and Bat Reporting System Guide** for contact information.)

Field identification marks used: _____

(Identification marks that helped you determine the species of the bird, if you are not sure and have an educated guess, write it here. For example, "red tail and white chest".)

Sex (circle): Male Female Unknown

Age (circle): Juvenile Adult Unknown

Number of Photos Attached: _____

(Print digital photos and attach to Bird and Bat Reporting Form)

SECTION NO. 4 – OBSERVATIONAL DATA

Weather (at time of discovery/sighting):

Temperature: _____°F

Precipitation: _____ [Record as N (none), L (light), M (moderate), H (heavy), F (fog)]

Snow Cover: _____% of ground covered

FOR A LIVE SIGHTING:

Behavior:

(Describe the behavior at the time of sighting: flying overhead, perched on powerline, scavenging on the ground, etc.)

FOR AN INJURY/FATALITY:

Physical condition:

(Describe the physical condition at the time of discovery: obvious injuries, decomposition status, skeleton visible?, parasites?, etc.)

Estimated Time since Death or Injury (days): _____ (<1, <4, <7, <14, <30, >30) (Use your best judgment. Carcasses less than a few days old will have round, fluid filled eyes and will lack insect infestation. Carcasses with maggots are probably one to two weeks old. If bones are visible, the carcass is probably over 30 days old. Bones visible indicate over 30 days. Keep in mind that in cold weather carcasses will look fresh for much longer than in warmer weather.)

Final Carcass Possession:

(USFWS/ODWC Agent took possession, preserved at operations building, left in the field)

Other Field Notes:

(Note anything else relevant to incident such as final sighting of live animal [i.e., observed flying south through project], presence of other fatalities in the area, evidence of electrocution details, or other applicable information)

Form Completed by: Name: _____

Signature: _____

Date: _____

Operations Manager should immediately email a copy of the Bird and Bat Reporting Form to EGPNA Permitting Department:

[ADD Project Proponent Contact Information HERE]

Disclaimer: All discoveries/sightings of federal- or state-protected species are subject to confirmation by a trained biologist.

Species identification confirmed by: Name: _____ Date: _____

Appendix D MEETING NOTES



Meeting Notes

Thunder Ranch Wind Project Eagle Conservation Plan Agency Meeting
Thunder Ranch Wind Project

Date/Time: February 3, 2017 / 10:00 AM CST
Place: USFWS Oklahoma Ecological Services Field Office, Tulsa, OK
Next Meeting: TBD
Attendees: U.S. Fish and Wildlife Service –
Alisha Autio
Brain Fuller
Larry Levesque
Bob Murphy (via phone)
Jay Martini (via phone)

Tradewind Energy, Inc. -
Jennifer Dean
Emily Truebner
Heath Herje (via phone)

Stantec Consulting Services Inc. -
Ryan Hrabe
Josh Flinn
Sarah Rehme (via phone)

Introduction

The meeting was hosted at the USFWS Oklahoma Ecological Services Field Office in Tulsa, and a conference call-in number and web link to a PowerPoint presentation were provided by Stantec to all attendees. The presentation slides are attached to this document for reference. The meeting began with introductions of all attendees and their roles related to the project.

Thunder Ranch Wind Project Background and Development Status

Heath and Emily provided an update on the project status and details. The project includes 69,500 acres, will have 120 turbines, and a total capacity of 300 megawatts. Groundbreaking is scheduled to begin in April 2017, with turbines expected to be installed in late summer 2017, and commercial operation date is expected during the 4th quarter of 2017.

Previous Agency Coordination and Pre-Construction Survey Results to Date

Josh explained the project is being developed using USFWS's *Land-based Wind Energy Guidelines* (WEG) and the USFWS's *Eagle Conservation Plan Guidance: Module 1 – Land-based Wind Energy, Version 2* (ECPG). A review of topics discussed during the previous four agency meetings (December 2015, January 2016, June 2016, and August 2016) was provided along with a survey

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February 3, 2017
Thunder Ranch Wind Project Eagle Conservation Plan Agency Meeting
Page 2 of 7

timeline of the wildlife surveys (avian migration, raptor migration, bat migration, eagle nest, and eagle use) completed at the project to date. See attached presentation slides for details.

Summary of Eagle Nest Survey Results

Josh presented the results of the eagle nest survey. He explained that a survey was conducted via helicopter March 16-18, 2016 to search for eagle nests within a 10 mile buffer of the project boundary. During the survey, 9 active and 5 unknown status nests were located within the 10 mile buffer (Project Area). Two additional active nests and two inactive nests were observed just outside (within 1.5 miles) of the Project Area. The total number of active eagle nests located during the spring 2016 was 11, and half the average internest distance (i.e., active bald eagle nesting territory) was calculated as 2.59 miles. All active nests were buffered by 2.59 miles to show the nesting territories compared to proposed project infrastructure. Jay asked if there were any eagle nests in the current project boundary. Josh explained that none of the nests are within the project boundary and none of the nest territories overlap any of the proposed infrastructure; therefore, construction and operation of the project is not expected to result in nest disturbance. One additional active nest was observed during monthly eagle use surveys in January 2017. The location of all known nests was shown in the presentation and in hard-copy printed maps. The aerial nest survey will be repeated March 2017 to update the status of breeding eagles around the project.

Summary of Eagle Use Survey Results

Josh explained that eagle use surveys have been conducted at 36 point counts for 1 hour each for a continuous 12-month period (October 2015 through September 2016; 432 survey hours) and at the same 36 points plus an additional 4 points (40 points total) for a 2nd winter of surveys (October 2016 through January 2017). The additional 4 points were added in October 2016 at the suggestion of USFWS during a meeting in August 2016. The project has been surveyed for eagles for a total of 592 hours to date, which has resulted in 32 bald eagle observations and 60 eagle use minutes. A figure showing the distribution of the survey locations and the total number of eagle minutes observed at each location was shown in the presentation and in hard-copy printed maps. A graph showing the distribution of eagle minutes by month was also presented and discussed. No eagle minutes were recorded from April through November 2016. Bob Murphy explained that bald eagles would be expected to be active through May in this area due to the proximity of active nests and was surprised none were recorded in April and May.

Proposed Surveys and Documents in Development

Josh explained the surveys for raptor and avian migration would continue in spring 2017 to provide 2 full years (4 migration seasons) of data and that the survey results are currently being incorporated into a Bird and Bat Risk Assessment and a Bird and Bat Conservation Strategy. Jennifer committed to submitting drafts of these documents to USFWS for review before they are finalized.

The results of the Stage 1 Eagle Risk Assessment (ERA) were presented, which indicated the project was preliminarily defined as a risk "Category 2 - High or moderate risk to eagles, opportunity to mitigate impacts" (as per ECPG definition based on desktop data). This assessment is based on known eagle nesting locations within the Project Area (10-mile buffer). Alisha requested a copy of the final Stage 1 ERA be sent to her for filing. Josh explained the ERA had been previously provided to Bob Murphy but he would provide an additional copy. The eagle use surveys are scheduled through March 2017 and Josh asked for recommendations on continuing the surveys through September 2017 to collect 2 full years (24 months) of data (see questions and responses below).

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February 3, 2017
Thunder Ranch Wind Project Eagle Conservation Plan Agency Meeting
Page 3 of 7

Eagle Conservation Plan Development

The following outline of topics was discussed through a series of questions posed by Stantec and Tradewind to the USFWS. Some questions were answered and others were deferred to be answered after an internal USFWS technical staff meeting later the following week.

- Permitting Timeline
- Revisions to the New Permit Rule
- Take Calculations
- Population Estimates
 - Available Take for EMU
 - Available Take for LAP
- Compensatory Mitigation
- Best Management Practices
- Future Monitoring Protocols
 - Eagle Use Surveys
 - Nest Search and Monitoring
 - Mortality Survey
- Adaptive Management
- ITP Process and NEPA Timeline

Questions presented to USFWS by Stantec and Tradewind:

- Question: Who do we coordinate with for development and reviews of the ECP?

Answer: Coordinate with Jay and Alisha.

- Question: How much turnaround time is needed for reviews?

Answer: The spring is a busy time for USFWS personnel, so plan on 2-3 weeks for turnaround.

- Question: Construction will begin before 2 full years of eagle use surveys can be completed. The project will have 2 winter seasons surveyed for eagle-use (the busiest time for eagle activity) and no eagle minutes were recorded from April through November 2016. Will the USFWS provide a waiver on the requirement of 2 full years of pre-construction eagle-use surveys?

Answer: Bob Murphy was going to check on this internally about the possibility of getting a waiver on the 2 year survey requirement. He recommended surveys continue at a minimum through June to account for the breeding and fledging season, but discussed that surveys after that may be affected by ongoing construction at the project, which could produce inconclusive results. Bob stated the USFWS could validate grandfathering of a reduced survey effort, as in stopping monthly point county surveys before September, which would be the 2 year survey requirement.

- Stantec requested more guidance on how the take estimates should be calculated using the USFWS's CRM.

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February 3, 2017
Thunder Ranch Wind Project Eagle Conservation Plan Agency Meeting
Page 4 of 7

- Question: How are multiple years of data and partial years of data calculated using the model? Separated by year and averaged? All data combined?
Answer: Combine all data into one input and run all at once.
- Question: What is the best way to calculate take if you do not have an even 2 years of data?
Answer: Run the model with the data you have and then extrapolate to cover months that were not surveyed. Provide support for how the calculations were made and any assumptions used.
- Question: Who does Stantec coordinate with at the USFWS regarding take calculations and the Collision Risk Model (CRM)?
Answer: Not sure at this time, but will provide an answer later. For now, coordinate with Alisha and Jay. The Service will need all the raw data and will run their own take estimate during the NEPA process.
- Question: How can Stantec get a copy of the updated CRM when it is ready?
Answer: There will be a webinar on February 15 on updates to the CRM and how to use it. Suggest we participate on that for new information on updates.
- Question: Will the updated model be available by June/July?
Answer: It's a work in progress, but there is a good chance an update will be available.
- It would be helpful to have explicit guidance on how to calculate the bald eagle population within the project's LAP. Depending on how the population is calculated, the allowable take could range from 2 to 30 eagles:
 - Question: What density should be used to calculate the Bald Eagle population within the project's LAP? The density based on the Central Flyway EMU and the 20th quantile population estimate in the 2016 Status Report (1.8 eagles)? Use local population data based on the project's surveys (29.4 eagles)? Local data from the Sutton Center/other developers if possible?
Answer: Using the density of the Central Flyway will underestimate eagle density in the project LAP. The previously defined take limit for our LAP was 4 to 5 eagles based on the old eagle management units and LAP, so the current LAP take limit should be higher. The USFWS agrees the Central Flyway estimate of 1.8 eagles available for take is too low. Work with Sutton Center and other developers if possible to obtain local data for LAP calculations. The explanation of the calculation needs to be robust, defensible and based on the best available science.
 - Question: If local data are used, how is the 20th quantile (conservative estimate) incorporated into those calculations? In other words, is there a way to repeat what

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February 3, 2017
Thunder Ranch Wind Project Eagle Conservation Plan Agency Meeting
Page 5 of 7

the USFWS did in the 2016 Status Report (or something along those lines) using local nest data?

Answer: Not sure, but will provide an answer later.

- Question: To what degree does the project need to try to evaluate the local background/unauthorized take in the development of the ECP? How does such background take (or lack of information there upon) affect the project's ECP development and application? Does the USFWS have information to provide related to rates of background take?

Answer: The ECP should acknowledge this, but does not need to provide any estimates. At this time, the USFWS does not have any information on background levels of take for bald eagles in Thunder Ranch's LAP. An incidental take permit application can be submitted prior to knowing this information. As new projects come online, information about this will be updated in a database managed by USFWS. The Service is developing a cumulative effects tool that will be available at a later date.

- Question: If the project's take is estimated to be less than 5% of the LAP, to what degree does compensatory mitigation need to be addressed in the ECP?

Answer: Compensatory mitigation is not required if take is less than 5% of the LAP. The ECP should include a section to acknowledge voluntary offset of potential impacts even if no compensatory mitigation is required.

- Question: If compensatory mitigation is determined to not be needed during year 1, is it possible that it could be needed at a later time, i.e., during the evaluation process every five years based on changes to the LAP take limits?

Answer: The project is locked in to the agreements outlined at the time the permit is issued. Bob Murphy wasn't sure about how changes in the LAP take limits, whether they increase or decrease, could affect compensatory mitigation at a later time. They will discuss it and provide an answer at a later date.

- Question: What compensatory mitigation options are available within the project's LAP? Lead abatement program? Carcass removal program? Contributions to rehab facilities?

Answer: Not sure at this time, but will provide an answer later. Any mitigation options need to be quantifiable, tested to show how they offset take, and defensible. The USFWS is currently testing some options. Contribution to eagle rehab facilities is likely not a viable option.

- Question: What is the timeline for payment and implementation of compensatory mitigation if necessary?

Answer: The recommendation is to get the permit application in as soon as possible and the Service will work with the project on this.

- Question: Does the USFWS have any recommended Best Management Practices for the ECP beyond those in the WEG and ECPG?

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February 3, 2017
Thunder Ranch Wind Project Eagle Conservation Plan Agency Meeting
Page 6 of 7

Answer: None at this time.

- Question: Adaptive management will be triggered based on take thresholds. The ECP will specify take thresholds based on the actual number of observed eagle taken rather than the modelled estimate of the number of eagles taken. Is this acceptable?
- Answer: Yes, take and adaptive management is based on the actual number of eagles found.

Future monitoring and survey requirements

- Question: Is additional nest monitoring or eagle use surveys required after construction?

Answer: No.

- Question: For post construction monitoring, Stantec proposed to include monthly searches at all project turbines by searching roads and pads and scanning out to a 120 meter radius from each turbine using binoculars. What level of effort is expected for post construction mortality monitoring?

Answer: There are currently no tested minimum requirements for level of effort for eagle fatality monitoring. Bob Murphy discussed that scanning out to 120 meters with binoculars is a method that has not been tested and may not be rigorous enough to detect all potential eagles, but later stated that augmenting the plot search during winter months, when ground visibility is high, is a good idea. Brian mentioned eagle carcass persistence times and that the project will need to account for that when designing the survey methods. Alisha suggested that searches be more frequent (every two weeks) during the winter months when activity is expected to be highest. It was agreed that Stantec should work with the Service to develop an acceptable level of effort for post construction mortality monitoring.

Towards the end of the meeting, the USFWS explained that they will not provide comments or review ECPs for projects that do not intend to seek an incidental take permit. Jenni explained that Tradewind is the developer, but the project will be constructed and operated by another party. At this time, Tradewind is making commitments on behalf of the Project but the ultimate decision to apply for an Incidental Take Permit for Eagles under BGEPA will be left to the Owner and Operator of the Project. All agreed to revisit the project progress and development of the ECP at some point in March.

The meeting adjourned at 1:10 PM CST

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services Inc.

Josh Flinn
Project Manager
Phone: 913-205-5759

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Appendix B: Eagle Risk Assessment

Stage 1 Eagle Risk Assessment



Thunder Ranch Wind Project,
Garfield, Kay, and Noble
Counties, Oklahoma



Prepared for:
Thunder Ranch Wind Project, LLC
16105 West 113th Street, Suite 105
Lenexa, Kansas 66219

Prepared by:
Stantec Consulting Services Inc.
6800 College Blvd
Overland Park, Kansas 66211

Stantec Project #193703991

August 1, 2016

Sign-off Sheet

This document entitled Stage 1 Eagle Risk Assessment was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Thunder Ranch Wind Project, LLC ("Thunder Ranch"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and Thunder Ranch. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by 
(signature)
Amber Wingert, Wildlife Biologist

Reviewed by 
(signature)
Josh Flinn, Wildlife Biologist/ Project Manager

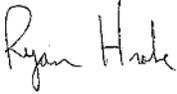
Reviewed by 
(signature)
Ryan Hrabe, Wildlife Biologist/Project Director

Table of Contents

EXECUTIVE SUMMARY	II
ABBREVIATIONS	IV
1.0 INTRODUCTION.....	1.1
1.1 PROJECT DESCRIPTION.....	1.1
1.1.1 Project Habitat.....	1.3
1.2 SPECIES DESCRIPTION	1.3
1.2.1 Bald Eagles	1.3
1.2.2 Golden Eagles.....	1.6
2.0 APPLICABLE REGULATIONS AND GUIDELINES.....	2.8
2.1 MIGRATORY BIRD TREATY ACT.....	2.8
2.2 BALD AND GOLDEN EAGLE PROTECTION ACT	2.8
2.3 EAGLE CONSERVATION PLAN GUIDELINES.....	2.9
2.3.1 Determination for an Eagle Take Permit	2.9
2.3.2 Eagle Management Units and Take Thresholds	2.11
3.0 SCOPE AND METHODS OF ASSESSMENT	3.15
3.1 SCOPE	3.15
3.1.1 Bald Eagles	3.15
3.1.2 Golden Eagles.....	3.15
3.2 METHODS	3.17
4.0 RESULTS	4.18
4.1 SEASONAL ABUNDANCE.....	4.18
4.2 NESTING RECORDS.....	4.20
4.3 MIGRATION CORRIDORS.....	4.20
4.4 COMMUNAL ROOSTS	4.21
4.5 PREY AVAILABILITY OR FORAGING HOTSPOTS	4.21
5.0 CONCLUSIONS.....	5.22
6.0 REFERENCES	6.25

LIST OF FIGURES

Figure 1-1	Project Location.....	1.2
Figure 1-2	Project Footprint National Land Cover Dataset.....	1.4
Figure 1-3	Project Water Features	1.4
Figure 2-1	USFWS Region 2 Lower Mississippi Eagle Management Unit.....	2.13
Figure 2-2	USFWS Golden Eagle Management Unit within Oklahoma	2.14
Figure 3-1	Geographic Scope of Eagle Risk Assessment	3.16
Figure 4-1	Bald Eagle Sightings and Referenced Data Locations.....	4.19

LIST OF APPENDICES

APPENDIX A	AGENCY CORRESPONDENCE.....	A.27
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Executive Summary

Stantec Consulting Services Inc. (Stantec) has completed this Eagle Risk Assessment (ERA) for the proposed Thunder Ranch Wind Project (Project), which is located in Garfield, Kay, and Noble counties, Oklahoma. This ERA evaluated the potential risk to Bald Eagles (*Haliaeetus leucocephalus*) and Golden Eagles (*Aquila chrysaetos*) from construction and operation of the Project as part of the U.S. Fish and Wildlife Service's (USFWS's) Eagle Conservation Plan Guidance (ECPG) Stage 1 Site Assessment. The ECPG was designed to aid wind developers in conserving Bald and Golden Eagles during the siting, construction, and operation of a wind energy facility, and in adhering to the regulations in the Bald and Golden Eagle Protection Act. The purpose of this ERA is to collect information on the potential occurrence and distribution of eagles within the Project boundary and its vicinity, determine whether the Project contains suitable habitat for eagles, and provide a preliminary risk evaluation to eagles from the construction and operation of the Project.

Stantec conducted a literature and database review to obtain information about Bald Eagle resources that may occur within the Project Footprint (boundary), within the Project Area (the area within 10 miles of the Project Footprint), and within the Local Area Population (LAP; the area within 43 miles of the Project Footprint). Given the rarity of Golden Eagles in central Oklahoma, Golden Eagles were excluded from further evaluation in this ERA. Data sources were reviewed for information on Bald Eagle seasonal abundance, nesting records, migration corridors, communal roosts, and prey availability or potential foraging hotspots.

The Project is located within the Bald Eagle's winter and breeding ranges. Throughout the year, Bald Eagle distribution and abundance is closely tied to the availability and abundance of food. During the winter and migration, Bald Eagles will congregate at reservoirs, lakes, rivers, streams, and wetland complexes where fish, waterbirds, or mammals are abundant. Bald Eagles will also congregate at locations with an abundance of livestock carcasses, such as feedlots and cattle ranches. The locations of Bald Eagle nests and roosts are also linked to the location of foraging areas and the availability of nest habitat (large trees near food sources).

Within the Project's LAP, highest concentrations of Bald Eagles occur at Salt Plains National Wildlife Refuge (NWR), Kaw Lake, Sooner Lake, the Arkansas River, Lake McMurry, and Lake Carl Blackwell. In addition, Bald Eagle nests occur at Salt Plains NWR, along the Arkansas River, and at Sooner Lake, which is within the Project Area. Stantec did not identify any concentrations of eagles, locations of roosts, or locations of any eagle nests within the Project Footprint. Suitable Bald Eagle foraging and nesting habitat within the Project Area includes the Arkansas River, Salt Fork Arkansas River, Red Rock Creek, Cimarron River, and Sooner Lake. The Project Footprint contains ponds and wetlands that may be used by Bald Eagles, but these water features are small and unlikely to attract concentrations of eagles.

Within the Project Area, there is one known important eagle-use area (Bald Eagle nest) at Sooner Lake. Site specific surveys aerial eagle nest surveys (as per the ECPG) may be necessary

to confirm the presence/absence of additional Bald Eagle nests within the Project Area. However, Stantec did not identify any habitats within the Project Area known to be or potentially valuable to eagles that would be destroyed or degraded by the Project. The habitat within the Project Footprint is predominately crop fields and fragmented grassland used for cattle production, which are not typically used by Bald Eagles.

Based on publicly available data, the Project is likely considered a Category 2: High to Moderate Risk based on the ECPG criteria because of known important eagle-use areas within the Project Area (i.e. Sooner Lake). Site-specific surveys (eagle point-counts and nest surveys) will be necessary to further determine the Project's risk category. The necessity for such surveys should be determined in coordination with the USFWS.

Abbreviations

ACP	Advanced Conservation Practice
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
CBC	Christmas Bird Count
CFR	Code of Federal Regulations
ECP	Eagle Conservation Plan
ECPG	Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2
EMU	Eagle Management Unit
ERA	Eagle Risk Assessment
ESA	Endangered Species Act
ft	feet
GIS	Geographic Information System
km	kilometer
LAP	Local Area Population
m	meter
mi	mile
NABCI	North American Bird Conservation Initiative
NWR	National Wildlife Refuge
ODWC	Oklahoma Department of Wildlife Conservation
Project	Thunder Ranch Wind Project
Salt Fork	Salt Fork Arkansas River

STAGE 1 EAGLE RISK ASSESSMENT
Thunder Ranch Wind Project, LLC
Abbreviations
August 1, 2016

Stantec	Stantec Consulting Services Inc.
Sutton Center	George Miksch Sutton Avian Research Center
Thunder Ranch	Thunder Ranch Wind Project, LLC
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) completed an Eagle Risk Assessment (ERA) for the proposed Thunder Ranch Wind Project (Project), which is owned and under development by Thunder Ranch Wind Project, LLC (Thunder Ranch). The Project is located within the ranges of the federally protected Bald Eagle (*Haliaeetus leucocephalus*) and Golden Eagle (*Aquila chrysaetos*). These species are protected under the Bald and Golden Eagle Protection Act (BGEPA) as amended (16 U.S.C. §668-668d) as well as the Migratory Bird Treaty Act (MBTA). Due to the Project's location within the range of these species, the Project has the potential to impact eagles. The U.S. Fish and Wildlife Service (USFWS) published the Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2 (ECPG) in an effort to assist wind developers with eagle conservation during the siting, construction, and operation of a wind energy facility (USFWS 2013).

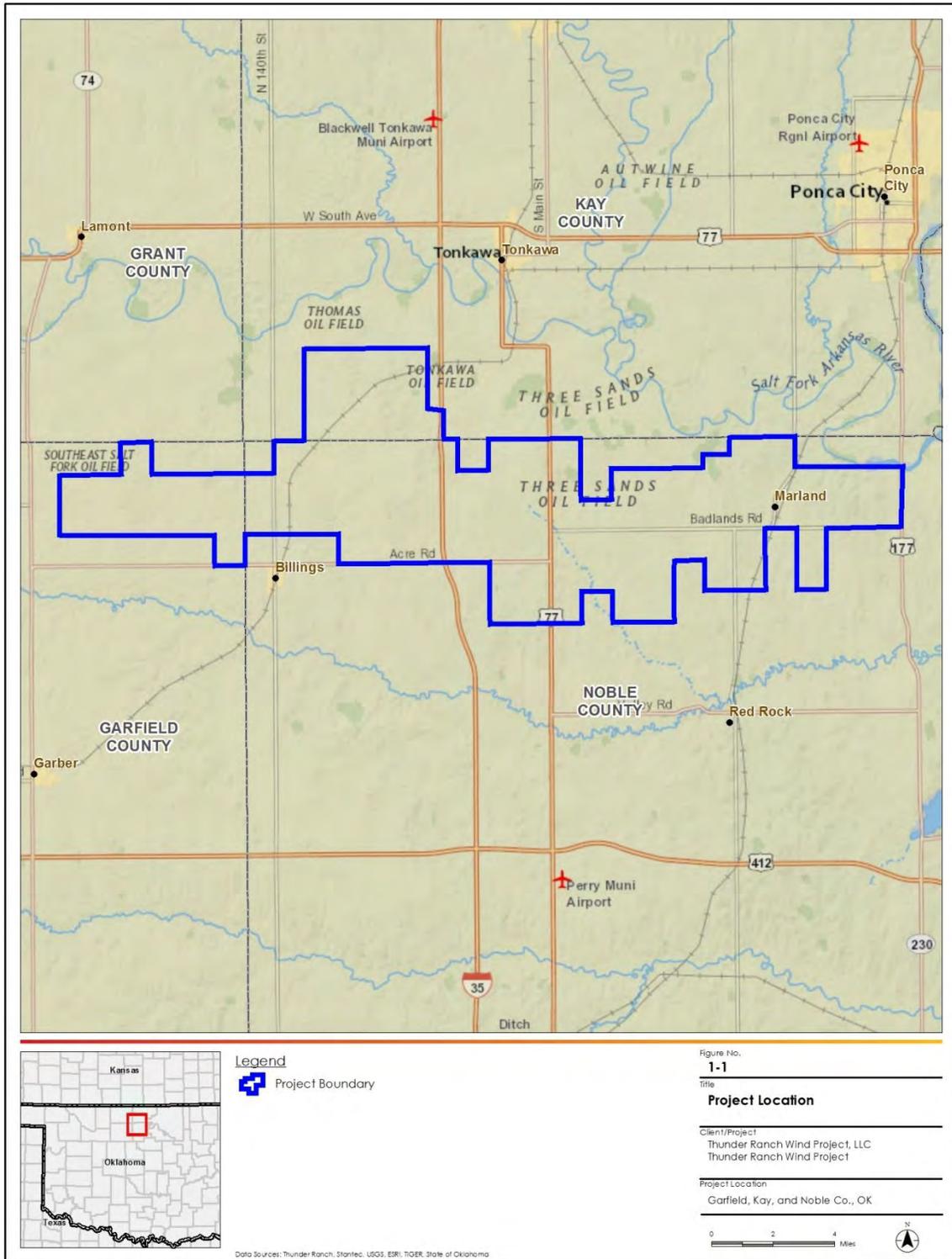
This ERA was prepared in accordance with the ECPG. Specifically, methods used in this ERA are in accordance with Appendix B (Stage 1 – Site Assessment) of the ECPG (USFWS 2013). The purpose of this ERA is to determine whether the Project is within the vicinity of areas known or likely to be used by eagles, and to determine the relative spatiotemporal extent and type of eagle use. Stantec has prepared this ERA to address the following objectives:

1. Collect information on the potential occurrence and distribution of eagles within the Project and its vicinity.
2. Determine whether the Project contains suitable habitat for eagles.
3. Provide a preliminary evaluation of the potential risk to eagles from the construction and operation of the Project.

The findings in this ERA are based on information obtained from publicly available data sources, Geographic Information System (GIS) desktop analyses, and by comparing Project features and geography with eagle distributions and life-history characteristics. Stantec used this information to assess the potential risk to eagles from wind energy development at the preliminary Project location.

1.1 PROJECT DESCRIPTION

The Project is located in Garfield, Kay, and Noble counties in north-central Oklahoma and encompasses approximately 69,513 acres (109 square miles). The Project is southwest of Ponca City, Oklahoma, and south of the town of Tonkawa, Oklahoma. The Project's northeastern boundary occurs along the Salt Fork Arkansas River (Salt Fork) and the southern boundary is about 2 miles north of the Red Rock Creek. A map showing the Project location is provided in Figure 1-1. The Project is proposed to produce approximately 366 megawatts of electricity. The size, number, and placement of the Project turbines and infrastructure have not been finalized.



1.1.1 Project Habitat

According to the U.S. Geological Survey's National Land Cover Dataset, the habitat within the Project is primarily cultivated cropland (57% of the total land use within the Project boundary) and grassland/herbaceous (35%). The remaining habitat within the Project is developed land such as roads and houses (5%), pasture/hay (1%), and forest (1%). The Project also contains less than 1% each of open water and emergent herbaceous wetlands (Homer et al. 2015). The land cover within the Project boundary is shown in Figure 1-2.

Project topography is flat with gently rolling hills. Water features within the Project boundary consist mainly of intermittent streams, small wetlands, and ponds. Water features within the Project are shown in Figure 1-3. There are no large waterbodies or rivers in the Project boundary. The three largest rivers in the Project vicinity include the Salt Fork (directly adjacent to Project boundary), Arkansas River (approximately 3.0 miles [mi] east of the Project), and Red Rock Creek (2.0 mi south), (see Figure 1-3). Intermittent streams within the Project boundary consist of tributaries of the Salt Fork and Red Rock Creek (Figure 1-3). Sooner Lake is located approximately 6.3 miles southeast of the Project boundary.

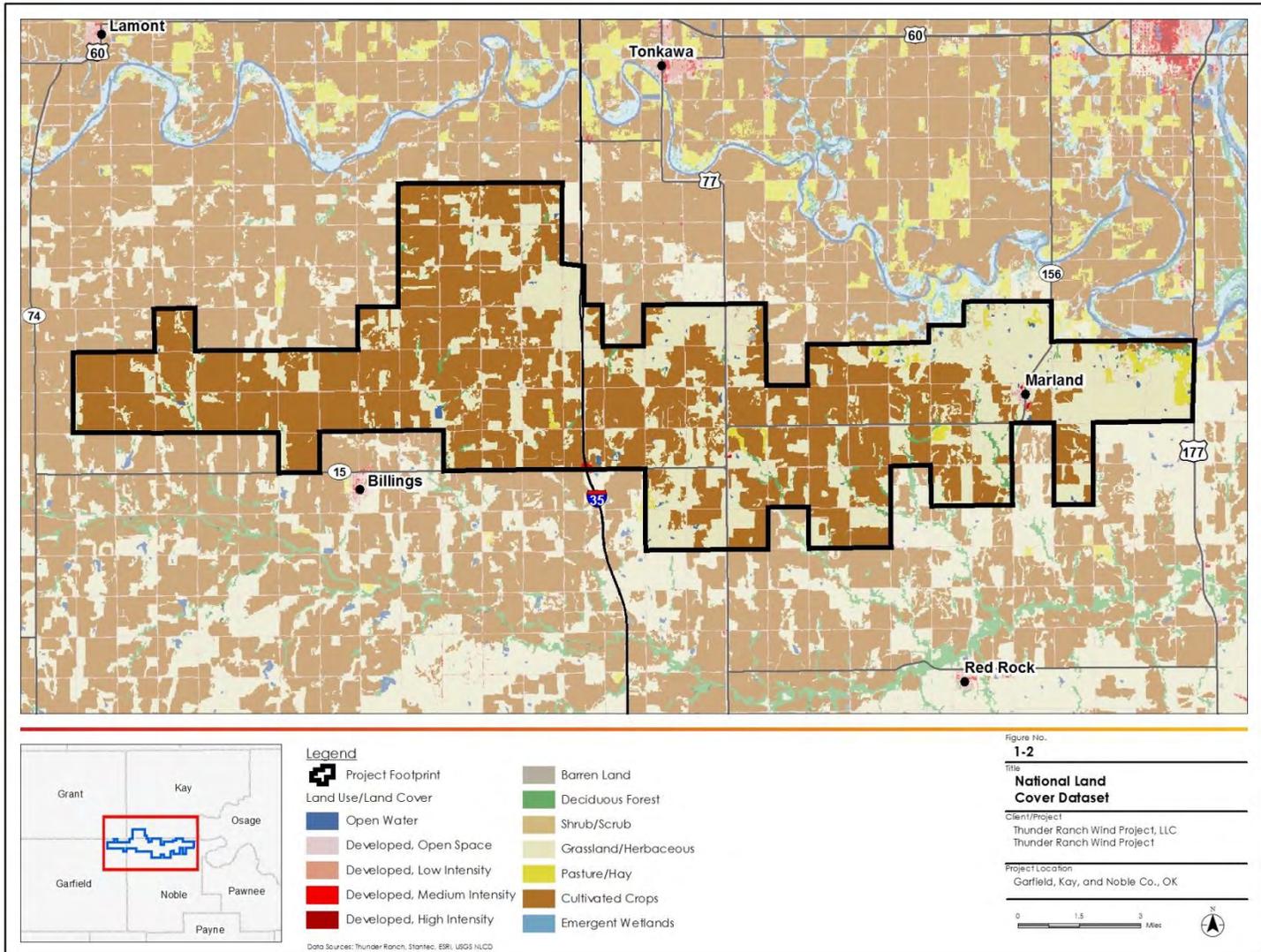
1.2 SPECIES DESCRIPTION

1.2.1 Bald Eagles

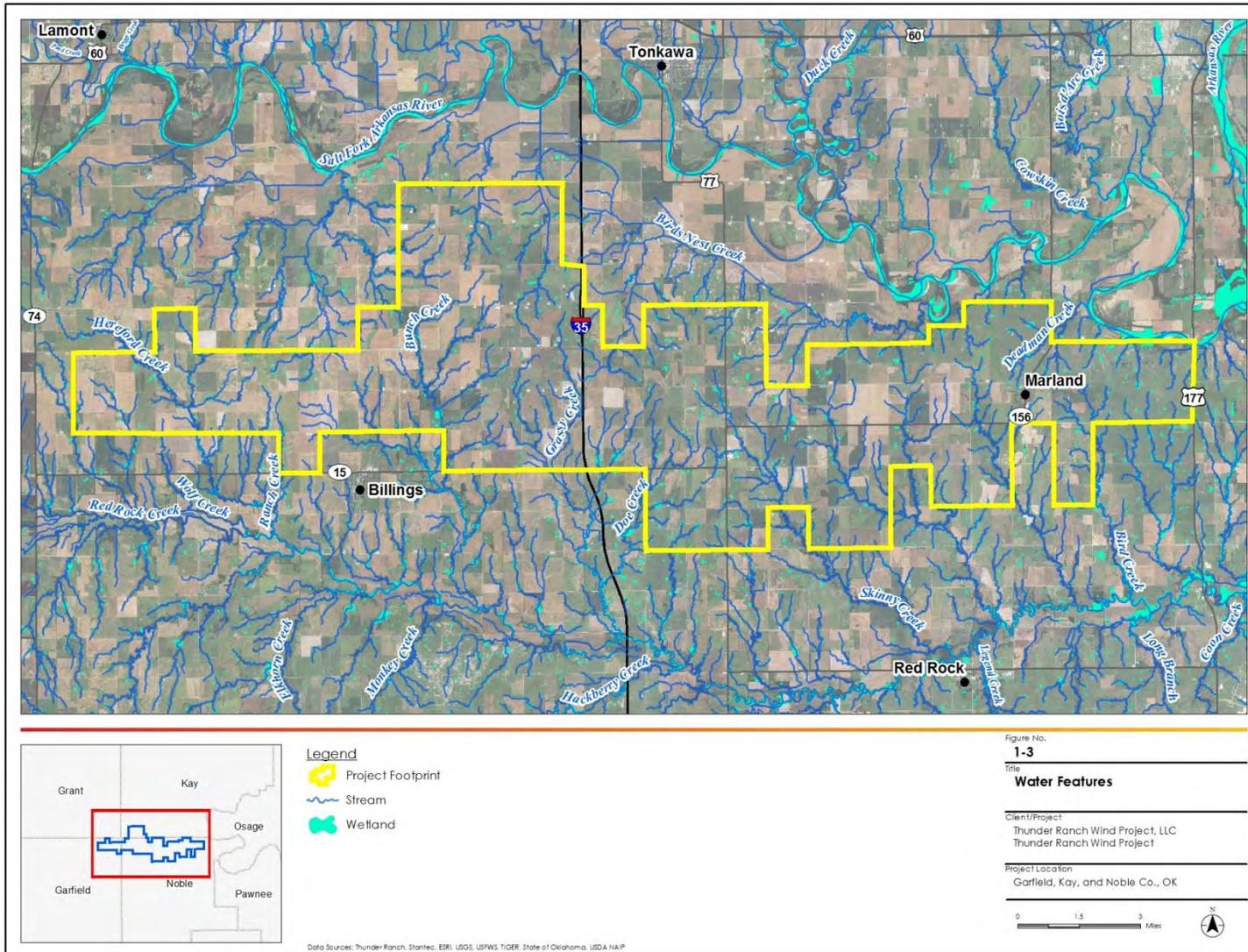
The second largest bird of prey in North America, the adult Bald Eagle has a brown body with a distinctive white head and tail and with a yellow bill and feet. Juvenile Bald Eagles are covered in dark brown feathers mixed with white feathers (Buehler 2000). The Bald Eagle was listed as endangered under the Endangered Species Act (ESA) in 1978, but in 1999 the species had recovered sufficiently for USFWS to propose removing it from the ESA (Department of the Interior 2007). It was officially delisted in 2007, though the Bald Eagle is still protected under the BGEPA and MBTA. Both breeding and wintering Bald Eagle populations occur in Oklahoma.

Bald Eagles breed throughout most of the subarctic Alaska and Canada, with breeding populations associated with aquatic habitats (coastal areas, rivers, lakes, and reservoirs) throughout much of the Lower 48 States. Breeding Bald Eagles are very territorial. Bald Eagles typically nest in large, mature trees with an open branch structure in a given area near a reservoir or large river, and rarely near smaller ponds, lakes, or creeks (Buehler 2000; Reinking 2004). Nests are usually less than 1.2 kilometer [km] (1.2 mi) from a water source with suitable foraging opportunities and generally away from human disturbance (greater than 500 m [1,640 feet (ft)]) (Buehler 2000). Bald Eagle nests are large (4-6 ft in diameter or more, and 3 ft deep), made of large sticks, and lined with grasses and other soft vegetation (USFWS 2007b).

STAGE 1 EAGLE RISK ASSESSMENT
 Thunder Ranch Wind Project, LLC
 Introduction
 August 1, 2016



STAGE 1 EAGLE RISK ASSESSMENT
 Thunder Ranch Wind Project, LLC
 Introduction
 August 1, 2016



The migration patterns of Bald Eagles are complex and are dependent on the age of the individual (immature or adult), the location of the breeding site (north vs. south, interior vs. coastal), the climate of the breeding site, and the availability of food. Bald Eagles migrate alone, although they will congregate with other eagles at feeding and roost sites, which are generally associated with aquatic foraging areas (within 10 km [6 mi] of the foraging area) (Buehler 2000). Migrating Bald Eagles will pass over unsuitable, human-developed habitat, but they will also follow traditional migration pathways. Stopover sites during migration have abundant food resources such as fish and waterfowl concentrations or the presence of large mammals as carrion. Most stopover sites also have traditional communal roost sites, which are often clumps of mature deciduous trees in riparian areas that are protected from human disturbance (Buehler 2000).

Bald Eagles spend the winter in the Lower 48 States and coastal Alaska and Canada near aquatic habitats. During the winter, Bald Eagle communal roosts are generally located in large deciduous or coniferous trees that are open and accessible (Buehler 2000). Communal roost trees are between 15 to 60 m (49 to 197 ft) in height, are associated with aquatic foraging areas, and are located away from houses and roads. Communal roost locations are also selected because of their ability to protect eagles from prevailing winter winds (Buehler 2000).

During migration and winter, the distribution of Bald Eagles across the landscape is most related to the availability of food. Nest locations are also tied to the location of foraging areas. The Bald Eagle's primary prey is fish, but they are opportunistic feeders. Bald Eagles will feed on fish, carrion, aquatic and terrestrial mammals, turtles, and waterfowl. During the winter, they are frequently found near large bodies of water and large rivers where the water is more likely to stay at least partially free of ice throughout the winter (Buehler 2000; USFWS 2007b). Bald Eagles will also feed on wild and domestic carrion along roads, in landfills, and at feedlots (USFWS 2007b). Large carcasses can potentially be fed on for many days (Buehler 2000).

1.2.2 Golden Eagles

The Golden Eagle is a large, dark-brown raptor with golden-brown feathers on the back of its head. Adult Golden Eagles are completely brown, but juvenile Golden Eagles have white patches on their tails and flight feathers. Golden Eagles are wide-spread throughout Europe, Asia, and the Americas (Kochert et al. 2002). In the United States, Golden Eagles occur year-round in the western half of the continental United States and winter on the western Great Plains. In Oklahoma, a small population breeds in the Panhandle. During the winter, Golden Eagles can be found statewide but occur infrequently in the eastern half of Oklahoma (ODWC 2011b).

Golden Eagles prefer open habitats with native vegetation (e.g., grasslands) and generally avoid urban, agricultural, and forested areas. Throughout the year, Golden Eagles feed primarily on small to medium-sized mammals including hares (*Lepus* spp.), rabbits (*Sylvilagus* spp.), ground squirrels (*Spermophilus* spp.), prairie dogs (*Cynomys* spp.), and marmots (*Marmota* spp.). Golden Eagles can often be found near prairie dog colonies during the winter. Golden Eagles are opportunistic predators and will prey on domestic animals, birds, and larger

mammals. During the winter, they are frequently found near reservoirs and wildlife refuges where winter waterfowl concentrations provide feeding opportunities (Kochert et al. 2002).

2.0 APPLICABLE REGULATIONS AND GUIDELINES

2.1 MIGRATORY BIRD TREATY ACT

The MBTA is a joint agreement between the United States, Canada, Mexico, Japan, and Russia to ensure the protection of a shared migratory bird resource. All migratory birds and raptors, including eagles, in North America are protected under the MBTA (16 United States Code [U.S.C.] §703 et seq.). The MBTA prohibits the take, kill, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior (16 U.S.C. §703). The word "take" is defined by the MBTA as any act that pursues hunting, wounding, killing, or capturing migratory birds (50 Code of Federal Regulations §10.12).

2.2 BALD AND GOLDEN EAGLE PROTECTION ACT

The BGEPA was first passed in 1940 and provides protection to the Bald Eagle and Golden Eagle (as amended in 1962). The BGEPA prohibits the "take, possession, sale, purchase, barter, offer to sell, transport, export, or import of any bald or golden eagle (dead or alive) including any part, nest, or egg, unless allowed by permit" (16 United States Code [USC] §668a; 50 Code of Federal Regulations [CFR] §22). In the BGEPA, "take" means to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb" (50 CFR §22.3). "Disturb" means "to agitate or bother a bald or golden eagle 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" (50 CFR §22.3). The BGEPA provides civil and criminal penalties for persons who violate these regulations without a permit from the USFWS.

In September 2009, the USFWS established rules (50 CFR §22.26 and §22.27) authorizing limited take of Bald or Golden Eagles and their nests through take permits. As part of the 2009 Eagle Permit Rule (USFWS 2009), the USFWS established thresholds of take under which a regional population of eagles would maintain stable or increasing eagle populations. Take limits for permits issued by the USFWS under the BGEPA must not exceed established thresholds. A take permit can be issued "when the take is associated with, but not the purpose of, an otherwise legal activity" and where the take is unavoidable even though Advanced Conservation Practices (ACPs) are being implemented. The Eagle Permit Rule distinguishes take that might result from short-term or one-time actions from take that might result from ongoing, long term actions (i.e., programmatic take). The USFWS may issue a programmatic take permit when the take is recurring, is not caused solely by indirect effects, and occurs over the long term.

2.3 EAGLE CONSERVATION PLAN GUIDELINES

The USFWS issued the ECPG in 2013 to assist wind developers in their efforts to adhere to the BGEPA. The ECPG details the USFWS's approach to the issuance of programmatic eagle take permits for wind facilities under the Eagle Permit Rule and provides guidance on the development of Eagle Conservation Plans (ECP). Adherence to the ECPG is voluntary, but the USFWS has developed the ECPG to assist wind-facility developers with regulatory compliance regarding eagle take, avoidance and minimization of unintentional eagle take, and provide the information to support an eagle take permit application, if necessary (USFWS 2013). The ECPG describes a five-stage approach for siting new wind facilities¹:

1. Stage 1 is the preliminary site evaluation, which includes the landscape-level screening of one or more potential project sites.
2. Stage 2 includes site-specific surveys to assess the potential risk of the proposed project to eagles.
3. In Stage 3, the USFWS and the project developer or operator use the data from Stage 2 to predict the project's risk to eagles.
4. In Stage 4, the USFWS and wind developers use the information gathered in previous stages to determine eagle risk at a project and write an ECP. The ECP discusses conservation measures and ACPs to be used to avoid or minimize potential risks to eagles to the extent practical. The final eagle risk assessment for a project is completed at the end of Stage 4.
5. In Stage 5, if the USFWS issues a take permit, the project operator conducts post-construction monitoring to evaluate the effectiveness compensatory mitigation.

This ERA is a Stage 1 evaluation for the Project.

2.3.1 Determination for an Eagle Take Permit

Adherence to the ECPG is voluntary, and the methods and approaches outlined in the ECPG are not mandatory to obtain an eagle take permit. However, take permit applications that do not follow the ECPG may take longer for the USFWS to process. An ECP is not required to obtain an eagle take permit, as long as the permit application includes all necessary information for the USFWS to adequately evaluate the application.

USFWS uses the approach outlined below to assess the likelihood that a wind project will take eagles. The following definitions are part of the process for evaluating a project's potential risk to eagles:

¹ All stages of the ECPG may not be applicable to all projects

Project Footprint – the boundary that encompasses the wind project inclusive of the hazardous area around all turbines and any associated infrastructure, including utilitylines, out-buildings, roads, etc. (USFWS 2013, pg. 12)

Project Area – the area that includes the Project Footprint plus a 10-mile buffer around the Project Footprint, which is a conservative approximation of the largest recorded Golden Eagle breeding territory size (USFWS 2013, pg. 12).

Local Area Population (LAP) –refers to the eagle population within a distance from the Project Footprint equal to the species median natal-dispersal distance (43 mi for Bald Eagles) (USFWS 2013, pg. iv).

Projects are placed into one of three risk categories based on proximity of the Project Footprint to important eagle-use areas or migration concentrations sites and the project's annual eagle fatality estimate in relation to the population size of the LAP. An important eagle-use area is defined as "an eagle nest, foraging area, or communal roost site eagles rely on for breeding, sheltering, or feeding, and the landscape features surrounding such nest, foraging area, or roost site that are essential for the continued viability of the site for breeding, feeding, or sheltering eagles" (USFWS 2009; 50 CFR §22.3). The LAP is the eagle population within a distance of 43 mi for Bald Eagles and 140 mi for Golden Eagles (USWS 2013, pg. iv). The three risk categories in the ECPG are defined as follows (USFWS 2013, pg. 25-26):

Category 1 – High risk to eagles, potential to avoid or mitigate impacts is low

A project is in this category if it:

- 1) has an important eagle-use area or migration concentration site within the Project Footprint; or
- 2) has an annual eagle fatality estimate (average number of eagles predicted to be taken annually) > 5% of the estimated LAP size; or
- 3) causes the cumulative annual take for the LAP to exceed 5% of the estimated LAP size.

Category 2 – High or moderate risk to eagles, opportunity to mitigate impacts

A project is in this category if it:

- 1) has an important eagle-use area or migration concentration site within the Project Area but not in the Project Footprint; or
- 2) has an annual eagle fatality estimate between 0.03 eagles per year and 5% of the estimated LAP size; or

- 3) causes cumulative annual take of the LAP of less than 5% of the estimated LAP size.

Category 3 – Minimal risk to eagles

A project is in this category if it:

- 1) has no important eagle-use areas or migration concentration sites within the Project Area; and
- 2) has an annual eagle fatality rate estimate of less than 0.03; and
- 3) causes cumulative annual take of the LAP of less than 5% of the estimated LAP size.

Should a project be considered to be in Category 1, the USFWS recommends that the project not be constructed or should be substantially redesigned to meet criteria in Category 2. An eagle take permit is recommended for projects in Category 2. Projects in Category 3 pose little risk to eagles and may not require or warrant an eagle take permit; however, the decision to pursue an eagle take permit should be made in coordination with the USFWS (USFWS 2013). The risk category of a project can potentially change as a developer moves through the 5 stages in the ECPG as a result of site-specific evaluations or changes in the project's design or layout.

2.3.2 Eagle Management Units and Take Thresholds

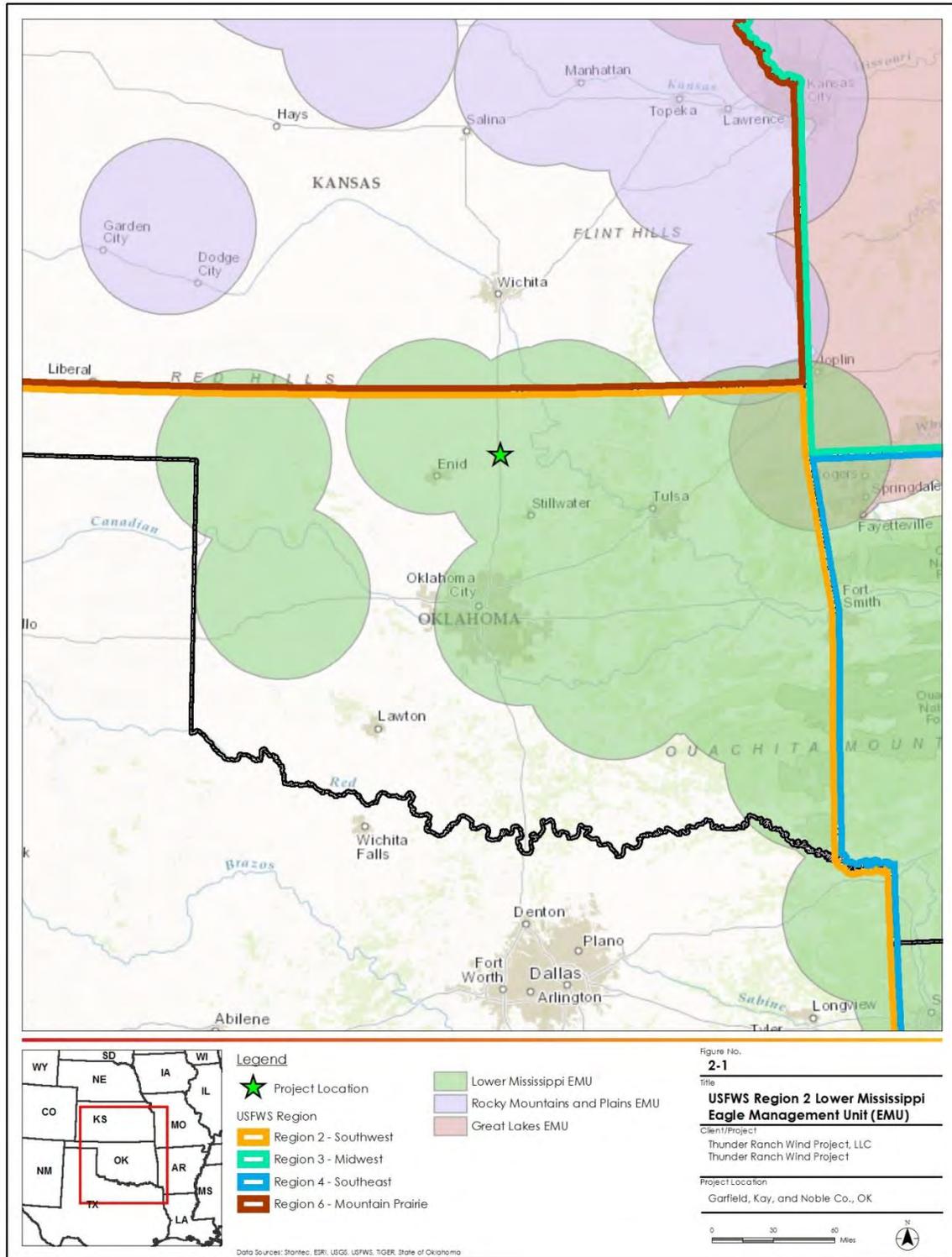
The USFWS used available data for Bald and Golden Eagles to identify appropriate regional population boundaries for management purposes, with the goal of ensuring the USFWS's permit program does not cause declines in eagle populations at a regional or national scale. These defined regional management boundaries are called Eagle Management Units (EMU). Each species' EMU has take thresholds that ensure permitted take does not negatively affect the species' status in any regional management population or EMU (USFWS 2009).

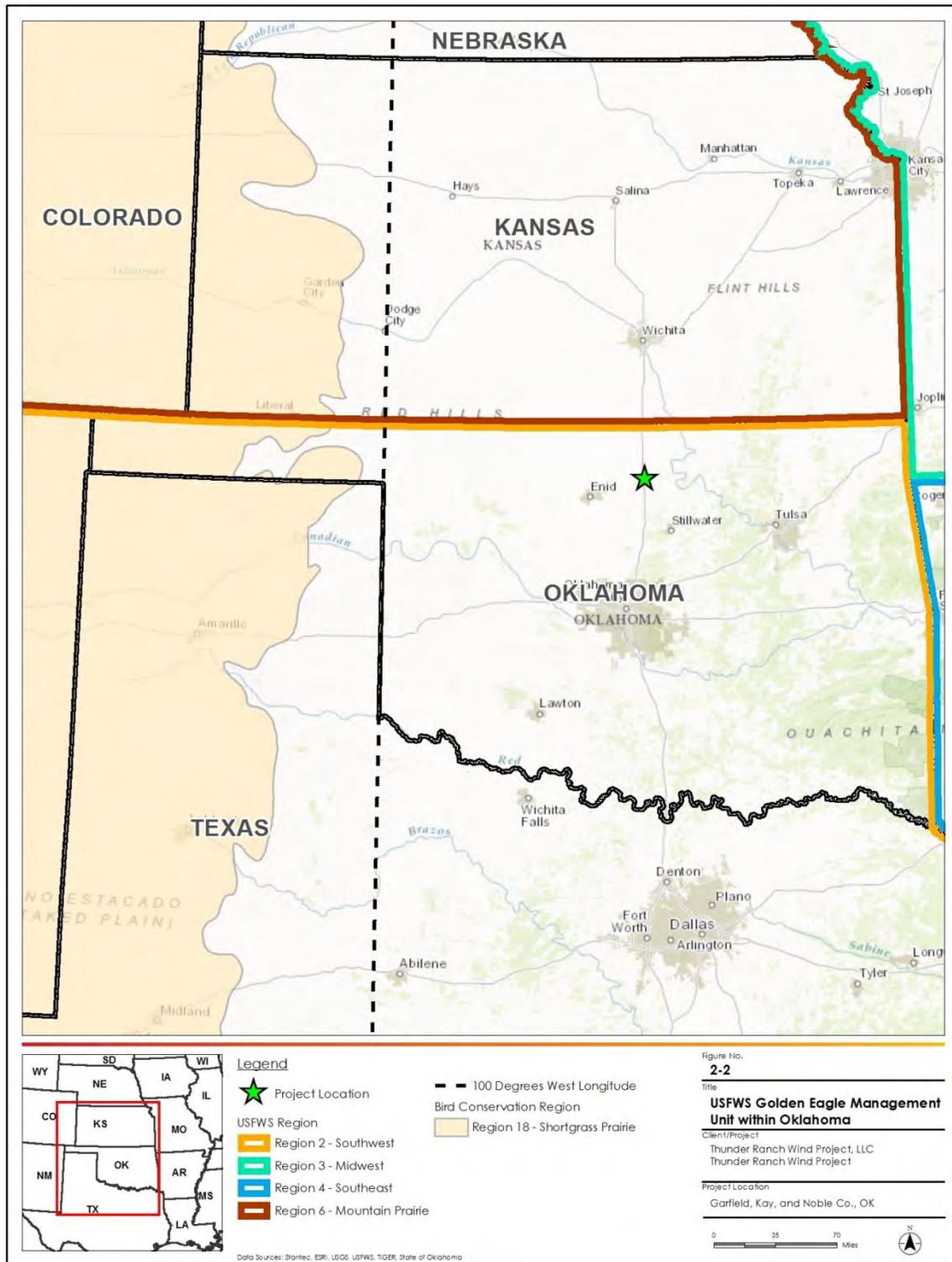
2.3.2.1 Bald Eagle Management Unit

There are 14 EMUs for Bald Eagles in the United States. The Project is located in the Region 2 Lower Mississippi EMU (USFWS 2013). The Lower Mississippi EMU is subdivided between USFWS Region 2 and Region 4. Region 2 Lower Mississippi EMU includes all of Oklahoma and portions of eastern Texas. The Project location within the Region 2 Lower Mississippi EMU is shown in Figure 2-1. In 2009, as part of the evaluation of the Eagle Permit Rule, the USFWS estimated the Bald Eagle population size for the Region 2 Lower Mississippi EMU to be 589.17 Bald Eagles, and the USFWS set the annual individual take threshold for this EMU at 4.79 Bald Eagles/year. In 2009, the USFWS also knew the locations of 136 nests and estimated they had mapped less than 1% of the actual Bald Eagle nests within the Region 2 Lower Mississippi EMU (USFWS 2009). The locations of known nests are not publicly available. The Bald Eagle population and nest data for the EMU in the Eagle Permit Rule are the most recent available population estimates for the EMU, and given that Bald Eagle populations are increasing in the United States, the current population is likely larger than the 2009 estimates.

2.3.2.2 Golden Eagle Management Unit

The USFWS uses the North American Bird Conservation Initiative (NABCI) Bird Conservation Regions (BCR) to manage Golden Eagle populations. Thus, the BCRs also serve as the EMUs for the Golden Eagle. The NABCI is a committee of government agencies, including the USFWS, and Non-Governmental Organizations that have a common objective of conserving birds (NABCI 2016). There are 16 EMUs for Golden Eagles in the United States (including Alaska); however, the USFWS does not issue Golden Eagle take permits east of 100 degrees west longitude (USFWS 2009), though USFWS has proposed changing this rule to allow take permits in the eastern U.S. (USFWS 2016). As a result, Golden Eagle EMUs do not exist in the eastern half of the United States, which includes the Project; therefore, the take of Golden Eagles is not permitted for the Project. The Project location in relation to Golden Eagle EMUs and 100 degrees west longitude is shown in Figure 2-2.





3.0 SCOPE AND METHODS OF ASSESSMENT

3.1 SCOPE

As recommended by the ECPG, publicly available information on eagle occurrence data and potential habitat (breeding and non-breeding) was searched for the Project and surrounding area. The geographic scope of this assessment included the Project Footprint, Project Area, and LAP and is shown in Figure 3-1. Within the scope of this ERA, all data sources were searched for Bald Eagle data within the Project Footprint, Project Area, and LAP. These defined search areas are significant because the USFWS uses eagle information in each of these areas to determine relative eagle risk at wind projects (see Section 2.2.2).

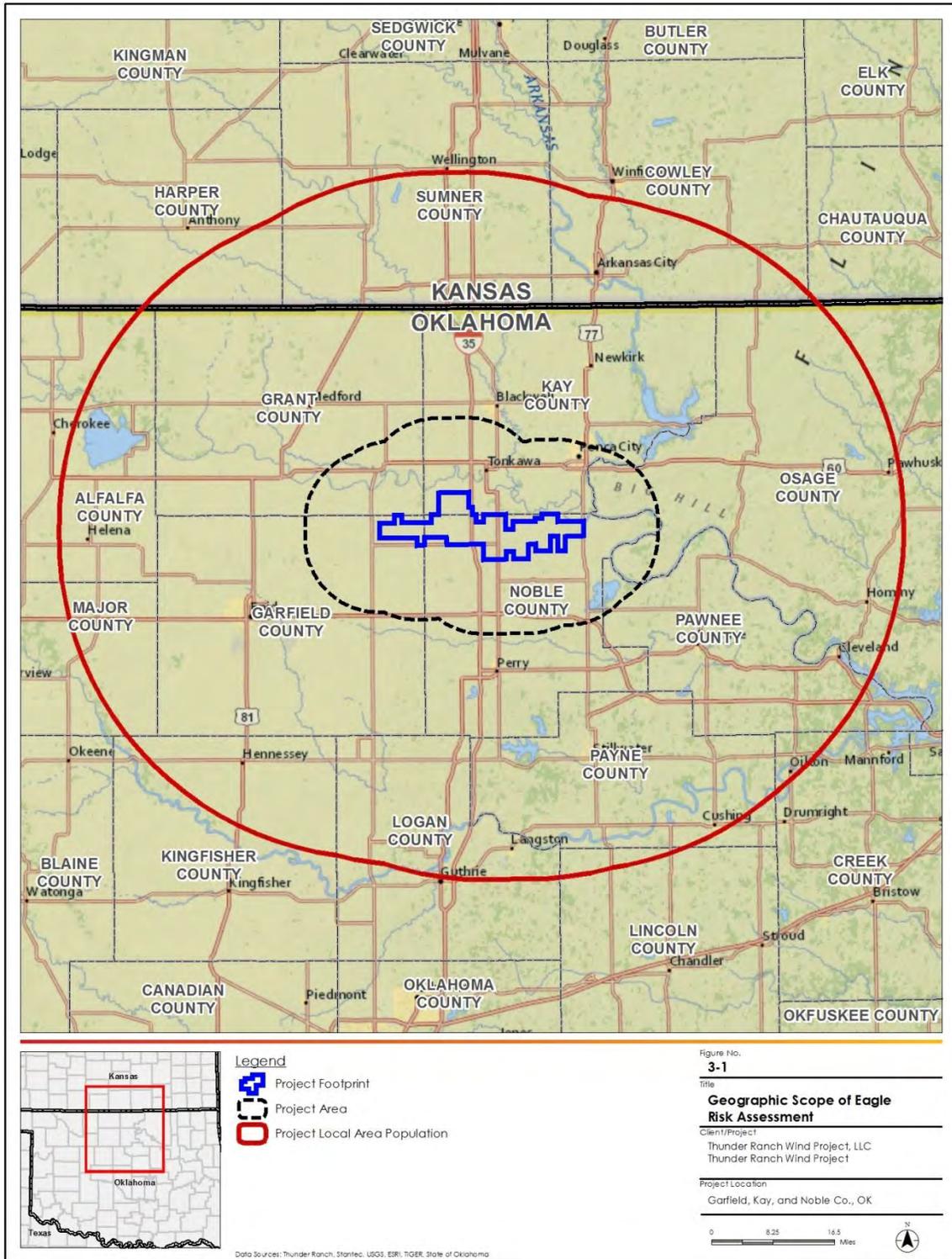
3.1.1 Bald Eagles

The Project is located within the Bald Eagle's winter (OBRC 2014) and breeding range (USFWS 2014). Bald Eagle populations have been increasing rapidly since 1991, including in Oklahoma (Suckling and Hodges 2007; USFWS 2007a). They have expanded into sections of the state where nesting has not been previously documented. Based on the occurrence of Bald Eagles in central Oklahoma, and the availability of suitable habitat and preferred prey within, or near the Project, Bald Eagles are further assessed in this ERA.

3.1.2 Golden Eagles

Golden Eagles are present in Oklahoma from late-October to mid-March in the western third of the state. They occur in the eastern two-thirds of the state during the winter on rare occasions. Within Oklahoma, breeding occurs only in Cimarron and Texas counties in the Oklahoma panhandle, which are approximately 300 mi from the Project, and only 2 to 4 nesting pairs occur in Oklahoma (OBRC 2014; ODWC 2011b). Due to their rarity in the state, data on Golden Eagle range and population size in Oklahoma are limited.

The Project is within the winter range of the Golden Eagle (OBRC 2014); however, they occur infrequently in north-central Oklahoma and there is little suitable habitat for this species in the Project (i.e., open grasslands). Golden Eagles are most frequently found near colonies of black-tailed prairie dogs (*Cynomys ludovicianus*) or areas with high concentrations of waterbirds during the winter (Kochert et al. 2002), neither of which have been documented within the Project boundary. The rarity of Golden Eagles within the Project's vicinity is demonstrated as Golden Eagles were observed only 4 times during the Salt Plains National Wildlife Refuge (NWR) Christmas Bird Count (CBC) and once during the Sooner Lake CBC in the last 20 years (Audubon 2016). Golden Eagles were observed during the CBC at Tallgrass Prairie 7 times in the last 20 years, with a high count of 6 in 2003. Based on the rarity of occurrence, limited availability of suitable habitat, and limited preferred prey within or near the Project, risk to Golden Eagles is low. Based on this information, Golden Eagles are excluded from further analysis in this ERA.



3.2 METHODS

Stantec conducted a literature and database review to obtain information about Bald Eagle resources that may occur in the Project's vicinity. These data sources provided information on the potential distribution and abundance of Bald Eagles within the scope of this assessment (Section 3.1). Stantec reviewed the following sources for Bald Eagle-related information:

- State and Federal data, publications, and correspondence
- Oklahoma Breeding Bird Atlas (Reinking 2004)
- National Audubon Society's CBC
- National Audubon Society and the Cornell Lab of Ornithology's eBird program
- Scientific publications
- Publicly available GIS data
- Publicly available survey data

These data sources were reviewed for information on Bald Eagle seasonal abundance, nesting records, migration corridors, communal roosts, and prey availability or potential foraging hotspots.

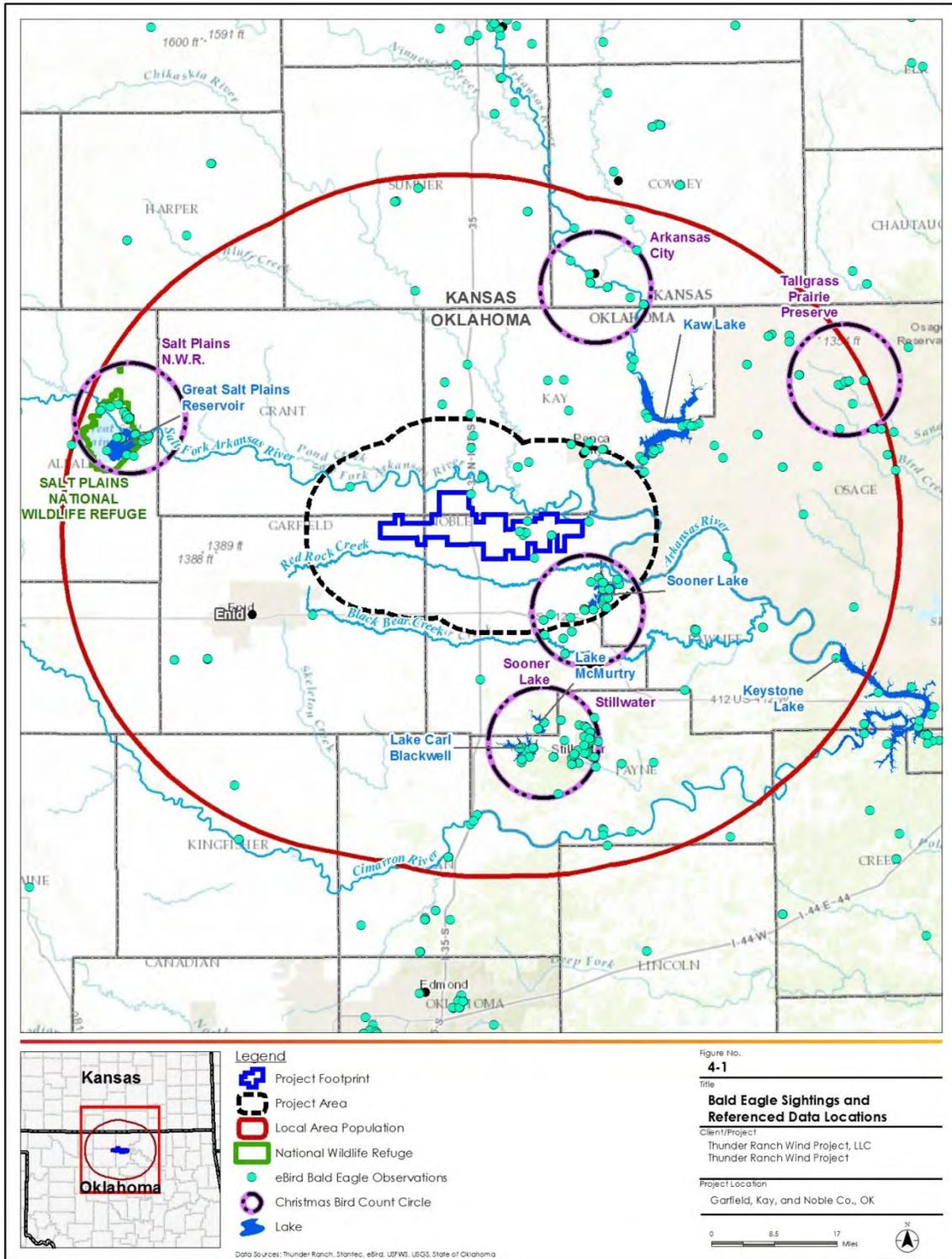
4.0 RESULTS

4.1 SEASONAL ABUNDANCE

The Project is located within the **Bald Eagle's** winter and breeding ranges. Winter-resident Bald Eagles begin arriving in Oklahoma in November and migrate back north in late March. During the winter, Bald Eagles occur in the highest concentrations around major waterbodies with reliable food sources. Oklahoma lakes with the highest concentrations of eagles include Kaw Lake, Keystone Lake, Lake Texoma, Tenkiller Lake, Fort Gibson Lake, Grand Lake, Canton Lake, Great Salt Plains Reservoir, Tishomingo Lake, and Spavinaw Lake (ODWC 2011a). These lakes are popular eagle watching destinations for eagle enthusiasts. Great Salt Plains Reservoir (approximately 35 mi northwest of the Project) and Kaw Lake (approximately 13 mi northeast of the Project) are within the Project's LAP (see Figure 4-1).

Bald Eagles are expected to occur within the LAP during the winter, but are most abundant near reservoirs with suitable food sources, as demonstrated by the distribution of eBird Bald Eagle sightings within the LAP. Bald Eagle eBird sightings within the LAP in the last 6 years (2011-2016) are shown in Figure 4-1. The majority of these sightings were concentrated around reservoirs. Four of the largest reservoirs within the LAP are surveyed as part of the CBC (Great Salt Plains Reservoir, Sooner Lake, Lake Carl Blackwell, and Lake McMurtry). In the last 5 years of surveys (2011-2015), an average of 17.8 Bald Eagles/year were observed within the Salt Plains NWR CBC circle, with a maximum annual count of 40 Bald Eagles in 2013 (Audubon 2016). The Sooner Lake CBC circle, which is approximately 2 mi southeast of the Project, recorded an average of 21.0 Bald Eagles/year in the last 5 years, with a maximum annual count of 36 Bald Eagles. The Stillwater CBC circle, located approximately 19 mi south of the Project, had an average of 2.4 Bald Eagles/year over the last 5 years, with a maximum annual count of 4 Bald Eagles (Audubon 2016). The Arkansas City CBC circle, located approximately 30 mi north of the Project, had an average of 12 Bald Eagles/year over the last 5 years, with a maximum annual count of 15 Bald Eagles. The Tallgrass Prairie CBC circle, located approximately 34 mi northeast of the Project, had an average of 11.2 Bald Eagles/year in the last 5 years, with a maximum annual count of 15 Bald Eagles. Most of these CBC circles include large reservoirs or rivers which provide nesting and foraging habitat. Although wintering Bald Eagles can be expected to occur throughout the LAP and Project Area, there are no large reservoirs within the Project Footprint to attract concentrations of wintering Bald Eagles.

Bald Eagles breed in Oklahoma from December through early July (Reinking 2004). Stantec did not locate any publicly available data on the abundance of Bald Eagles within the LAP, Project Area, or Project Footprint during the breeding season. Typical Bald Eagle breeding territories are about 0.4-0.8 square miles (1-2 square kilometers) and are limited by the availability of suitable nest trees and food sources (Buehler 2000). There are four known nests within the LAP and Project Area based on publicly available data. Bald Eagles are frequently observed within



the Project Area and LAP during the breeding season based on eBird and CBC data.

4.2 NESTING RECORDS

Historically, Bald Eagles are not known to have nested west of the Arkansas River in Oklahoma, and the first documented successful nesting in Oklahoma occurred in 1978 in east-central Oklahoma (Lish and Sherrod 1986). From 1984 to 1990, Bald Eagles were reintroduced to Oklahoma to augment the state's existing population, and nesting Bald Eagle populations began to increase in the state (Reinking 2004). Bald Eagle populations are increasing in Oklahoma and throughout much of their range in the continental United States (USFWS 2007a).

Current and historical records of Bald Eagle nests in Oklahoma indicate nesting activity is generally confined to the eastern half of the state. Bald Eagle nesting records from 1997-2001 provided in Reinking (2004) were located along the Arkansas River and its main tributaries from Tulsa, Oklahoma, to the Arkansas state line, with additional nests scattered in Osage, Delaware, Adair, Latimer, Pottawatomie, and Love counties. A portion of Osage County is within the LAP. In addition, three Bald Eagle nests have been documented at the Salt Plains NWR which is within the LAP (USFWS 2014). The current information on the status and exact locations of these previously documented nests in Oklahoma are not publicly available.

Within the Project Area, the George Miksch Sutton Avian Research Center (Sutton Center) maintains a Bald Eagle nest camera with live internet feed on a nest platform at Sooner Lake in Pawnee County, Oklahoma, about 8 mi southeast of the Project. The Sooner Lake nest was inactive for the 2016 nesting season (Sutton Center 2016b). In addition to Sooner Lake, potential suitable nesting habitat within the Project Area is most abundant along the Arkansas River, Salt Fork, and Red Rock Creek due to the availability of superstructure trees and proximity to preferred food sources; however, nesting records for these areas was not publicly available (See Figure 1-1). In addition, large wetland complexes hydrologically connected to these river/stream systems could also contain suitable nesting habitat. **Based on Stantec's experience** with other wind projects in Oklahoma, isolated large trees adjacent to stock ponds may also be suitable nest sites; however, this behavior is rare.

Waterbodies within the Project Footprint include small farm ponds used for watering livestock and smaller intermittent streams (See Figure 1-3). These smaller water features are not typically used by Bald Eagles for nesting; therefore, the probability of nesting in the Project Footprint is likely low.

4.3 MIGRATION CORRIDORS

There is limited publicly available information on the migration patterns of Bald Eagles in Oklahoma. Since 2010, the Sutton Center has tracked nine Bald Eagle chicks that were hatched in Oklahoma and equipped with satellite transmitters. The Sutton Center has not published the results of their tracking research, but the public can view the most current locations of these eagles on the Sutton Center's website (Sutton Center 2016a). The tracking locations visible on

the website are limited to the 100 most recent locations, which currently includes movements from about August 2015 to April 2016. While the tracking locations do not provide a complete picture of the movements of these Bald Eagles throughout the year, the tracking program is one of the only sources of information about Bald Eagle movements in Oklahoma.

Of the nine tracked Bald Eagles, eight were in southern Canada or the north-central United States during the fall migration (August – October) and migrated down to Oklahoma, Kansas, Missouri, and Arkansas for the winter months (October – April). One Bald Eagle spent the entire time between August 2015 through April 2016 in Oklahoma and Kansas. Two of the tracked Bald Eagles were documented within the Project Area or LAP at Kaw Lake and the Arkansas River (Sutton Center 2016a).

As these eagles demonstrate, the Bald Eagle wintering population in Oklahoma spends the summer months in the northern Midwest (i.e., Minnesota and Wisconsin) or in south-central Canada (i.e., Alberta and Saskatchewan). The nine tracked eagles did not fly along similar pathways as they moved from the north to the south (Sutton Center 2016a), which is consistent with broad-front migration. The Sutton Center data did not indicate there are migration corridors within the Project Footprint, Project Area, or LAP. However, migrating eagles may pass through the Project vicinity and would likely follow rivers like the Arkansas River or Salt Fork but may occur in other locations within the LAP.

4.4 COMMUNAL ROOSTS

In the LAP, Bald Eagle communal roosting habitat occurs at Salt Plains NWR in large cottonwood trees (USFWS 2014). Potential Bald Eagle communal roosting habitat likely occurs at Sooner Lake and Kaw Lake (see Figure 4-1). In the Project Area, communal roost habitat may occur along the Arkansas River, Salt Fork, and Red Rock Creek (see Figure 4-1). Communal roost habitat is limited within the Project Footprint as there are few large trees suitable along riparian areas for roosts. In addition, potential roost trees within the Project Footprint are generally not part of the forest blocks which would provide protection from winter winds. Stantec did not find any other information on the current location of communal roosts in the Project Footprint, Project Area, or LAP.

4.5 PREY AVAILABILITY OR FORAGING HOTSPOTS

The water features most likely to provide suitable foraging opportunities for Bald Eagles within the LAP are: Salt Plains NWR, the Arkansas River and its tributaries, Kaw Lake, Lake McMurtry, Lake Carl Blackwell, and Keystone Lake (see Figure 4-1). Within the Project Area, the Arkansas River, Salt Fork, Red Rock Creek, and Sooner Lake also provide suitable foraging opportunities. There are no known prairie dog colonies within the Project Area or the Project Footprint, and the ponds and wetlands within the Project Footprint are unlikely to attract concentrations of waterfowl or provide an abundance of fish. The Project Footprint contains grassland and pasture used for cattle production. Any cattle carcasses left in the open by local ranchers have the potential to attract eagles, especially during the winter.

5.0 CONCLUSIONS

The ECPG provides a five-stage process for determining the potential risk of a wind project to eagle resources. This Stage 1 ERA is a review of desktop, landscape-level data regarding the potential occurrence of Bald Eagles in the vicinity of the proposed Project. Within the ECPG, the USFWS provided five questions for wind developers to consider as part of the Stage 1 assessment to help place a prospective project into an appropriate risk category (USFWS 2013). Based on the results of this ERA, these questions and associated answers for the Project are as follows:

1. *Does existing or historical information indicate that eagles or eagle habitat (including breeding, migration, dispersal, and wintering habitats) may be present within the geographic region under development consideration?*

Bald Eagles are known to occur throughout the eastern two-thirds of Oklahoma with the highest concentrations documented during the winter months, peaking in January and February (ODWC 2011a). Suitable habitat for breeding, migrating, or wintering Bald Eagles is present within the LAP at Salt Plains NWR, Lake Carl Blackwell, Kaw Lake, Keystone Lake, and the Cimarron River. Within the Project Area, suitable Bald Eagle habitat is located along the Arkansas River, Salt Fork, Red Rock Creek, and Sooner Lake. The Project Footprint does not provide substantial suitable nesting or communal roost habitat; however, Bald Eagle occurrence within the Project Footprint is probable due to the proximity of the Arkansas River, Salt Fork, and Sooner Lake. Domestic livestock carrion (e.g., cattle carcasses) associated with ranching within the Project Footprint may provide foraging opportunities. The current presence of nesting, foraging, or migrating Bald Eagles within the Project Footprint is not known.

2. *Within a prospective project site, are there areas of habitat known to be or potentially valuable to eagles that would be destroyed or degraded due to the project?*

Based on publicly available data, this ERA did not identify any habitat within the Project Footprint or Project Area that is known to be or potentially valuable to eagles that would be destroyed or degraded by the Project. The habitat within the Project Footprint is predominately crop fields and fragmented grassland used in cattle production. These types of habitats are not usually valuable to eagles (compared with rivers, reservoirs, and wetland complexes) unless there is a consistent and abundant source of carrion to attract eagles. The most valuable habitats in the Project Area are located along the Arkansas River, Salt Fork, Red Rock Creek, and Sooner Lake, and these habitats are not expected to be impacted by construction of the Project.

3. *Are there important eagle-use areas or migration concentration sites documented or thought to occur in the project area?*

This ERA identified Sooner Lake as an important eagle-use area within the Project Area. Sooner Lake is the site of at least one Bald Eagle nest along with suitable nesting and foraging habitat. Additional potential nesting and foraging habitat may exist along the Salt Fork, Red Rock Creek, and Black Bear Creek. Site-specific surveys may be necessary to confirm the presence/absence of Bald Eagle nests along these water features. The necessity for such surveys can be determined through coordination with the USFWS.

4. *Does existing or historical information indicate that habitat supporting abundant prey for eagles may be present within the geographic region under development consideration (acknowledging, wherever appropriate, that population levels of some prey species such as black-tailed jackrabbits (*Lepus californicus*) cycle dramatically such that they are abundant and attract eagles only in certain years)?*

The LAP contains Bald Eagle foraging hot spots (e.g., Salt Plains NWR, Kaw Lake), the closest of which is 12.0 mi from the Project Footprint. Within the Project Area, Sooner Lake may support sufficient prey to attract Bald Eagles. The Arkansas River, Salt Fork, and Red Rock Creek, may provide foraging opportunities within the Project Area, but are not expected to attract Bald Eagle concentrations. Ponds and wetlands within the Project Footprint are small and unlikely to provide an abundance of prey. Publicly available information obtained for this ERA did not indicate the presence of habitats supporting abundant sources of prey for eagles within the Project Footprint.

5. *For a given prospective site, is there potential for significant adverse impacts to eagles based on answers to above questions and considering the design of the proposed project?*

Important eagle-use areas within the Project Area include the Arkansas River, Salt Fork, Sooner Lake and potentially the Red Rock Creek. These areas likely provide suitable breeding, migration stopover, and wintering habitats as well as foraging opportunities. Although limited data are available to characterize migratory corridors used by eagles in the Project Area, satellite-tracked eagles have used the Project Area during the migration season. Eagle nests have been identified within the LAP and likely occur within the Project Area; however, there is little available habitat within the Project Footprint for nests to occur. Significant adverse impacts on eagles are unknown given the lack of site-specific data for the Project Footprint. However, due to the proximity of eagle-use areas to the Project Footprint, impacts on eagles could occur, but site-specific surveys will be necessary to confirm these conclusions.

Based on publicly available information, the Project likely meets the criteria for Category 2 – High or Moderate Risk to Eagles. There are likely important eagle-use areas (nests) within the Project Area (Category 2); however, there were none identified within the Project Footprint (Category 1). As per the ECPG, projects in Category 2 may have opportunities to mitigate impacts and reduce risks to eagles. The preliminary conclusion of a Category 2 does not indicate that an eagle take permit is required as the Project's risk category can potentially change based on

additional site-specific surveys for eagles and/or minimization measures proposed by Thunder Ranch. A Stage 2 assessment would provide additional data to adequately determine the risk category for the Project.

Thunder Ranch has begun site-specific surveys to document eagle activity within the Project Footprint and eagle nest locations within the Project Area, which are part of Stage 2 of the ECPG. The design and implementation of these surveys has been developed in coordination with the USFWS. Thunder Ranch initiated coordination with the USFWS and with the Oklahoma Department of Wildlife Conservation (ODWC) in December 2015. Thunder Ranch received a written response to a request for information from the ODWC, but has not received a response from the USFWS. However, USFWS representatives were present at a meeting between Thunder Ranch, the USFWS, and the ODWC on January 28, 2016. Eagle survey protocols were discussed at that meeting and the USFWS had the opportunity to provide input. Agency correspondence is provided in Appendix A. The results of the Stage 2 surveys will be used to adjust the Project's risk Category 2 classification, as needed.

6.0 REFERENCES

- Buehler, David A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/506>.
- Department of the Interior. 2007. RIN 1018-AF21. Endangered and Threatened Wildlife and Plants; Removing the Bald Eagle in the Lower 48 States From the List of Endangered and Threatened Wildlife. July 9, 2007.
- eBird. 2016. eBird: An Online Database of Bird Distribution and Abundance [web application]. eBird, Ithaca, New York. Available: <http://ebird.org>. Accessed April 5, 2016.
- George Miksch Sutton Avian Research Center (Sutton Center). 2016a. Eagle Tracking. <http://www.suttoncenter.org/eagles/>. Website Accessed June 20, 2016.
- Sutton Center. 2016b. Live Bald Eagle Nest Camera. <http://www.suttoncenter.org/live-bald-eagle-nest-camera/>. Website accessed July 14, 2016.
- Homer, C.G., J.A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N.D. Herold, J.D. Wickham, and K. Megown. 2015. Completion of the 2011 National Land Cover Database for the conterminous United States-Representing a decade of land cover change information. Photogrammetric Engineering and Remote Sensing, v. 81, no. 5, p. 345-354.
- Kochert, M. N., K. Steenhof, C. L. McIntyre and E. H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/684>.
- Lish, J.W. and Sherrod, S.K. 1986. A History of Bald Eagle Nesting Activity in Oklahoma. Proceedings of the Oklahoma Academy of Science. 66: 15-20 (1986).
- National Audubon Society (Audubon). 2016. The Christmas Bird Count. <http://www.audubon.org/conservation/science/christmas-bird-count>. Accessed March 14, 2016.
- North American Bird Conservation Initiative (NABCI). 2016. North American Bird Conservation Initiative – U.S. <http://www.nabci-us.org/bcrs.htm>. Website accessed on March 31, 2016.
- Oklahoma Birds Records Committee (OBRC). 2014. Date Guide to the Occurrences of Birds in Oklahoma. Sixth edition. Oklahoma Ornithological Society, Norman, Oklahoma.

- Oklahoma Department of Wildlife Conservation (ODWC). 2011a. Eagles in Oklahoma. <http://www.wildlifedepartment.com/wildlifemgmt/eaglesinok.htm>. Website accessed on April 5, 2016.
- ODWC. 2011b. Golden Eagle Species Profile. <http://www.wildlifedepartment.com/wildlifemgmt/goldenprofile.htm>. Accessed November 13, 2015.
- Omernik, J.M., and G.E. Griffith. 2014. Ecoregions of Oklahoma. <http://www.eoearth.org/view/article/152152/>. Accessed on March 2, 2016.
- Reinking, Dan L. (ed.). 2004. Oklahoma Breeding Bird Atlas. Project administered by the George M. Sutton Avian Research Center and the Oklahoma Biological Survey, University of Oklahoma Press, Norman, Oklahoma.
- Suckling, K. and W. Hodges. 2007. Status of the Bald Eagle in the Lower 48 States and the District of Columbia: 1963-2007 (September 21, 2007 version). Center for Biological Diversity, Tucson, AZ.
- U.S. Fish and Wildlife Service (USFWS). 2016. Eagle Permits; Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests; Proposed Rule. *Federal Register*, 81: 27935.
- USFWS. 2014. Salt Plains National Wildlife Refuge, Oklahoma: Habitat. http://www.fws.gov/refuge/Salt_Plains/wildlife_and_habitat/habitat.html. Accessed April 19, 2016.
- USFWS. 2013. Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy Version 2. Division of Migratory Bird Management. April 2013.
- USFWS. 2012. Final Land-based Wind Energy Guidelines. 23 March 2012.
- USFWS. 2009. Final Environmental Assessment; Proposal to Permit Take as Provided Under the Bald and Golden Eagle Protection Act. Department of Interior, Division of Migratory Bird Management. April 2009.
- USFWS. 2007a. Bald Eagle Fact Sheet: Natural History, Ecology, and History of Recovery. Available from: <http://www.fws.gov/midwest/eagle/recovery/biologue.html>. Accessed April 15, 2016.
- USFWS. 2007b. National Bald Eagle Management Guidelines. 25 pp.

STAGE 1 EAGLE RISK ASSESSMENT
Thunder Ranch Wind Project, LLC
Agency Correspondence
August 1, 2016

Appendix A AGENCY CORRESPONDENCE

STAGE 1 EAGLE RISK ASSESSMENT
Thunder Ranch Wind Project, LLC
Agency Correspondence
August 1, 2016



December 10, 2015

Ken Collins
Biologist
U.S. Fish and Wildlife Service
Oklahoma Ecological Services Field Office
9014 E. 21st Street
Tulsa, Oklahoma 74129

Reference: Thunder Ranch Wind Project, LLC, in Noble, Kay, and Garfield Counties, Oklahoma

Dear Mr. Collins,

Thunder Ranch Wind Project, LLC (Thunder Ranch) is in the process of developing the Thunder Ranch Wind Project (Project) in Noble, Kay, and Garfield Counties, Oklahoma. Thunder Ranch has contracted Stantec Consulting Service Inc. (Stantec) to evaluate the environmental aspects of the Project, including potential impacts to sensitive species or habitats. Tradewind Energy, Inc. (TWE) is developing the Project. TWE is a participant in the Wind Energy Whooping Crane Action Group and the Great Plains Wind Energy Habitat Conservation Plan.

The Project is located in northwest Noble County, southwest Kay County, and northeast Garfield County. The Project covers approximately 69,500 acres of land, and is currently proposed to produce up to 300 megawatts. A map depicting the general proposed Project location is provided as an attachment. The layout of the Project, including the locations of turbines and Project infrastructure, has not been finalized.

As part of Thunder Ranch's environmental permitting due diligence, Stantec is requesting information on the presence of sensitive species and habitats and any other potential environmental concerns with regards to the construction and operation of the Project. Also, Stantec and TWE would like to schedule a meeting with you to further discuss the Project. Thank you for your consideration of this matter, and we look forward to coordinating with you in the future. If you have any questions or concerns, please feel free to contact me via phone or email.

Sincerely,

A handwritten signature in black ink that reads "Ryan Hrabe".

Ryan Hrabe
Project Manager
Phone: (913) 202-6872
Fax: (913) 498-0511
Ryan.Hrabe@stantec.com

Attachment: Figure 1 – General Project Location

c.c. Jennifer Dean and Emily Truebner, Thunder Ranch Wind Project, LLC

Design with community in mind.

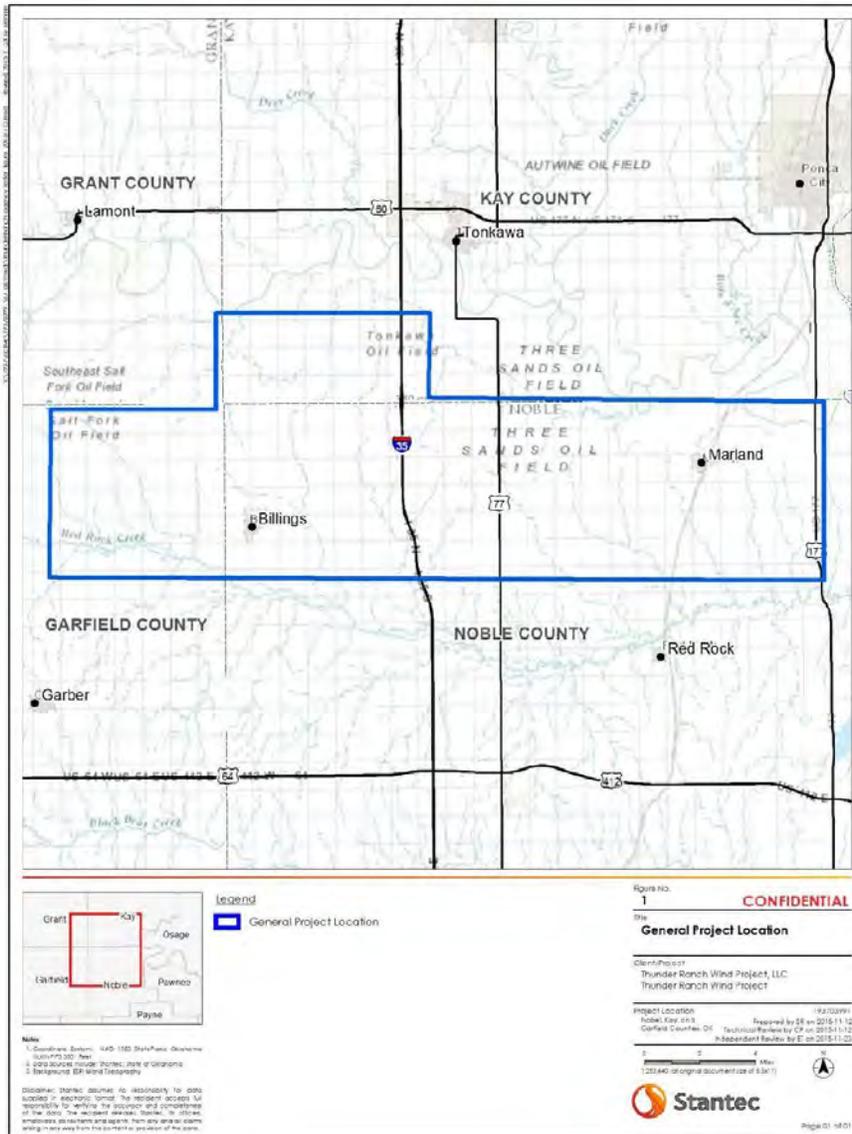


STAGE 1 EAGLE RISK ASSESSMENT
 Thunder Ranch Wind Project, LLC
 Agency Correspondence
 August 1, 2016



December 10, 2015
 Page 2 of 2

Reference: Thunder Ranch Wind Project, LLC, in Noble, Kay, and Garfield Counties, Oklahoma



Design with community in mind



STAGE 1 EAGLE RISK ASSESSMENT
Thunder Ranch Wind Project, LLC
Agency Correspondence
August 1, 2016



December 10, 2015

Rich Fuller
Biologist
Oklahoma Department of Wildlife Conservation
P.O. Box 53465
Oklahoma City, Oklahoma 73152

Reference: Thunder Ranch Wind Project, LLC, in Noble, Kay, and Garfield Counties, Oklahoma

Dear Mr. Fuller,

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Sincerely,

A handwritten signature in black ink that reads "Ryan Hrabe".

Ryan Hrabe
Project Manager
Phone: (913) 202-6872
Fax: (913) 498-0511
Ryan.Hrabe@stantec.com

Attachment: Figure 1 – General Project Location

c.c. Jennifer Dean and Emily Truebner, Thunder Ranch Wind Project, LLC

Design with community in mind

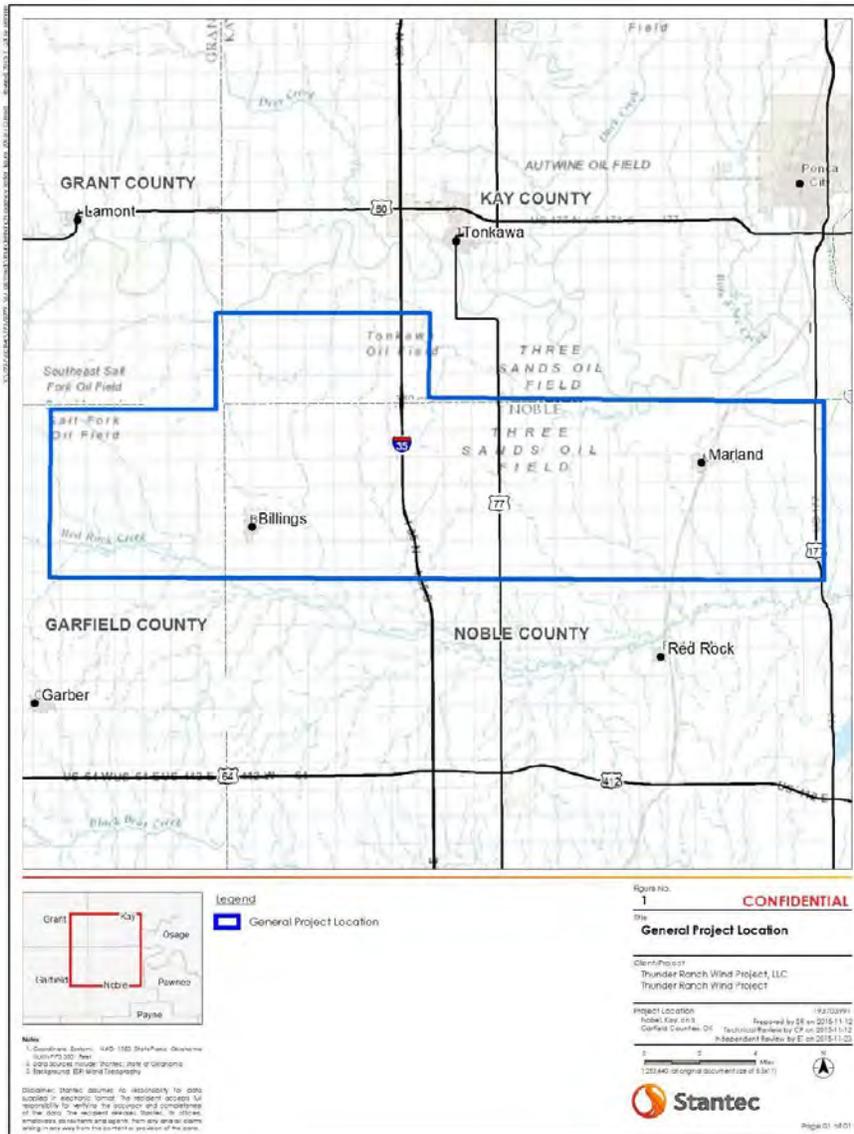


STAGE 1 EAGLE RISK ASSESSMENT
 Thunder Ranch Wind Project, LLC
 Agency Correspondence
 August 1, 2016



December 10, 2015
 Page 2 of 2

Reference: Thunder Ranch Wind Project, LLC, in Noble, Kay, and Garfield Counties, Oklahoma



Design with community in mind



WILDLIFE CONSERVATION COMMISSION

John P. Zelbst CHAIRMAN	Bill Brewster MEMBER
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MARY FALLIN, GOVERNOR
RICHARD T. HATCHER, DIRECTOR
wildlifedepartment.com

DEPARTMENT OF WILDLIFE CONSERVATION

P.O. Box 53465 Oklahoma City, OK 73152 PH. (405) 521-3851

Friday December 18, 2015

Attn. Ryan Hrabe, Project Manager
Stantec Consulting
6800 College Blvd., Suite 380
Overland Park, KS 66211

**Re: Your letter of December 10, 2015 pertaining to the proposed Thunder Ranch
Wind Project in Noble, Kay & Garfield Counties, Oklahoma.**

Dear Mr. Hrabe,

This letter is provided to you as a courtesy of the Oklahoma Department of Wildlife Conservation. It is our hope that this information will help in the planning, siting and design of your wind energy development in such a way as to avoid or minimize its potential negative impacts on wildlife resources. Please understand that we have not conducted an actual field investigation of your project area due to financial and personnel constraints, however we have endeavored to provide you with the most comprehensive information that we can based upon the information that we have on hand. Ultimately it is the responsibility of the parties involved in the planning, design, construction, operation, and maintenance of the proposed project to evaluate the impact on wildlife resources, including threatened and endangered species.

State-listed Threatened and Endangered Species:

There are no state-listed species in Noble, Kay or Garfield County.

Federally-listed Threatened and Endangered Species:

Official county lists of federally threatened and endangered species are maintained by the U.S. Fish and Wildlife Service, the federal agency that administers the Endangered Species Act in Oklahoma. Federally listed endangered and threatened species in Noble, Kay and Garfield Counties may include:

- Whooping Crane (*Grus americana*) – endangered
- Interior Least Tern (*Sterna antillarum*) - endangered
- Piping Plover (*Charadrius melodus*) – threatened
- Red Knot (*Calidris canutus rufa*) – threatened

According to the site map showing the General Project Location of the Thunder Ranch Project, the area appears to consist primarily of cropland, interspersed with patches of native rangeland. The area is also bisected by the Salt Fork of the Arkansas River and smaller tributaries along with other riparian zones adjacent to Bois D'arc Cr., Cowskin Cr. and Duck Cr.

The Oklahoma Department of Wildlife Conservation is the state agency responsible for managing fish and wildlife. The Wildlife Department receives no general tax appropriations and is supported by hunting and fishing license fees and federal excise taxes on hunting and fishing equipment.

Although Federally protected Bald and Golden Eagles as well as the T&E species listed above may utilize the area, we suspect they would be much more likely to inhabit areas around Great Salt Plains Reservoir to west of the project, Kaw Reservoir to the east, and Sooner Lake to the southeast. However, ODWC recommends you consult with the USFWS Ecological Services office in Tulsa for specific guidance on eagles and the other federally-listed bird species; and in particular the USFWS [Land based Wind Energy Guidelines 2012](#) (also called the WEG) which can be found at the following link:

http://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf

The contact information for the Tulsa USFWS office is as follows:

U. S. Fish and Wildlife Service, Ecological Services,
9014 East 21st Street, Tulsa, OK 74129-1428,
Phone: 918-382-4500 Fax: 918-581-7467

In most areas of Oklahoma, wind developers can contact both the USFWS Tulsa Office and ODWC via teleconference to discuss and plan pre-construction wildlife surveys (see Tier III description in WEG). Once a developer completes the Tier III surveys, it is then preferred to arrange an onsite meeting either within Tulsa or Oklahoma City to discuss wildlife survey findings.

Other Species of Concern (Eagles and other Migratory Birds)

Kaw Reservoir & the adjacent Kaw Wildlife Management Area to the east of the project are important areas for migratory birds, particularly waterfowl. Kaw Lake also has some of the highest recorded densities of wintering bald eagle populations within Oklahoma, however these are typically “episodic” congregations found near the Kaw hydroelectric dam. During prolonged extreme cold weather episodes, bald eagles from a large area of northern Oklahoma and southern Kansas will gather at the Kaw Reservoir dam to find open water and prey on fish in the tailwater below the dam. Both Great Salt Plains Lake and Sooner Lake are also significant stopover areas for migratory waterfowl, shorebirds and eagles.

In utility-scale wind developments, electricity lines are constructed between turbines (either overhead or buried). Due to its proximity between Great Salt Plains Lake and Kaw Lake attract eagles and a host of other migratory birds, ODWC recommends the burial of transmission lines if possible. If overhead lines are used however, ODWC recommends following the guidance provided by the Avian Power Line Interaction Committee (APLIC) for reducing avian collisions with power lines. The guidance can be found at the following link:

http://www.aplic.org/uploads/files/11218/Reducing_Avian_Collisions_2012watermarkLR.pdf

Black-tailed Prairie Dog: In order to assess the potential effects of the project on the Black-tailed Prairie Dog (*Cynomys ludovicianus*), we recommend that you conduct a survey for Black-tailed Prairie Dog colonies throughout the project area or, at a minimum, within a 1.5-mile buffer of planned infrastructure. Black-tailed Prairie Dogs are active year-round; therefore colony surveys can be conducted at any time of the year, although they are most easily conducted in late

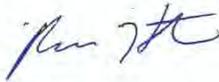
spring and early summer when prairie dog activity is at its peak. Surveys can be conducted on the ground from existing roads, or, in many cases, prairie dog colonies can be detected remotely using high-quality aerial photography. The Black-tailed Prairie Dog is a colonial rodent in the squirrel family that has previously been under review for potential federal listing as a threatened species under the Endangered Species Act. It also is classified as a state species of special concern in Oklahoma because of an historic decline in its population. Currently the Black-tailed Prairie Dog population in Oklahoma is limited to fewer than 700 colonies scattered across the western half of Oklahoma. More than 75% of these colonies occur within the three panhandle counties so their numbers are limited in the main body of the state.

Texas Horned Lizard: We recommend that a field survey be conducted for the Texas Horned Lizard (*Phrynosoma cornutum*) where suitable habitat exists within a 0.5-mile buffer from planned infrastructure. The Texas Horned Lizard occupies a range of habitat conditions, and suitable habitat types include native mixed-grass and shortgrass prairies (managed either as rangeland or hay meadows), sand plum or sand sagebrush shrubland, mesquite savannahs, and oak woodlands. In your project area, we anticipate that Texas Horned Lizards are most likely to occur on remnant mixed-grass prairie sites and in a corridor along the Cimarron River where sandy soils predominate and there is mix of open woodland, sandy prairie and sand plum shrubland habitats. The Texas Horned Lizard is a state species of special concern that is protected under a year-round closed season that prohibits the killing, collection or possession of these lizards. This species is found in scattered populations across the western 3/5 of Oklahoma in the habitats described above, and they appear to reach their greatest abundance in mixed-grass prairie rangeland and sandy shrubland habitats. Historically, the Texas Horned Lizard was widespread where ever native warm-season bunch grasses such as little bluestem, big bluestem and sand bluestem remain. Texas Horned Lizard populations have declined and become more fragmented across their range during the past 50 years as a result of multiple factors, the most important of which is the loss and fragmentation of their habitat (the conversion of native prairies and shrublands into crop fields and Bermuda grass pastures). Another factor contributing to their decline appears to be unintentional road mortality. Texas Horned Lizards use bare surfaces, including roads, as basking sites during the morning and evening hours to raise their body temperatures. This behavior increases their susceptibility to vehicle collisions and road mortality. Currently, ODWC does not have sufficient information to evaluate the response of Texas Horned Lizard populations to wind energy development. We anticipate that the physical construction of turbines will have a minimal impact on horned lizard populations; however, the construction of turbine facilities typically includes the construction of access roads. The increased miles of road created by these access roads may have unanticipated consequences on horned lizard and other reptile and amphibian populations because of the increased potential for road mortality from the vehicles that are used to maintain the turbines or other vehicles that may use these roads. Because the Texas Horned Lizard is a state species of special concern, we recommend that any environmental documentation associated with this facility evaluate the potential impact of construction and operation on this species. Potential impacts to horned lizard populations can be partially offset by replanting all disturbed ground around planned infrastructure to native warm-season bunch grasses, minimizing the number and length of new road construction, and restoring tracts of land within the project area to native prairie or shrubland habitats.

Swainson's Hawk: The Swainson's Hawk (*Buteo swainsoni*) is a migratory bird of prey that is classified as a state species of special concern. It is restricted to prairies and similar open habitats in western and north-central Oklahoma, and may be found in the state between mid-April and mid-October annually. Swainson's Hawks occur at low population densities and appear to prefer relatively flat, open habitats for establishing their nesting territories. We recommend that a survey be conducted for Swainson's Hawk nests between May and July during the planning stages of this project. Swainson's Hawks typically nest in isolated trees or small groves of trees within and adjacent to relatively level rangeland, pastureland and cropland. They often re-use the same nesting location for multiple years.

In conclusion, we appreciate the opportunity to review and provide comments on the proposed Thunder Ranch Wind Energy Project. If we can be of further assistance, please contact Rich Fuller, Wildlife Biologist- Energy Emphasis (Ph. 405.397.1599 or rich.fuller@odwc.ok.gov).

Sincerely,



Russ Horton
Lands and Wildlife Diversity Supervisor

Appendix C: Tribal Coordination



United States Department of the Interior

FISH AND WILDLIFE SERVICE



P.O. Box 1306
Albuquerque, NM 87103-1306

In Reply Refer To:
FWS/R2/MB/ 070140

The Honorable Name
Title, Organization
Street Address
City, State, Zip code

Dear _____:

Pursuant to the National Historic Preservation Act of 1966, and the American Indian Religious Freedom Act of 1978, this will notify you of a Federal action proposed for private land in Garfield, Kay and Noble Counties, Oklahoma. The U.S. Fish and Wildlife (Service) is reviewing a permit application for the incidental take of bald eagles (*Haliaeetus leucocephalus*) at the Thunder Ranch Wind Project, approximately 5 miles north of the city of Billings, Oklahoma. The enclosed handout will provide you with an overview of the wind facility and the history of the application process. We are requesting your views, comments, or concerns regarding the proposed permit authorizing incidental take of bald eagles at the Thunder Ranch Wind Project. The Draft EA will be posted to our website by June 15 and may be found at <https://www.fws.gov/southwest/migratorybirds/NEPAreviews.html>.

As provided under the National Historic Preservation Act, the Service has determined that eagles are species of cultural and spiritual significance to many Indian Tribes, and that eagles can be contributing elements of traditional religious and cultural importance to Native American Tribes. The Service has further determined that disturbance of eagles can affect the free exercise of American Indian religious practices, as provided under the American Indian Religious Freedom Act.

The Service looks forward to working with you to promote the conservation of all eagles while ensuring the protection of tribal trust resources, rights, and cultural and religious values. Although there is no mandatory time limit for your response, we are requesting your reply within 45 days, so that we may further advise the permit applicant and proceed with our evaluation of the permit application.

Please contact Mary Elder, Assistant Regional Director, External Affairs at 505-248-6285 or mary_elder@fws.gov to arrange a meeting on these topics. To submit comments you can send them to this email address: mb_nepacomments@fws.gov.

Sincerely,

Regional Director

Enclosure



Eagle Incidental Take Permit Application for the Thunder Ranch Wind Project

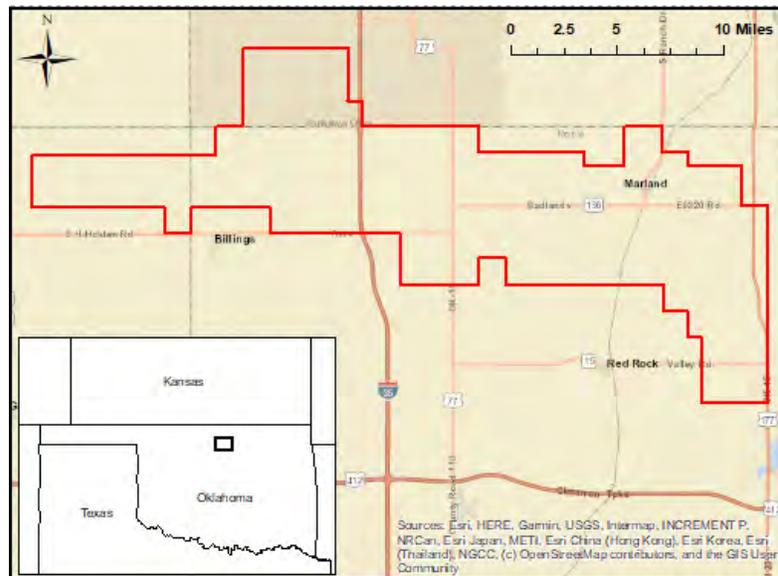
Thunder Ranch Wind Project

- Owned by Enel Group and operated by Thunder Ranch Wind Project, LLC; approximately 35,213 ha (87,015 ac), approximately 8 km (5 mi) north of Billings, OK.
- Operational since 2017. Comprised of 120 total turbines that generate a nameplate capacity of 300 MW of energy. 109 are 2.5 MW GE turbines (90-m [295-ft hub height], 148-m [486-ft] rotor blade tip height). The remaining 11 are 2.3 MW GE turbines (80-m [263-ft] hub height, 138-m [453-ft] rotor blade tip height). All turbines have a rotor diameter of 116 m (381 ft) and a total rotor swept area of 10.6 square kilometers (6.6 sq. mi.). Operations and maintenance building on 1 ha (2.5 ac), 52 km (32 mi) of new roads, substation on 2 ha (5 ac), 24 km (15 mi) of transmission lines, and 4 permanent metrological towers.

Permit History

Thunder Ranch Wind Project, LLC applied for a 30-year eagle incidental take permit in December 2017. The application included a project-specific Eagle Conservation Plan (ECP) developed by a contractor (Stantec), in collaboration with Southwest Region Division of Migratory Birds staff.

- The Draft EA is expected to be released for public comment in May 2019.



Surveys and Monitoring

- Stantec has undertaken eagle nest and use surveys (2015-2017) and fatality monitoring since 2018.
- Modeled fatality predictions estimate the potential to incidentally take 8 bald eagles over 5 years.

Compensatory Mitigation

- Since the predicted take is under the Local Area Population and Central Management Unit thresholds there is no requirement for compensatory mitigation.





Eagle Take Permitting Rules

Eagles are protected by:

- Migratory Bird Treaty Act
- Bald and Golden Eagle Protection Act (BGEPA)

No person may take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such birds **except as may be permitted under terms of a valid permit.**

Definition of “Take”

- Migratory Bird Treaty Act: Pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.
- Bald and Golden Eagle Protection Act: Same, but also includes shoot at, poison, or molest or disturb.

2016 Rule Revision

- BGEPA requires that any authorized take of eagles be “compatible with the preservation” of bald eagles and golden eagles. The Service now defines this preservation standard to mean “consistent with the goals of maintaining stable or increasing breeding populations in all eagle management units and the persistence of local populations throughout the geographic range of each species.”
- A cumulative effects analysis is required for the Local Area Population for both species as a part of permit issuance decisions. Cumulative take within a LAP may not exceed 5% of the LAP unless it is demonstrated why allowing such take is compatible with the preservation of eagles.
- Permits can be valid up to a maximum of 30 years, with mandatory re-evaluations every 5 years and mandatory adaptive management plans as conditions of the permit.
- Wind developers who wish to apply for an eagle take permit must use the survey protocols in the rule (which come from the Eagle Conservation Plan Guidance).
- Permittees who hold permits that have durations longer than 5 years must conduct monitoring using independent, qualified entities who report directly to the Service.



Appendix D: Section 7 Biological Evaluation

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Kammie Kruse, Wildlife Biologist **Station:** Region 2, Migratory Birds

Telephone: 505-248-6875

Email: kammie_kruse@fws.gov

Date: March 28, 2019

TAILS:

PROJECT NAME: Thunder Ranch Wind

Consultation Code (from IPAC species list) 5GL4NV3SVNBUZEPI2NXJT6IC3E

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
Interior Least Tern (<i>Sterna antillarum</i>)	None in Project Area	Endangered
Piping Plover (<i>Charadrius melodus</i>)	None in Project Area	Endangered
Rufa Red Knot (<i>Calidris canutus rufa</i>)	None in Project Area	Threatened
Whooping Crane (<i>Grus americana</i>)	None in Project Area	Endangered
Arkansas River Shiner (<i>Notropis girardi</i>)	None in Project Area	Threatened
American Burying Beetle (<i>Nicrophorus americanus</i>)	None in Project Area	Endangered

See attached iPaC report dated December 21, 2018.

III. Project Location: Information from Tails

Ecoregion Number and Name: Ecoregion 27d: Central Great Plains Prairie Tableland

County: Garfield, Kay, and Noble counties, Oklahoma

Latitude, Longitude: 36°32'36.12"N, 97°15'22.03"W (approximate center of project)

Distance and direction to nearest town center: Marland, Oklahoma located within project area

Species/habitat occurrence:

Least tern (interior population)

The interior least tern may rarely use the project area during migration. The interior subspecies of the least tern breeds on the Arkansas, Canadian, Ohio, and Red River systems. In their breeding range, least terns form colonies on sparsely vegetated riverine or coastal flats or sandy areas. The Project is in close proximity to the Arkansas River, and interior least tern habitat is present northeast of the Project between Kaw Lake Dam and the mouth of the Salt Fork Arkansas River. Data from eBird indicate a sighting of six least terns in habitat closely associated with Sooner Lake, which is located one mile south of the Project. The Project area itself does not contain breeding habitat.

Piping plover

The piping plovers may rarely use the project area during migration. Piping plovers live the majority of their lives on open sandy beaches or rocky shores, often in high, dry sections away from water and breed along prairie rivers, alkali wetlands, sandy beaches along Great Lakes shorelines, and on vast Atlantic coast beaches. During the fall migration, inland populations of piping plovers may migrate nonstop to the Gulf of Mexico or the Atlantic coast, as sightings are rare at seemingly appropriate stopover sites. Suitable stopover habitat does not exist within the project area and eBird data do not indicate sightings near the Project area. However, appropriate piping plover habitat is present northeast of the Project between Kaw Lake Dam and the mouth of the Salt Fork Arkansas River.

Rufa red knot

The rufa red knot is unlikely to be found in the project area. Rufa red knots breed in the Arctic and migrate to nonbreeding areas in South America. In Oklahoma, fewer than five rufa red knots are sighted annually; ideal foraging sites are limited within the state and most stopover individuals are likely inexperienced or malnourished individuals. A review of eBird data found no rufa red knot records in the project area.

Whooping crane

Whooping cranes are unlikely to be found in the project area. Whooping cranes use palustrine wetlands (i.e., wetlands with a water depth of <6.6 feet) and river systems as stopover habitat during migration. The Project area is located within the whooping crane migration corridor, within areas which encompass 80-95% of all compiled migration records (with 75% being the most interior corridor, i.e., most likely to be used in migration). Areas overlapping the Project are designated as "unoccupied" or "low intensity," a category which indicates some evidence of crane use but low numbers of stopovers. Limited or no stopover habitat is found in the project area. A review of eBird data found no whooping crane records in the project area.

Arkansas River shiner

This Arkansas River shiner is not expected to be found in the project area. The historic range of the Arkansas River shiner spanned the western Arkansas River basin in Kansas, New Mexico, Oklahoma, and Texas, inhabiting sandy bottomed rivers and streams within the basin. The IUCN Red List indicates the species no longer resides in over 80% of its original habitat and is restricted to a 508-mile area within the Canadian River in Oklahoma, Texas, and New Mexico, with a small remnant population possible in the Cimarron River in Oklahoma and Kansas. Neither the Canadian River nor the Cimarron River are located within the project area.

American burying beetle

The American burying beetle is not expected to be found in the project area. American burying beetles have a broad geographical range, but today are restricted to areas with minimal human influence. Remaining populations occur in eastern Oklahoma (excluding Garfield, Noble, and Kay counties, among others), Arkansas, and Nebraska, as well as east of the Mississippi River. Burying beetles utilize a wide variety of habitat types; the following are considered unfavorable:

- Land that is tilled on a regular basis, planted in monoculture, or which does not contain native vegetation;
- Pasture or grassland frequently mowed, grazed, or treated with herbicide;
- Land which lacks topsoil, leaf litter, or vegetation due to development;
- Urban areas with maintained lawns, paved surfaces, or roadways;
- Stockpiled soil without vegetation; and
- Wetlands with standing water or saturated soils

The majority of the project area is planted in row crops or used for grazing and therefore is considered unfavorable habitat.

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

The proposed action is issuance of a 30-year Eagle Take Permit (ETP) to take up to 48 bald eagles. The Applicant will implement applicant-committed mitigation measures and adaptive management, which are described in the applicant's Eagle Conservation Plan (ECP). In addition, during construction of the Project, the applicant committed to further measures to protect listed species in its Bird and Bat Conservation Strategy (BBCS).

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

The following minimization and avoidance measures related to listed species will be implemented during Project operation, according to the Project's BBCS:

- Continued use of bird diverters on Project overhead transmission line infrastructure (diverters were installed during Project construction);
- Use of strobe or flashing, rather than continuously burning lights to identify turbines, met towers, and communication towers. Strobe or flashing lights are as likely to attract birds to turbines as unlit turbines;

- Overall reduction of lighting at operation and maintenance facilities and substations;
- Management of garbage and waste to reduce wildlife attractants; and
- Implementation of periodic on-site training for operation and maintenance staff on listed species identification and wildlife incident reporting protocol.

Additionally, the Project will implement the following measures specifically to address risks to whooping cranes in the Project area:

- If a whooping crane is sighted by on-site personnel, turbines within one mile of the sighting will be shut down and will not resume operations until the crane is greater than one mile away;
- Coordination with the Service to monitor whooping crane tracking data when cranes are moving through north-central Oklahoma; and
- Triggering of further adaptive management strategies should cranes be injured or killed by a turbine or wind energy-related component on the Project site.

Mitigation Measures

The Proposed Action is issuance of an ETP; therefore, the mitigation measures proposed in the Project's ECP deal specifically with eagles. No specific mitigation for listed species is proposed; however, some of these measures proposed for eagles may indirectly benefit listed species, such as donating to one or more of the following organizations:

- a local, non-profit environmental organization dedicated to lead abatement, which includes public education on lead's effects on eagles and other wildlife and the production of non-toxic fishing tackle and ammunition;
- a local conservation fund where contributions are used to retrofit power poles to avoid eagle electrocutions, habitat protection and/or enhancement, or removal of road kill carcasses to discourage eagle use of the area and avoid or reduce eagle collisions;
- a local non-profit organization which conducts scientifically rigorous research investigating the effects of wind development on eagles and ways to reduce eagle-turbine collisions at wind facilities.

Lead abatement, power pole modifications, and habitat enhancement could benefit the interior least tern, piping plover, and whooping crane.

V. Determination of Effects:

There are no critical habitats located within the project area.

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

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Interior least tern	The interior least tern may rarely use the project area during migration. The least tern is only provided protection under the ESA 50 miles inland.
Piping plover	The piping plover may rarely use the project area during migration.
Rufa red knot	The rufa red knot is unlikely to be found in the project area.
Whooping crane	The whooping crane is unlikely to be found in the project area.
Arkansas River shiner	The Arkansas River shiner is not expected to be found in the project area and operation of the project and issuance of an ETP will have no effect on the species.
American burying beetle	The American burying beetle is not expected to be found in the project area and operation of the project and issuance of an ETP will have no effect on the species.

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

SPECIES/ CRITICAL HABITAT	ACTIONS TO MINIMIZE IMPACTS
Interior least tern	The BBCS and Project design reduce effects on the interior least tern through the use of bird diverters, strobe or flashing lights, and implementation of on-site employee training to address wildlife incidents and reporting. These actions are expected to minimize impacts to the interior least tern.
Piping plover	The BBCS and Project design reduce effects on the piping plover through the use of bird diverters, strobe or flashing lights, and implementation of on-site employee training to address wildlife incidents and reporting. These actions are expected to minimize impacts to the piping plover.
Whooping crane	The BBCS and Project design reduce effects on the whooping crane through the use of bird diverters, strobe or flashing lights, and implementation of on-site employee training to address wildlife incidents and reporting. In addition, if a whooping crane is sighted within one mile of Project turbines, they will be shut down until the crane is greater than one mile away. Project staff will coordinate with the Service to monitor whooping crane migration through the Project area.

VIII. Effect determination and response requested:

A. Listed species/designated critical habitat:

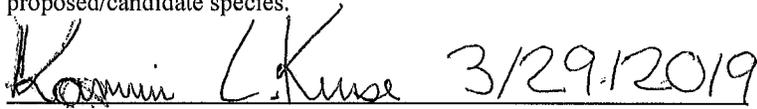
SPECIES/CRITICAL HABITAT	DETERMINATION		
	NE	NLAA	LAA
Least tern		X	
Piping plover		X	
Red knot	X		
Whooping crane		X	
Arkansas River shiner	X		
American burying beetle	X		

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.

 3/29/2019

Signature

Region 2, Migratory Birds

IX. Reviewing ESFO Evaluations:

A. Concurrence: X Nonconcurrency: _____

B. Formal consultation required: _____

C. Conference required _____

D. Informal conference required _____

E. Remarks (attach additional pages as needed):

John E. Polk 4/5/19
Signature Date
Field Supervisor
Oklahoma Ecological Services Field Office