ATTACHMENT 2

EAGLE CONSERVATION PLAN/BIRD CONSERVATION STRATEGY (ECP/BCS)

Mohave County Wind Farm

Eagle Conservation Plan and Bird Conservation Strategy

Prepared for

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ACRONYMS AND ABBREVIATIONS

AERI	American Eagle Research Institute
APLIC	Avian Power Line Interaction Committee
ARS	Arizona Revised Statutes
AZGFD	Arizona Game and Fish Department
BCS	Bird Conservation Strategy
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
Reclamation	Bureau of Reclamation
BP Wind Energy	BP Wind Energy North America Inc.
CI	confidence interval
cm	centimeter
CRP	Conservation Reserve Program
DVC	deer-vehicle collision
ECP	Eagle Conservation Plan
EIS	Environmental Impact Statement
°F	degrees Fahrenheit
GPS	Global Positioning System
IM	Instruction Memorandum
km	kilometer
km^2	square kilometer
MBTA	Migratory Bird Treaty Act
m	meter
met	meteorological
min	minutes
MW	megawatt
NEPA	National Environmental Policy Act
O&M	Operations and Maintenance
PDSI	Palmer Drought Severity Index
Project	Mohave County Wind Farm
Project area	area within the Project's proposed right-of-way boundaries
ROD	Record of Decision
RSA	rotor swept area
sec	second
SERI	Species of Economic and Recreational Importance

USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
UVC	ungulate-vehicle collision
WEST	Western EcoSystems Technology, Inc.
Western	Western Area Power Administration
WIRS	Wildlife Incident Reporting System

1 INTRODUCTION

1.1 Background Information

BP Wind Energy North America Inc. (BP Wind Energy), a wholly owned, indirect subsidiary of BP p.l.c., a publicly traded company, or an affiliate thereof, is proposing to develop, own, and operate the Mohave County Wind Farm (Project) in Mohave County, northwestern Arizona, on federal lands managed by the Bureau of Land Management (BLM) and the Bureau of Reclamation (Reclamation). BP Wind Energy has applied to interconnect the proposed Project with either the Western Area Power Administration's (Western) Liberty-Mead transmission line or the Mead-Phoenix transmission line (of which Western is one of several co-owners) for up to 500 megawatt (MW). The proposed Project would interconnect through a new switchyard to be constructed within the Project area. Currently, an Environmental Impact Statement (EIS) is being developed for the Project to meet the requirements of the National Environmental Policy Act (NEPA) of 1969. The NEPA process was initiated in 2006. BLM is the lead agency for the Project and released the Draft EIS for public comment from April 27, 2012 to June 18, 2012. The Final EIS is scheduled to be released to the public starting in December 2012.

BP Wind Energy contracted Tetra Tech to create this Eagle Conservation Plan (ECP) and Bird Conservation Strategy (BCS) in order to meet the requirements of BLM Instructional Memorandum (IM) 2010-156, which provides direction for compliance under the Migratory Bird Treaty Act (MBTA; see Section 1.4.1, Regulatory Framework) and the Bald and Golden Eagle Protection Act (BGEPA; see Section 1.4.2, Regulatory Framework). The purpose of this document is to provide sufficient information to allow BLM to comply with BLM IM 2010-156. The IM states that the U.S. Fish and Wildlife Service (USFWS) must issue a letter of concurrence that addresses the adequacy of an Avian Protection Plan (APP) prior to BLM signing a Record of Decision (ROD) for BGEPA and NEPA compliance. During the evolution of this process, USFWS has changed their preferred terminology from an APP to an ECP and BCS, as outlined in the Final Land-based Wind Energy Guidelines (USFWS 2012b). At the time when the IM was issued, USFWS had the authority to issues permits (USFWS 2009), but did not have implementing guidelines that were subsequently released in the 2011 Draft ECP Guidance (USFWS 2011a). The USFWS views the process as described in the IM as one of issuing a letter of acknowledgement instead of approval. The USFWS and BLM have agreed that consideration of the ECP/BCS as the basis for issuing the letter of acknowledgement will satisfy the IM requirement.

This version of the document will not be the mechanism for permit issuance because BP Wind Energy and USFWS will continue to confer on the content of the ECP as BP Wind Energy prepares their formal application for a take permit. After submittal of the formal eagle take permit application, the USFWS has indicated they will complete their own NEPA analysis to consider issuance of a permit using the most current version of the ECP. This ECP/BCS is being submitted so that BLM can meet their NEPA requirement in order to issue a ROD for the Project.

This ECP/BCS summarizes the environmental conditions at the Project, avian studies that have been conducted and their results, an assessment of potential impacts to eagles and non-eagle bird species, avoidance and minimization elements, and compensatory mitigation for unavoidable impacts of the Project. BP Wind Energy has worked closely with USFWS, the Arizona Game and Fish Department (AZGFD), BLM, and Reclamation to develop the ECP/BCS (Table 1).

Table 1. Chronology of Resource Agency Contact for BP Wind Energy's Proposed Mohave County Wind Farm Eagle Conservation Plan and Avian Conservation Strategy

Date	Purpose	Attendees
January 29, 2008	Agency meeting at Kingman Field Office of BLM that partially focused on wildlife surveys.	BLM (J. Cook, R. Sanchez, D. McClure, J. Neckels), BP Wind Energy (L. Mazer, B. Gibson)
June 2008	Agency meeting to discuss survey results and proposed future surveys.	BLM, AZGFD, and BP Wind Energy
July 11, 2008	Written submittal of 2007-2008 survey results and proposed surveys for 2008-2009 year.	BLM (J. Priest, R. Peck), AZGFD (G. Ritter, B. Cary), USFWS (S. Spangel, B. Smith)
August 13, 2008	Written comments on proposed wildlife surveys	AZGFD (G. Ritter, L. Canaca, T. Buhr)
August 25, 2008	Email survey results from Western EcoSystems Technology, Inc. (WEST) submitted to BLM.	WEST (R. Good), BLM (J. Priest, R. Peck, J. Cook), BP Wind Energy (B. Gibson, L. Mazer)
May 4, 2009	Email submittal of 2008-2009 survey results and proposed 2009-2010 survey methods.	BLM (J. Crockford, J. Neckels, A. Wilhelm, J. Stroud)
July 19, 2011	Conference call and webinar with WEST presenting results of 2011 eagle nest surveys; and discussion of ECP/BCS process with connection to NEPA compliance and EIS process already underway. Draft meeting minutes were circulated for input and then finalized later and recirculated.	AZGFD (K. Jacobson, G. Ritter), Reclamation (M. Maynard), Western (B. Werner), BLM (K. Grove, A. Wilhelm), USFWS (B. Wooldridge, C. O'Meilia), WEST (J. Thompson), BP Wind Energy (K. Wells, T. Eagleston, D. Quick, D. Runyan)
August 10, 2011	Conference call to discuss resource agencies preliminary impressions of baseline wildlife study reports and eagle nest survey report; discuss resource agency support for EIS impact assessment; and discuss ECP/BCS process. Draft minutes circulated for input with final minutes circulated later. BP Wind Energy formally commits to preparing an ECP/BCS.	AZGFD (K. Jacobson), Western (B. Werner), BOR (M. Maynard), BLM (K. Grove, E. Arreola), USFWS (R. Murphy, B. Wooldridge, C. O'Meilia), WEST (J. Thompson), URS (J. Charpentier), BP Wind Energy (K. Wells, D. Quick, T. Eagleston)
September 19, 2011	In person meeting to discuss preliminary impact assessment. Hard copy of formal letter from USFWS to BP Wind Energy also provided in person documenting low impact with moderate uncertainty.	USFWS (R. Murphy), BP Wind Energy (K. Wells)

Table 1. Chronology of Resource Agency Contact for BP Wind Energy's Proposed Mohave County Wind Farm Eagle Conservation Plan Avian Conservation Strategy (continued)

Date	Purpose	Attendees
October 5-9, 2011	Informal discussions in person at Raptor Research Meeting about potential mitigation approaches	USFWS (R. Murphy, B. Millsap), Tetra Tech (L. Nagy, C. Farmer)
October 13, 2011	Conference call to discuss existing golden eagle fatality data in Arizona and get AZGFD feedback on most viable eagle mitigation options.	AZGFD (K. Jacobson, G. Ritter, D. Kephart, J. Driscoll), BP Wind Energy (K. Wells)
October 26, 2011	Conference call to discuss proposed eagle mitigation concepts.	AZGFD (K. Jacobson), USFWS (R. Murphy, B. Wooldridge, B. Werner), Tetra Tech (L. Nagy, C. Farmer), BP Wind Energy (K. Wells)
October 31, 2011	Telephone call to USFWS Region 2 Special Agent In Charge for Law Enforcement to ask about availability of eagle fatality and source data.	USFWS (N. Chavez), BP Wind Energy (K. Wells)
November 1-17, 2011	Email and telephone interviews of eagle experts regarding potential carcass mitigation and risk posed to eagles by road-killed carcasses.	American Eagle Research Institute (D. Driscoll), Big Horn Environmental (T. Maetchle), Bloom Biological (P. Bloom), G. Doney, Montana State University (A. Harmata), Tetra Tech (C. Farmer, L. Nagy), USFS (T. Grubb), Wildlife Research Institute (D. Bittner)
November 9, 2011	In-person and webinar meeting from Kingman BLM Field Office to provide an update on ECP/BCS mitigation proposal and gather feedback on proposed 2012 Golden Eagle surveys.	BLM (K. Grove, A. Wilhelm), Western (M. Schriner), Reclamation (M. Maynard), AZGFD (K. Jacobson, D. Kephart), USFWS (R. Murphy, B. Werner, B. Wooldridge), and BP Wind Energy (K. Wells, B. Gibson, T. Eagleston)
November 15-17, 2011	In-person discussions during Raptor Research Meetings on potential mitigation options and risk assessment models.	USFWS (R. Murphy, B. Millsap) and Tetra Tech (L. Nagy, C. Farmer)
November 28, 2011	Conference call to discuss eagle management team suggestion of considering out of state eagle mitigation. BP Wind Energy formally submits proposed eagle mitigation conceptual framework via email for USFWS eagle management team review during telephone call on December 1, 2011.	USFWS (R. Murphy) and BP Wind Energy (K. Wells)
December 7, 2011	Conference call to discuss USFWS eagle management team feedback on proposed conceptual mitigation framework and seek clarification on specifics of adaptive management expected	USFWS (R. Murphy), BP Wind Energy (K. Wells), and Tetra Tech (L. Nagy and C. Farmer)

Table 1. Chronology of Resource Agency Contact for BP Wind Energy's Proposed Mohave County Wind Farm Eagle Conservation Plan and Avian Conservation Strategy (continued)

Date	Purpose	Attendees
December 13, 2011	Email from BP Wind Energy with the Mohave Golden Eagle Survey Plan dated 121311 to get feedback on BP Wind Energy's planned golden eagle surveys for 2012	BLM (K. Grove, A. Wilhelm), Western (M. Schriner), Reclamation (M. Maynard), AZGFD (K. Jacobson, D. Kephart, J. Driscoll), USFWS (R. Murphy, B. Werner, B. Wooldridge), and BP Wind Energy (K. Wells), Tetra Tech (L. Nagy, C. Farmer, and A. Oller)
December 15, 2011	Conference call to discuss proposed 2012 Golden Eagle Survey Plan	AZGFD (K. Jacobson), USFWS (B. Werner), BP Wind Energy (K. Wells), Tetra Tech (L. Nagy, C. Farmer, and A. Oller)
February 2, 2012	Provided copy of the Mohave County Wind Farm Draft Eagle Conservation Plan (Mohave draft ECP 1-31-12.doc) to agencies for review and comments.	AZGFD (K. Jacobson, G. Ritter, D. Kephart, J. Driscoll, J. Kraft, D. Grandmaison), USFWS (B. Werner, R. Murphy, B. Woodridge), BLM (K. Grove, A. Wilhelm, E. Arreola, J. Neckels), Reclamation (M. Maynard), Western (M. Schriner, L. Hughes), BP Wind Energy (K. Wells, D. Runyan), Tetra Tech (L. Nagy), Morgan Lewis (D. Quick), and URS (B. Defend)
February 21, 2012	Conference call to gather comments on Mohave Wind Farm Project Eagle Conservation Plan.	AZGFD (K. Jacobson, G. Ritter, D. Kephart, J. Driscoll, J. Kraft, D. Grandmaison), USFWS (B. Werner, R. Murphy), BLM (K. Grove), BP Wind Energy (K. Wells, D. Runyan, T. Eagleston, M. Rigo, K. Pitney), Tetra Tech (L. Nagy, C. Farmer, and A. Oller), Morgan Lewis (D. Quick)
April 17, 2012	Conference call to discuss carcass search/removal mitigation location.	AZGFD (J. Kraft, D. Grandmaison, D. Kephart, J. Driscoll, M. Ingradli) USFWS (B. Werner), BLM (K. Grove, E. Arreola), BP Wind Energy (D. Runyon, D. Gonzales, K. Wells), Tetra Tech (L. Nagy, A. Oller, C. Farmer), URS (J. Charpentier)
April 26, 2012	Conference call with USFWS to discuss AZGFD eagle mitigation protocol.	USFWS (R. Murphy, B. Warner), BP Wind Energy (K. Wells), Tetra Tech (L. Nagy, C. Farmer)
May 9, 2012	Conference call to discuss AZGFD Carcass Removal Plan protocol.	AZGFD (T. Jacobson, G. Ritter, D. Grandmaison), USFWS (B. Werner), BP Wind Energy (K. Wells), Tetra Tech (L. Nagy, C. Farmer, J. Garvin), URS, (J. Charpentier)
June 7, 2012	Conference call to discuss AZGFD Carcass Removal Plan protocol.	USFWS (B. Werner), BP Wind Energy (K. Wells, D. Gonzalez), Tetra Tech (L. Nagy, C. Farmer, J. Garvin, A. Oller), BLM (K. Grove, E. Arreola), Reclamation (M. Maynard), NPS (J. Holland, M. Boyles, A. Howard), Morgan Lewis (D. Quick), AZGFD (D. Kephart, G. Ritter, T. Jacobson, R. Schweinsburg, M. Piorkowski)

Table 1. Chronology of Resource Agency Contact for BP Wind Energy's Proposed Mohave County Wind Farm Eagle Conservation Plan and Avian Conservation Strategy (continued)

Date	Purpose	Attendees
June 26, 2012	Conference call to discuss which variant of the carcass search/removal plan was closest to meeting USFWS regulatory needs.	USFWS (R. Murphy), BP Wind Energy (K. Wells), Tetra Tech (L. Nagy, C. Farmer)
July 5, 2012	Provided copy of the 2nd draft of the Mohave County Wind Farm Draft Eagle Conservation Plan (BP Mohave ECP-ACS 07052012.docx) to agencies for review and comments.	AZGFD (K. Jacobson, G. Ritter, D. Kephart, J. Kraft, D. Grandmaison), USFWS (B. Werner, R. Murphy, B. Woodridge, C. Omelia), BLM (K. Grove, A. Wihelm, E. Arreola, J. Neckels), Reclamation (M. Maynard, F. Streier), NPS (J. Holland, M. Boyles), Western (L. Hughes), BP Wind Energy (K. Wells, D. Runyan, M. Rigo), Tetra Tech (L. Nagy, C. Farmer), Morgan Lewis (D. Quick), and URS (B. Defend, L. Watson, J. Charpentier)
August 1, 2012	Conference call to gather comments on the 2nd draft of the Mohave County Wind Farm Eagle Conservation Plan.	AZGFD (K. Jacobson, D. Kephart, J. Kraft, D. Grandmaison M. Piorkowksi), USFWS (B. Werner, R. Murphy), BLM (K. Grove, A. Wihelm), BP Wind Energy (K. Wells), Tetra Tech (L. Nagy, A. Oller, C. Farmer, J. Garvin)
August 22, 2012	Conference call to discuss the carcass mitigation plan.	USFWS (R. Murphy), AZGFD (K. Jacobson), BP Wind Energy (K. Wells), Tetra Tech (L. Nagy, C. Farmer)
September 13, 2012	Conference call to discuss the carcass mitigation plan.	USFWS (R. Murphy), AZGFD (K. Jacobson), BP Wind Energy (K. Wells), Tetra Tech (L. Nagy, A. Oller, C. Farmer, J. Garvin)
October 2, 2012	In-person meeting to discuss Alternatives and golden eagle-specific avoidance and minimization measures needed for USFWS acknowledgement letter.	USFWS (R. Murphy, J. Thompson, B. Werner), BLM (J. Neckels, K. Grove, A. Wilhelm, E. Arreola, E. Masters), Reclamation (M. Maynard), NPS (J. Holland), AZGFD (J. Driscoll), Western (G. Daino), BP Wind Energy (D. Runyan, K. Wells, J. Madison), Tetra Tech (L. Nagy), URS (J. Charpentier, B. Defend)
October 15, 2012	Telephone conversation to clarify details associated with 1.25-mile no-build buffer and curtailment zone.	USFWS (R. Murphy), BP Wind (K. Wells), and Tetra Tech (L. Nagy)

1.2 Project Description

The Project area includes approximately 38,099 acres of public land managed by the BLM Kingman Field Office, and approximately 8,966 acres of land managed by Reclamation, for a total of 47,066 acres. The Project area is located approximately 64 kilometers (km) (40 miles) northwest of Kingman, Arizona in the White Hills of Mohave County. Project features as described in the EIS include wind turbines; foundations and pad-mounted transformers; electrical, communication, and distribution systems; interior access roads; substations; a switchyard; and ancillary facilities including an Operations and Maintenance (O&M) building, temporary laydown/staging areas, mobile batch plants, and temporary and permanent meteorological (met) towers. The exact location of the wind turbines, roads, and transmission and distribution lines will be determined during final design following completion of wind-resource data analyses and other environmental studies including identification of construction constraints and sensitive cultural or natural resources to be avoided (Figure 1).

The Project would generate and deliver electrical power to the regional electrical transmission grid by interconnecting with an existing transmission line passing through the Project Area. The potential interconnection points include the Liberty-Mead 345-kV or Mead-Phoenix 500-kV transmission lines, both of which cross the southern portion of the Project area and are operated by Western. BP Wind Energy has applied to generate up to a maximum nameplate capacity of 500 MW at the Project and has filed interconnection requests with Western that commit the firm to certain generating capacities (dependent on the specific transmission line) if the Project is approved. Any alterations to the Project that lower the generation capacity below these respective levels would cause the Project to fail to meet its stated purpose and need (BLM 2012).

Up to 283 turbines are proposed to be installed within the corridors in the Project area; each would have the capacity to generate between 1.5 to 3.0 MW. Depending on the turbine model used, the turbine hubs would be between 80 meters (m) (262 feet) and 105 m (345 feet) above the ground, and the turbine blades would extend between 39 m (126 feet) and 59 m (194 feet) above the hub. At the top of their arc, the blades would be between 119 m (390 feet) and 164 m (539 feet) above the ground. The energy generating capacity of the Project would depend on the turbine model selected, the transmission line used, and the turbine corridors approved by BLM and Reclamation. The Project would have a nameplate generating capacity of 425 MW in the event the Project interconnects to the Liberty-Mead line, and 500 MW in the event the Project interconnects to the Mead-Phoenix line. The desired generation level could be achieved by different numbers of turbines, depending on the turbine model(s) selected by BP Wind Energy, and the land area approved by BLM and/or Reclamation in accordance with the decisions made by these agencies in their respective RODs.

BP Wind Energy has used a “turbine corridor” approach instead of focusing on specific turbine locations in order to account for the degree of flexibility required for a project of this scale and complexity and given the long federal permitting timeline anticipated at the time of the initial development application submitted to BLM in August of 2006. By providing Project-specific data within broad turbine corridors, BP Wind Energy preserves flexibility to micro-site all elements of the Project in order to avoid and minimize impacts identified through NEPA and other analyses. In addition, BP Wind Energy preserves critical business flexibility to select turbine models and layout based on the options commercially available at the time a Notice to Proceed is issued. As a result of the turbine corridor approach, the EIS describes and analyzes impacts based on three turbine-parameter specification ranges (see above).

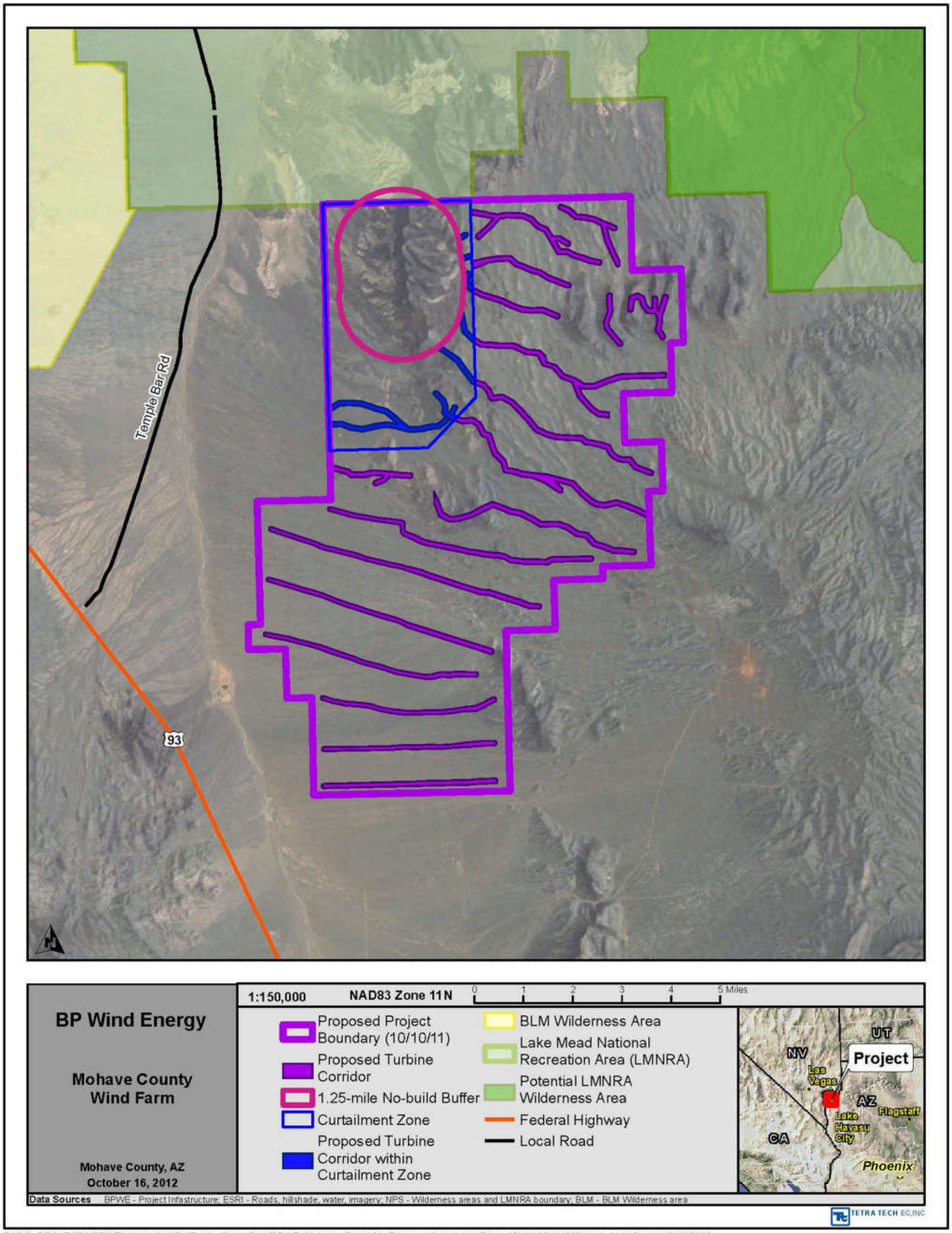

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Figure 1. Proposed Project Layout, EIS Alternative A With Turbines Removed Due to the Addition of a 1.25-mile No-Build Buffer Around the Squaw Peak Breeding Area and a Curtailment Zone.

The Project boundary analyzed for baseline conditions has shifted to accommodate comments received and the results of scoping. BP Wind Energy previously proposed a Project footprint east and southeast (Map 2-11 of the Draft EIS, BLM 2012) of what is currently proposed (Alternative A in the Draft EIS, BLM 2012). The previously proposed footprint was comprised of a checkerboard mix of private and public lands administered by BLM and Reclamation. The footprint was shifted for four primary reasons including: 1) constructability; 2) land access; 3) environmental constraints; and 4) agency and public feedback from scoping. The previous footprint was composed of a higher proportion of lands with rugged topography including ridges, mountain peaks, and mines. These characteristics imposed engineering and environmental impact constraints as well as increased costs. In addition, comments received during the scoping period in the initial stages of the EIS suggested that a footprint shift would result in a project with fewer impacts to the human and natural environment. In response, BP Wind Energy proposed the current footprint to provide a better sited project with fewer constraints that could affect sensitive resources in the area. In the ECP/BCS, this earlier footprint will be referred to as the prior footprint. The proposed layout represents a shift of turbine corridors to the west.

The currently proposed Project (Alternative A) that was developed in 2011 prior to the completion of golden eagle surveys, consists of a maximum of 283 turbines, and a Project area of approximately 47,066 acres. Two additional development alternatives are considered in the Draft EIS (BLM 2012). Alternative B was developed to address concerns raised by the Lake Mead National Recreation Area which is a unit of the National Park Service (NPS), as well as by private landowners, regarding visual and noise impacts from turbines located in proximity to NPS and surrounding lands. Turbine corridors in Alternative B are eliminated or shortened on lands managed by the BLM and Reclamation, and this increases the distance from turbines to private lands. Alternative C was developed to address similar concerns, but differs from Alternative B in that more turbines are moved from areas near private lands to lands managed by the BLM. Both Alternatives B and C reduce the maximum number of turbines to 208 by removing turbines from the northwestern (Alternative B) edge or southern edge (Alternative C) of the Project area but differ in the location of the turbine strings. Alternative B would have a Project area of approximately 34,720 acres, whereas Alternative C would have a Project area of approximately 35,302 acres. Either development alternative would result in potential avoidance and minimization of impacts to eagles and other birds due to the reduction in turbine numbers. To be conservative, impacts of the Project are discussed based on Alternative A unless explicitly stated otherwise.

Regardless of which alternative is chosen, BP Wind Energy is implementing two types of avoidance and minimization measures relative to potential eagle impacts, both associated with the Squaw Peak golden eagle breeding area (see Section 2.3 for details). First, BP Wind Energy is voluntarily implementing a no-build buffer within 2 km (1.25 miles) of the known active and alternate golden eagle nests of the Squaw Peak breeding area as documented by baseline surveys. Second, BP Wind Energy is removing potential turbines from two township-range sections approximately 3 km (1.9 miles) south of the Squaw Peak breeding area (Sections 20 and 21 in T29N, R20W).

The Project term is 30 years; however, incidental take permits are limited to 5 years at this time (USFWS 2011a). Therefore, both potential Project design elements that would be in effect for the Project lifetime are discussed, along with additional avoidance, minimization, and compensatory mitigation measures that are proposed for a 5-year timeline to correspond to the current duration of eagle take permits.

1.3 Environmental Setting

The Project area is located in the White Hills, situated between the Detrital Valley Basin and Black Mountains to the west and the Hualapai Valley Basin and Grand Wash Cliffs to the east (U.S. Geological Survey [USGS] 1999, WRCC 2012). The Colorado River and Lake Mead are to the north and the Cerbat Mountains are south of the Project area. The Project area is located in the Mojave Desert ecoregion, a transitional zone between the warmer Sonoran Desert to the south and the higher and cooler Great Basin Desert to the north (Lowe 1985, USEPA 2007). The dominant vegetation type within the Project is Sonora-Mojave Creosotebush-White Bursage Desert Scrub which is described as 2-50 percent cover of small-leaved, broad-leaved, and drought-adapted shrubs (NatureServe 2011). This vegetation type is dominated by creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Within the Project area and its surroundings, this vegetation type exhibits a great deal of variation in its secondary species, which change with elevation, soil texture, and available precipitation. Other vegetation in the Project area includes white burrobush (*Hymenoclea salsola*), brittlebush (*Encelia farinosa*), Mojave yucca (*Yucca schidigera*), and Joshua trees (*Yucca brevifolia;* Thompson et al. 2011a). Numerous species of cactus also occur.

Mohave County experiences milder summers and colder winter temperatures than the low desert regions of Arizona. Average annual temperatures near the Project area are in the low 60s degrees Fahrenheit (°F); 15-20 degrees Celsius (°C). Summer temperatures generally range from the mid-70s to the mid-90s °F (24 to 35 °C). In winter, early morning temperatures normally drop to the low 30s and reach the mid-50s °F (-1 to 10 °C) by the afternoon (WRCC 2012). Precipitation is limited in the Project area and its surroundings, and ranges from about 8 to 10 inches (20 to 25 centimeters [cm]) per year (WRCC 2012). The terrain is variable throughout the Project area and ranges from 585 m (1,920 feet) to 1,169 m (3,836 feet) above sea level (USGS 1999). The greatest topographic relief is in the northwestern portion of the Project area on land managed by Reclamation. The primary land uses within the Project area are utility and road rights-of-way, Off Road Vehicle (ORV) use and other recreational activities, and livestock grazing.

1.4 Regulatory Framework

Native migratory birds are protected under a variety of federal and state laws and regulations. Relative to the Project, these include the MBTA, BGEPA, BLM Instructional Memorandum 2010-156, and Arizona Revised Statute 17. In areas of federal land, the NEPA permitting process is required, and Memoranda of Understanding between BLM and AZGFD have been developed to clarify management responsibilities. These regulations are described in the following subsections.

1.4.1 Migratory Bird Treaty Act

Under the MBTA it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture, or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any native migratory bird, part, nest, egg or product. The USFWS has established a permitting scheme for a variety of intentional activities, such as hunting and scientific research, but has not done so for the incidental take of migratory birds associated with otherwise lawful activities. As a result, there is no permitting framework that allows a company to protect itself from liability resulting from take at wind facilities. BP Wind Energy has been coordinating with USFWS to develop this ECP/BCS to represent best management practices and good-faith efforts to minimize impacts to migratory birds and comply with the MBTA.

1.4.2 Bald and Golden Eagle Protection Act

The BGEPA prohibits the take of any bald or golden eagle, alive or dead including any part, nest, or egg. “Take” is defined as “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb” a bald or golden eagle. “Disturb” means to agitate or bother an eagle to a degree that causes, or is likely to cause (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. Historically permits were not available under the BGEPA; however, a rule change in 50 Code of Federal Regulations in November 2009 provided a mechanism to acquire permits for incidental take associated with otherwise lawful activity (§22.26). The Draft ECP Guidance outlining the steps requested for permits was released in January 2011 and was utilized in the development of this ECP/BCS. A revised Technical Appendix to the Draft ECP Guidance was released in August 2012 that replaces the prior appendix and provides an update on current methods being used to assess and document risk to eagles related to wind development (USFWS 2012a). Although the current permit period is limited to five years, this ECP/BCS has been developed for the entire 30-year life of the Project.

1.4.3 BLM Instruction Memorandum No. 2010-156

In July 2010, the BLM issued IM No. 2010-156 to all field officials (BLM 2010a). The purpose of the memorandum was to provide direction for compliance with BGEPA in the interim period between the final rule allowing for incidental take permits (USFWS 2009), and the establishment of criteria for how to issue programmatic take permits for golden eagles. The memorandum directed BLM officials to incorporate consideration of golden eagles and their habitat in the NEPA analysis for all renewable energy projects. Furthermore, the IM states that BLM will not issue a notice to proceed for any project with the potential to impact eagles until the USFWS provides a letter of acknowledgement regarding the applicant’s draft APP (see Section 1.1 for more details).

1.4.4 National Environmental Policy Act

NEPA is an act of Congress established to ensure that the environmental impacts of any federal action are fully considered and that appropriate steps are taken to mitigate potential environmental impacts. An EIS is being prepared for the Project in compliance with NEPA in order to analyze and disclose the potential impacts of the Project. The BLM is the lead agency responsible for preparing the EIS. Other agencies (federal, state, and local) cooperating with BLM in the preparation of the EIS include Reclamation, Western, NPS, AZGFD, and Mohave County. The Hualapai Tribe, a governmental entity, is also cooperating with BLM in the preparation of the EIS.

1.4.5 Memoranda of Understanding between BLM and AZGFD

In November 2007, the BLM and AZGFD entered into a memorandum of understanding (Agreement Number AZ-930-0703) to work cooperatively to manage resources on public lands within Arizona. This memorandum recognized AZGFD as the agency responsible for managing fish and wildlife populations on BLM public lands within Arizona, and BLM as the agency responsible for managing fish and wildlife habitat on these lands. BLM agreed in the memorandum to manage uses and users of BLM public lands so that habitat on these lands will support and enhance fish and wildlife populations consistent with AZGFD's trust responsibilities, goals, and objectives. Both parties to the memorandum agreed to cooperate and participate in the development of all plans or programs that affect fish and wildlife management on BLM public lands in Arizona.

In December 2010, the BLM and AZGFD entered into a memorandum of understanding (Agreement Number AZ-2010-5) with respect to their roles on the Project. Specifically, the BLM is designated as the lead agency with responsibility for the completion of the EIS and the ROD. AZGFD is identified as a cooperating agency whose role is to provide technical assistance with respect to wildlife, hunting, recreation, and environmental issues where AZGFD has special expertise or jurisdiction by law.

1.4.6 Arizona State Statutes

Under the Arizona Revised Statutes (ARS) Title 17 §17-102 wildlife is the property of the state and under both ARS §17-309 (criminal penalties) and §17-314 (civil liability) it is unlawful to take wildlife except as permitted by the Arizona Game and Fish Commission. Take, as applicable in the context of wind development, is defined as pursuing or killing wildlife where wildlife includes all birds, bird nests, and young (ARS §17-101). ARS §17-235 authorizes the Arizona Game and Fish Commission to regulate the taking of migratory birds, in compliance to the MBTA, specifically with respect to seasons, bag limits, possession limits, and other regulation. ARS §17-236 states, "It is unlawful to take or injure any bird or harass any bird upon its nest, or remove the nests or eggs of any bird, except as may occur in normal horticultural and agricultural practices and except as authorized by commission order."

2 MONITORING AND SURVEYING TO DATE

2.1 Bird Use Survey Methods

Point count surveys were conducted to evaluate the species, timing, and distribution of birds within the Project area. Point counts were conducted by WEST for all bird species from 2007 – 2011 (Thompson et al. 2011a; Appendix A) and by Tetra Tech for golden eagles in 2012.

During the 2007-2008 season, surveys were conducted at seven 800-m radius fixed-point bird use locations based on the prior footprint on BLM land (Figure 2). When the Project area changed to the proposed footprint, five new fixed-point bird use sites were surveyed in the 2010-2011 season on Reclamation land (Figure 2). The twelve points were representative of the habitats and topography within the Project area. Every bird observed during each 20-minute (min) fixed-point bird use survey was recorded, but observations of large birds beyond the 800-m radius, and small birds beyond a 100-m radius were excluded from the statistical analyses.

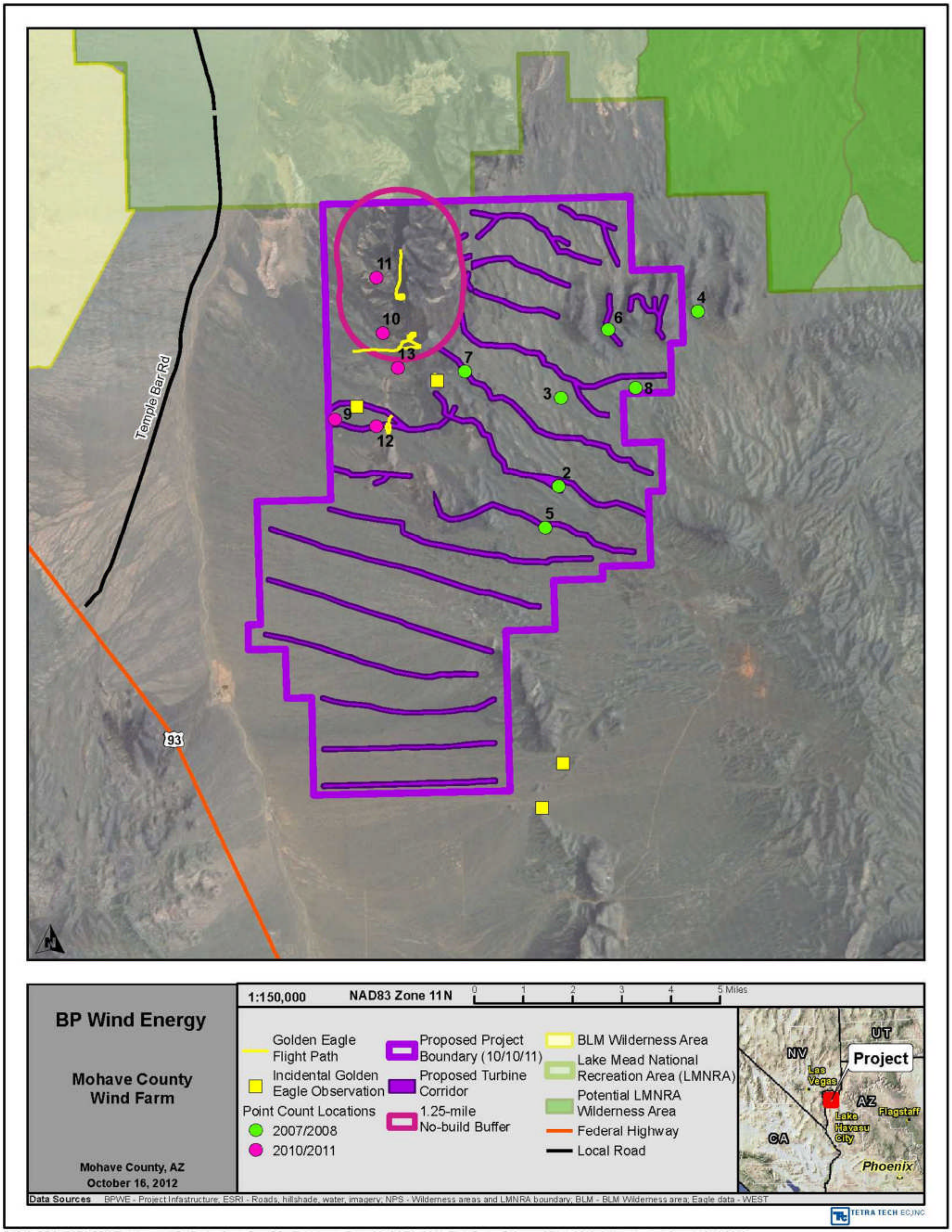

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Figure 2. Eagle Flight Paths and Point Count Locations in 2007/2008 and 2010/2011

Large birds included waterbirds, waterfowl, rails and coots, gulls and terns, shorebirds, raptors (defined here as kites, accipiters, buteos, harriers, eagles, falcons, vultures, ospreys, and owls), upland game birds, doves/pigeons, large corvids (e.g., ravens, magpies, and crows), goat-suckers, and kingfishers whereas small birds included passerines (excluding large corvids), swifts/hummingbirds, and woodpeckers (Appendix A).

Species or best possible taxonomic identification (e.g., genus), number of individuals, sex and age class (if possible), distance from plot center when first observed, closest distance, flight altitude above ground, activity (behavior), and habitat(s) used by birds were recorded for each observation. The behavior of each bird observed, and the vegetation type in which or over which the bird occurred, were recorded based on the point of first observation. Approximate flight height and distance from plot center at first observation were estimated to the nearest 5-m (16-ft) interval. Classification of species as resident or migrant was determined using the annual pattern of occurrence in Mohave County according to Peterson Guides Bird Finder (2011) and may differ from the classification used in Thompson et al. 2011a; species for which the majority of presence was documented during spring and fall migration periods were considered migrants, all other species were considered residents.

Fixed-point bird use surveys were conducted from April 21, 2007, through November 11, 2008, and from September 3, 2010, through May 30, 2011. Surveys were conducted approximately once per week during the spring (March 11 to May 31) and fall (August 1 to November 15) seasons and twice monthly during the winter season (November 16 to March 10). Summer surveys were not conducted because the area was expected to support birds primarily during migration and wintering periods. Surveys were carried out during daylight hours and survey periods were varied to approximately cover all daylight hours during a season. To the extent practical, each point was surveyed about the same number of times.

In 2012, golden eagle point count surveys were conducted at 16 fixed and five rover count locations within and near the Project area (Figure 3). Rover locations allowed surveyors to be responsive to areas of perceived or observed eagle use. All count locations were chosen to maximize visual coverage of the Project area, to provide views of areas where eagle use was expected based on topography and previous observations, and to provide a representative sample of use throughout the Project area. Nine rounds of golden eagle point count surveys were conducted every other week from January 14 to May 9, 2012. Each round of surveys consisted of a 2-hour point count at each of the 16 point count and at two of the rover locations. Survey start times were rotated so that all periods of daylight were sampled at all locations.

The data recorded for each golden eagle point count included numbers and age classes of golden eagles seen, flight height, minutes of golden eagle flight over the Project area that were within the approximate rotor swept area (RSA) height range of the anticipated turbine model at the time surveys were designed (35 – 125 m above ground), notes on flight and other behaviors. Each golden eagle flight observation was drawn on a topographic map or aerial image of the Project area and digitized into a geographic information system (GIS). There was no distance cut-off for observations. Eagles observed within or near the Project area but outside of the survey period (e.g., when surveyors were traveling between point count locations) were recorded as incidental observations and in the same manner as for eagle observations made during surveys. Flight paths of incidental eagle sightings were used to help delineate areas of eagle use within and near the Project area.

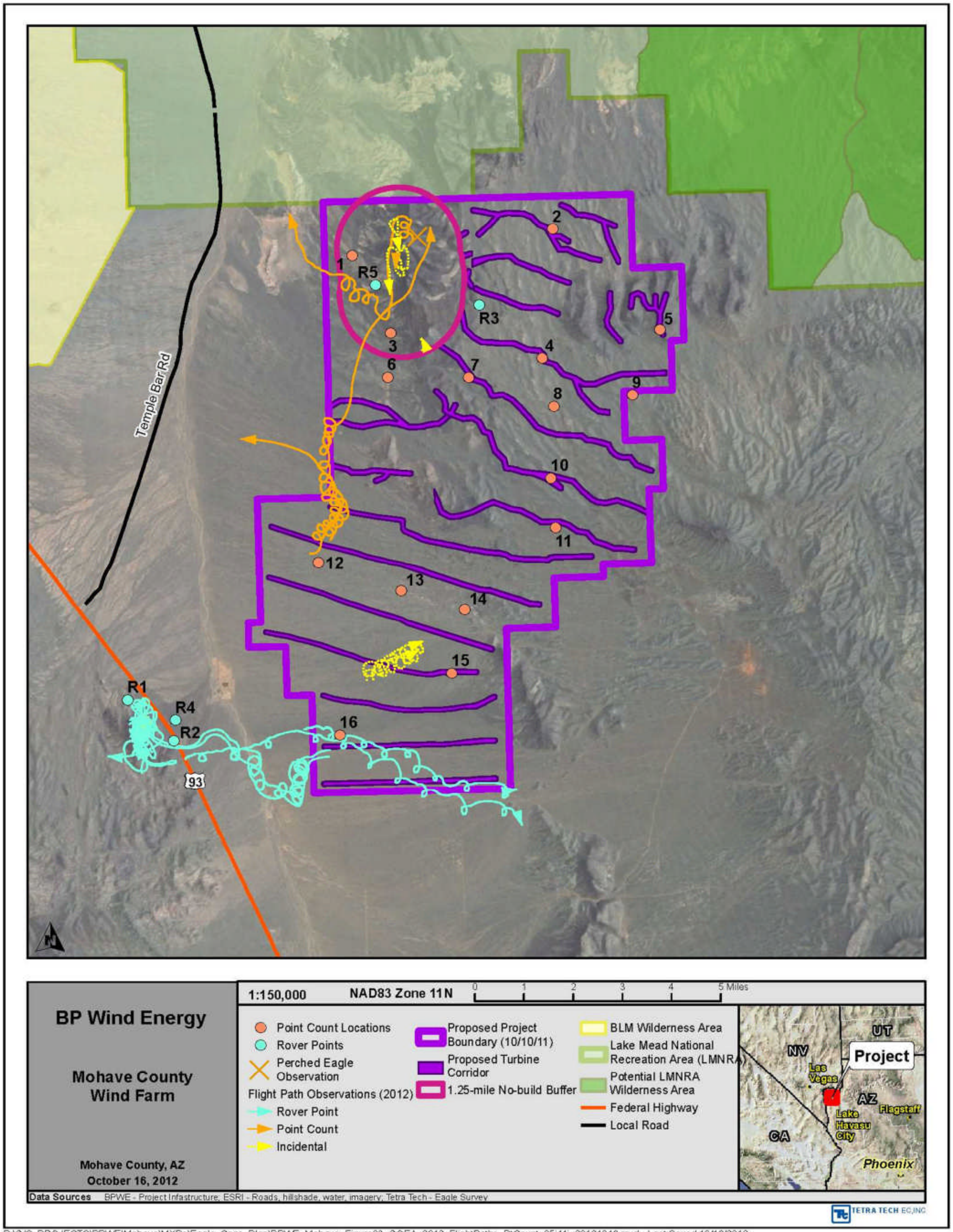

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Figure 3. Eagle Flight Paths and Eagle Point Count Locations in 2012

2.1.1 Golden Eagle Results

No golden eagles were seen during the 2007-2008 surveys, resulting in a golden eagle mean use of 0.00 eagles/20-min for the 2007-2008 survey year. In the 2010-2011 survey year, four golden eagles were seen in three groups within the Project area. Two golden eagles of unknown age were seen in winter on February 7, 2011. In spring, one adult golden eagle was seen on March 24, 2011, and one adult golden eagle was seen on April 27, 2011. No golden eagles were observed in the fall. All four golden eagles flew within the RSA along the northwestern portion of the Project area on Reclamation land (Figure 2). Across all 2011 surveys, golden eagle mean use was 0.02, 0.00, and 0.03 eagles/20-min in the spring (March 11 – May 31), fall (August 1 – November 15), and winter (November 16 – March 10) seasons, respectively.

Four golden eagles were seen incidentally between April 2007 and May 2011, one observed during bird use surveys but outside of the survey plot, and three during other wildlife surveys (Figure 2). Incidental sightings are those made outside of formal sampling plots or times; although they are used to detect presence of birds, incidental sightings are not included in the statistical analysis of the sample data.

In 2012, a total of 30 observations of eagles were made during 320 hours of observation, of which nine occurred within the Project area (Table 2, Figure 3) for a mean use of 0.03 eagles per hour. Eight of the nine eagle observations within the Project area were individuals in flight. These observations recorded 5.17 minutes of flight within the RSA while within the Project area (Table 2). Eagle observations were recorded from point count locations 1 and 6, and rover locations R2 and R4. Most flights occurred close to active nests, with little movement into the interior of the Project area (Figure 3).

Table 2. Summary of Golden Eagle Observations within Project area Boundary at Mohave County Wind Farm During 2012 Point Count Surveys[1]

Date	Point	Survey or Incidental	Time Eagle First Observed	Time Eagle Last Observed	Age[2]	Activity[3]	Approximate Flight Height[4](m)		Eagle Minutes at RSA Height in Project area[5]
							Low	High	
1/31/2012	6	Survey	1611	1659	A	FL	180	1200	0
1/31/2012	6	Survey	1611	1613	U	FL	180	250	0
1/30/2012	16	Incidental	1339	1346	A	FL	10	125	N/A
1/30/2012	16	Incidental	1339	1346	A	FL	10	150	N/A
1/30/2012	R2	Survey	1458	1625	A	FL/PE	0	350	2 min 35 sec
1/30/2012	R2	Survey	1458	1645	A	FL/PE	0	350	2 min 35 sec
2/12/2012	7	Incidental	1627	1627	U	FL/PE	0	300	N/A
3/1/2012	R2	Survey	1005	1026	A	FL	300	800	0
3/1/2012	R2	Survey	1010	1023	A	FL	500	800	0
3/13/2012	6	Survey	1102	1115	A	FL	250	1000	0
4/23/2012	1	Incidental	1845	1941	I	PE/FL	0	5	N/A
4/23/2012	1	Incidental	1859	1941	A	FL/PE	0	20	N/A
4/24/2012	1	Survey	809	809	U	FL/PE	0	2	0
5/9/2012	1	Survey	1229	1425	A	PE	0	0	0

1. Only those flight paths observed within the Project area are included in this table.
2. A = adult, I = immature, U = unknown
3. FL = flight, PE = perched
4. Flight height = height above ground
5. N/A = Not applicable, eagle minutes not reported for incidental sightings because they occur outside of standardized surveys

2.1.2 Non-eagle Bird Species Results

During 323 point-count surveys conducted by WEST (Thompson et al. 2011a), a total of 683 individual birds consisting of 35 species were observed in 518 separate groups (defined as one or more individuals; Appendix A). Regardless of bird size, four species (11.4 percent of all species) composed 51.5 percent of all observations: black-throated sparrow, common raven, horned lark, and turkey vulture. All four species are potentially resident breeders within the Project area and do not have special status (Appendix A). All other species comprised less than 5 percent of the observations, individually. All fixed-point surveys combined had a mean species richness of 0.31 large bird species/800-m plot/20-min survey and 0.55 small bird species/100-m plot/20-min survey. Overall mean use by all birds was 1.70 birds/plot/20-min survey; however, large birds were surveyed on different-sized plots than small birds. The highest overall large bird use occurred during the spring (0.97 birds/800-m plot/20-min survey), followed by winter (0.50) and fall (0.31). Small bird use was highest in the spring (2.33 birds/100-m plot/20-min survey), followed by the winter (0.55) and fall (0.45). For all large bird species combined, use was highest at locations in the east-central section of the Project area (2006-2007) where the topography is gently rolling and dispersed Joshua tree woodland habitat is prevalent. Small bird use was also high in this type of habitat (2006-2007), as well along the western slope of Squaw Peak (2010-2011).

Annual large-bird mean use was 0.56 birds/800-m plot/20-min survey, with raptors making up 40.3 percent of large birds detected at the Project area (Appendix A). Overall-mean raptor use at the Project area was 0.23 raptors/800-m plot/20-min survey, with the highest use recorded during the spring (0.46 raptors/800-m plot/20-min survey) and lowest during the winter (0.08). Raptors composed 47.6 percent of the overall bird use in the spring, 41.7 percent in the fall, and 15.9 percent in the winter. The most common raptor species observed were turkey vulture, red-tailed hawk, and American kestrel, with turkey vulture and red-tailed hawk having the highest exposure index among raptors (0.09 and 0.03 raptors flying within the RSA height/800-m survey plot/20-min survey, respectively) and the second and third highest among all bird species, respectively. Turkey vultures made up nearly half of all detections of raptor species (36 out of 73 individuals). Mean raptor use in the Project area ranked seventh lowest compared to 43 other wind energy facilities from across North America that implemented similar protocols to this study and had data for three or four different seasons. However, the mean raptor use in the Project area was highest among the three studies available from Arizona (range from 0.13 to 0.23 raptors/800-m plot/20-min survey; Thompson et al. 2011a).

Annual small-bird mean use was 1.07 birds/200-m plot/20-min survey, with passerine species making up 98.0 percent of small birds detected at the Project area (Appendix A). Black-throated sparrow had the highest use by any one species during all three seasons. Northern rough-winged swallow was the only small bird species recorded flying within the RSA based on initial flight height observations and had an exposure index of less than 0.01 birds flying within RSA height/100-m plot/20-min survey. Passerines were observed during 76.5 percent of spring surveys, 23.5 percent of fall surveys and 18.8 percent of winter surveys. Although 76.5 percent of passerine observations occurred during the spring, they were primarily of species considered to be potential residents within the Project area (Appendix A), suggesting that the site was used primarily by resident birds and not as a stopover for large numbers of migrants.

2.1.3 Sensitive Species

Sensitive species are defined here as those federal or state listed as threatened, endangered, or candidate for listing; USFWS Birds of Conservation Concern (BCC; USFWS 2008), BLM Sensitive species (BLM 2010b); Species of Greatest Conservation Need (SGCN) under the Arizona State Wildlife Action Plan (AZGFD 2010); or Species of Continental Importance (SCI) under the North American Landbird Conservation Plan developed by Partners in Flight (Rich et al. 2004). No listed or candidate bird species were detected during avian surveys. Five bird species were detected that are considered BCC in the Bird Conservation Region (BCR) containing the Project area, BCR 33 (Sonoran and Mojave Deserts): Bendire's thrasher, burrowing owl, Costa's hummingbird, gilded flicker, and prairie falcon (Table 3). Both the burrowing owl and gilded flicker are also listed as Sensitive by the BLM, in addition to golden eagle (see Section 2.1.1 for additional details; Table 3). Additionally, 20 species were detected that are considered SGCN including BCC and BLM Sensitive species (Table 3). There were 15 species detected that are considered SCI including several species ranked as BCC and SGCN (Table 3).

2.2 Songbird Migration Surveys

Songbird migration surveys were conducted for passerines between March 1 and May 30, 2009 to encompass the bulk of the spring migration season, as well as some of the early nesting season for songbirds in this region. These surveys were performed in response to a request from AZGFD to measure use of the Project by night-migrating passerines that may use the Project area as stopover habitat during the day. Because avian point count surveys (Section 2.1) focused on proposed turbine locations on ridges and did not target bird use in washes or at stock tanks, the songbird migration surveys utilized a paired-point approach to assess whether or not species using the site appeared to select for wash habitats over ridge/upland habitats. This survey effort was based on the assumption that if migrant birds were using the Project area as a stopover site during migration, wash habitats would show elevated use by migrants because these areas typically contain more habitat complexity/diversity than other areas.

Songbird migration surveys were conducted for 10 minutes at 21, 100-m-radius circular plots around fixed observation points following standard methods (Reynolds et al. 1980). Ten point count locations were established within turbine corridors proposed at the time of surveys, which were typically located on ridges. Each turbine plot was paired with a plot located within an adjacent wash, with plots in washes located a minimum of 400 m from turbine plots. One additional plot was surveyed at the Senator Mountain Stock Tank. Two sets of paired points, along with the single station at the Senator Mountain Stock Tank, were located outside of the current (as of July 2011) Project area; however, data from these points were included in the analysis and included in this report, as the primary goal of these surveys was to assess the area (not necessarily just the current Project area) for its potential as a stopover site for migrant songbirds during the spring migration. All birds observed during each survey were recorded. All passerines were recorded, regardless of the distance from the observer, but only those detected within 100 m from the observer were used for analysis. Surveys were conducted every other week during the survey period from sunrise to approximately 10:00 am, and the survey order rotated so that each point was sampled at various times in the morning.

Table 3. Summary of Individuals of Sensitive Species Detected by Survey Type Including Size Classification and Status

Species Common Name	Species Scientific Name	Size Class	Resident Classification	Total Number Detected			USFWS Status[1]	BLM Status[2]	State Status[3]	Species of Continental Importance[4]
				Point Counts	Songbird Migration	Incidental				
Abert's Towhee	*Pipilo aberti*	Small	Resident	-	-	1	-	-	1B	WL3
Bendire's thrasher	*Toxostoma bendirei*	Small	Resident	-	-	4	BCC	-	1C	WL3
black-tailed gnatcatcher	*Polioptila melanura*	Small	Resident	1	12	11	-	-	1C	AS1
black-throated sparrow	*Amphispiza bilineata*	Small	Resident	181	428	108	-	-	-	AS1
Brewer's sparrow	*Spizella breweri*	Small	Migrant	2	90	120	-	-	1C	WL2
Bullock's oriole	*Icterus bullockii*	Small	Resident	-	-	1	-	-	1C	-
burrowing owl	*Athene cunicularia*	Small	Resident	-	-	1	BCC	S	1B	-
cactus wren	*Campylorhynchus brunneicapillus*	Small	Resident	26	213	47	-	-	-	AS1
common poorwill	*Phalaenoptilus nuttallii*	Large	Resident	-	-	4	-	-	1C	-
Costa's hummingbird	*Calypte costae*	Small	Resident	-	4	3	BCC	-	1C	WL3
Gambel's quail	*Callipepla gambelii*	Large	Resident	28	56	47	-	-	-	AS1
gilded flicker	*Colaptes chrysoides*	Small	Resident	1	-	4	BCC	S	1B	-
golden eagle	*Aquila chrysaetos*	Large	Resident	5	-	3	-	S	1A	-
lark bunting	*Calamospiza melanocorys*	Small	Migrant	-	1	-	-	-	-	AS1
loggerhead shrike	*Lanius ludovicianus*	Small	Resident	20	84	45	-	-	1C	-
phainopepla	*Phainopepla nitens*	Small	Resident	-	-	4	-	-	1C	AS1
prairie falcon	*Falco mexicanus*	Large	Resident	-	-	1	BCC	-	1C	-
sage sparrow	*Amphispiza belli*	Small	Resident	2	2	-	-	-	1C	AS1
sage thrasher	*Oreoscoptes montanus*	Small	Migrant	27	45	38	-	-	1C	AS1
savannah sparrow	*Passerculus sandwichensis*	Small	Migrant	-	2	1	-	-	1B	-
Scott's oriole	*Icterus parisorum*	Small	Resident	5	40	10	-	-	1C	AS1
western scrub-jay	*Aphelocoma californica*	Small	Resident	1	-	-	-	-	1C	AS1

Table 3. Summary of Individuals of Sensitive Species Detected by Survey Type Including Size Classification and Status (continued)

Species Common Name	Species Scientific Name	Size Class	Resident Classification	Total Number Detected			USFWS Status[1]	BLM Status[2]	State Status[3]	Species of Continental Importance[4]
				Point Counts	Songbird Migration	Incidental				
white-crowned sparrow	*Zonotrichia leucophrys*	Small	Resident	-	12	84	-	-	1C	-
white-throated swift	*Aeronautes saxatalis*	Small	Resident	1	-	9	-	-	1C	WL2

1. USFWS 2008 Birds of Conservation Concern (BCC) for Bird Conservation Region 33 (Sonoran and Mojave Deserts)
2. 2010 BLM Sensitive species
3. Tiers of Species of Greatest Conservation Need (revised 2010) from the Arizona State Wildlife Action Plan
   1A Considered vulnerable in at least one of the 9 categories, or is federal endangered, threatened or candidate species; is covered under a signed conservation agreement; or is petitioned for listing
   1B Considered vulnerable but matches none of the additional criteria above
   1C Unknown vulnerability status species
4. Partners in Flight 2004 North American Landbird Conservation Plan Species of Continental Importance
   WL2 Watch List Species—Moderately abundant or widespread with declines or high threats
   WL3 Watch List Species—Restricted distribution or low population size
   AS1 Additional Stewardship Species—High percent of Global Population in single biome (breeding or winter)

Thirty-one bird species were identified during 143, 10-min songbird migration surveys, with an average of 2.94 species observed per 10-min survey. Mean use across all points for all bird species combined was 6.62 observations/10-min survey. Among all bird types, mean use was highest for passerines (5.83 birds/plot/10-min survey). Within passerines, black-throated sparrow (2.48 birds/plot/10-min survey), cactus wren (0.65), and Brewer's sparrow (0.57), were the species with the highest mean use. Cumulatively, two species (black-throated sparrow and cactus wren) comprised 41.9 percent of all observations. Both of these species are considered resident breeders in the Project area and neither is assigned special status by state or federal agencies (Appendix A). All other species made up less than 10 percent of the observations individually.

Two bird groups showed greater use of washes compared to ridges; the grassland birds/sparrows (i.e., Brewer's sparrow, black-throated sparrow, chipping sparrow, horned lark, lark bunting, sage sparrow, savannah sparrow, song sparrow, unidentified sparrow, and white-crowned sparrow) and swifts/hummingbirds (i.e., Costa's hummingbird and unidentified hummingbird). Although the grassland birds/sparrows showed significantly greater use of washes, the overall tendency for songbirds was for no selection of washes. Additionally, use by swifts/hummingbirds, although considered statistically different between washes and ridges, was based on very low use estimates (0.0 and 0.045 observations/100-m plot/10-min survey at ridge and wash points, respectively). The songbird migration survey data support the hypothesis that the Project area is primarily used by resident breeding bird species, and is not a high-use stopover site for migrating songbirds as only five migrant species were detected.

2.3 Golden Eagle Nest Surveys

Golden eagle nest surveys were conducted in 2011 and 2012. To protect the locations of this sensitive species, breeding area locations are shown with 1-mile-square (1.6-km-square) buffers on maps of both surveys. In 2011, WEST (Thompson 2011) conducted aerial golden eagle nest surveys following the survey protocol outlined in the Interim Golden Eagle Inventory and Monitoring Protocol (Pagel et al. 2010). The initial survey was conducted on March 9 and 10, 2011; a time when golden eagles in this part of Arizona were likely to be initiating nesting or already incubating eggs. A second survey was conducted on April 21, 2011 to document nest productivity and to verify the status of all nests located during the initial survey. Between the first and second survey, the Project area footprint changed such that there was a small area encompassed within the 10-mile (16-km) buffer that was not surveyed by WEST during the initial flight (9.5-10 miles [15-16 km] from the Project area in the extreme southwest portion of the search area; Figure 4). However, nesting data from this area for early in the season were provided by an AZGFD survey of the area in late February 2011.

In 2012, a two-phase nest survey was conducted to determine occupancy of the known golden eagle breeding areas identified in 2011 within 10 miles (16 km) of the Project area and to estimate the productivity of any active nests (Tetra Tech 2012). The survey approach was developed by an inter-agency group consisting of representatives of AZGFD, BLM, Reclamation, and the USFWS during a meeting on November 9, 2011. Phase 1 of the nest survey was conducted from the ground (per agency recommendation) on January 14-17, 2012 to determine breeding area occupancy for the five breeding areas within 5 miles (8 km) of the

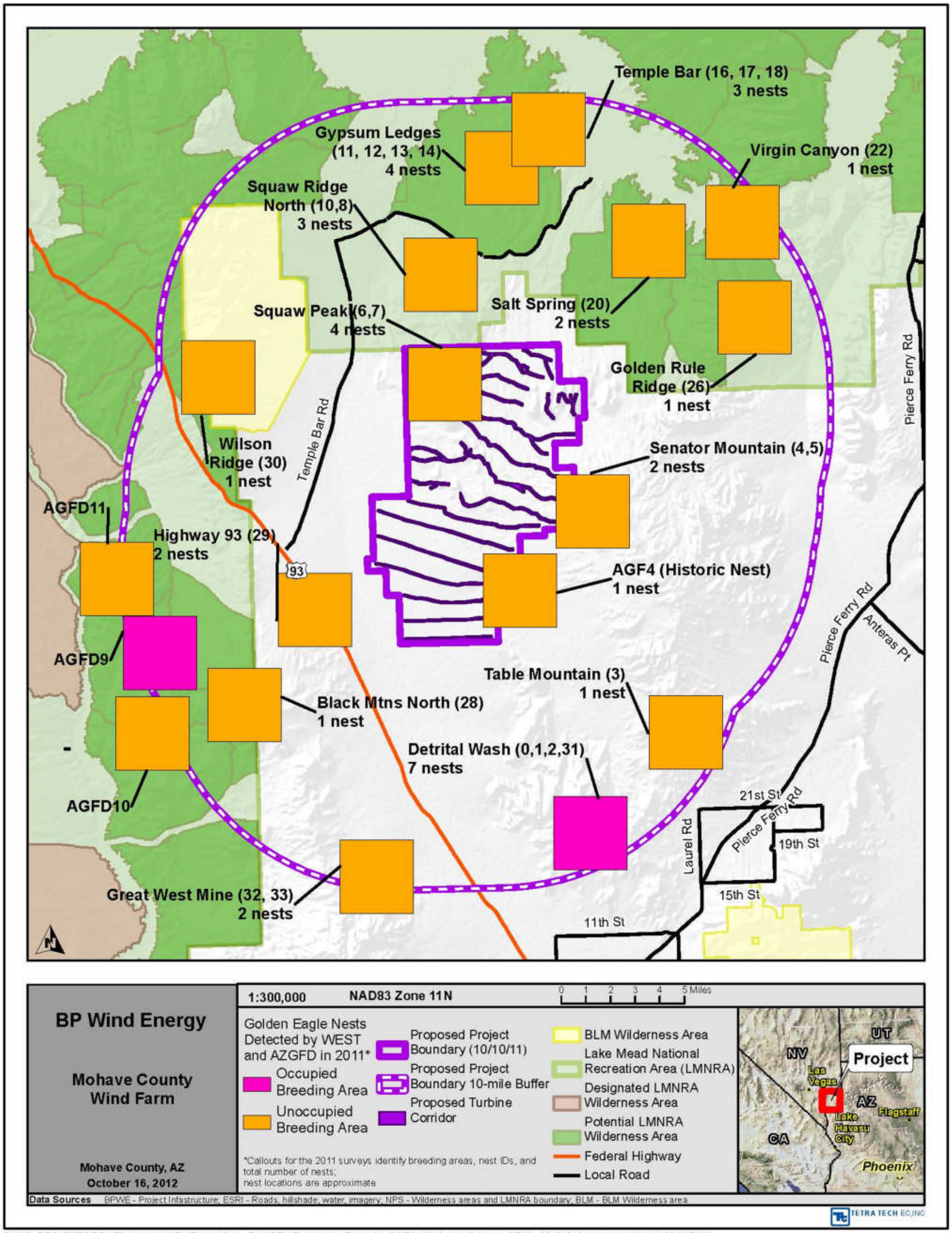

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Figure 4. 2011 Golden Eagle Breeding Area Locations* and Status

*Breeding areas are shown using 1-mile buffers around nest locations to protect the sensitive nature of eagle nest locations

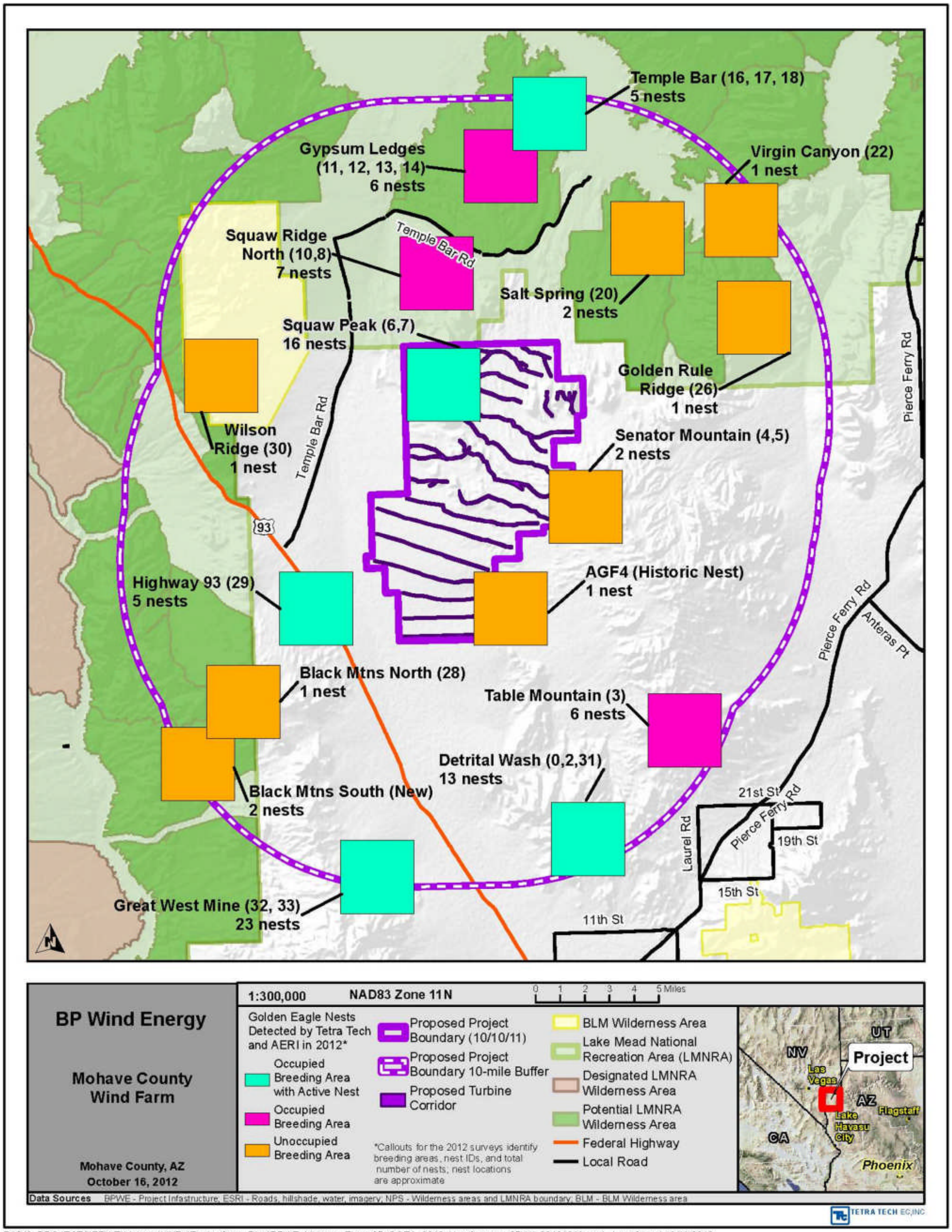

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Figure 5. 2012 Golden Eagle Breeding Area Locations* and Status

*Breeding areas are shown using 1-mile buffers around nest locations to protect the sensitive nature of eagle nest locations

Project area (Figure 5). Each Phase 1 survey consisted of a 4-hour observation period within sight of a known nest or group of nests. Phase 2 consisted of two helicopter flights conducted by the American Eagle Research Institute (AERI). AERI conducted the first flight on March 10, 2012. During this flight, AERI checked all known nests identified during 2011 surveys within 10 miles (16 km) of the Project area that were outside of wilderness or proposed wilderness areas (Figure 5). One known breeding area located in a BLM wilderness area was surveyed from the ground on April 12, 2012 so that it would not be necessary to fly over the wilderness area. On April 29, 2012, a second flight was conducted under the conditions of a permit issued by the National Park Service to survey known nests located within proposed wilderness areas of the Lake Mead National Recreation Area (Figure 5). During this survey, AERI also checked the status of all nests surveyed on March 10. Focal nest observations of four hours in length were performed weekly from May 25 – June 15, 2012 at each of the two active nests identified within and nearest the Project area (i.e., Highway 93 and Squaw Peak, Figure 5).

Occupancy of breeding areas and nests for this document is defined according to the Arizona Golden Eagle Survey and Monitoring Protocol (Southwestern Golden Eagle Management Committee [SGEMC] 2011). These definitions are consistent with Pagel et al. (2010), but use the term ‘breeding area’ in place of ‘territory’:

<u>Breeding Area</u>: An area containing one or more nests within the range of one mated pair of birds.

<u>Occupied Breeding Area</u>: An occupied Breeding Area must have a nest where at least one of the following activity patterns was observed during the breeding season:

a. Young were raised.
b. Eggs were laid.
c. One adult sitting low in the nest, presumably incubating.
d. Two adults present on or near the nest.
e. One adult and one bird in immature plumage at or near a nest, if mating behavior was observed (display flight, nest repair, copulation).
f. A recently repaired nest with fresh sticks, or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath.

<u>Unoccupied Breeding Area</u>: A nest or group of alternate nests at which none of the activity patterns diagnostic of an occupied Breeding Area were observed in a given breeding season.

<u>Active Nest</u>: A nest in which eggs have been laid. Activity patterns (a), (b), and (c) above are diagnostic of an active nest.

It is not uncommon for a pair of eagles to occupy a nest in years when resources are scarce, yet never lay eggs; these nests are still considered occupied (USFWS 2011a). Assigning an unoccupied stick nest to a species is challenging because a nest might be used by different species in each year and the characteristics of nests overlap for some species. However, golden eagle nests can usually be distinguished from hawk, falcon, and raven nests by size and placement.

2.3.1 2011 Golden Eagle Nest Survey Results

Thirty-six potential golden eagle nests, representing 16 breeding areas, were documented at 26 locations (multiple alternate nests at some locations) in the Project area plus 10-mile-radius (16-km-radius) survey area during the 2011 golden eagle nest survey (1 unoccupied breeding area in Project area, all other breeding areas outside Project area, see Table 4). No occupied breeding areas were documented within the Project area. None of the nests in these breeding areas were active (Figure 4). Because golden eagles often have multiple alternate nests within a single breeding area, the number of golden eagle nests and locations found is not reflective of the number of golden eagle breeding areas. Within the Project area plus 10-mile-radius survey area, WEST or AZGFD considered two of the golden eagle breeding areas outside of the Project area occupied. One breeding area was considered occupied by WEST due to the presence of a pair of adult golden eagles near a cluster of seven nests located approximately nine miles (14.5 km) south of the southernmost turbine string (Table 4, Figure 4). AZGFD considered a second breeding area occupied due to the presence of a pair of golden eagles during their February 2011 survey flight in the vicinity of nests 9.5-10 miles (15-16 km) to the southwest of the Project area (Figure 4). WEST did not check these nests during the second survey, and therefore could not confirm whether this breeding area was occupied.

The remaining unoccupied breeding areas contained nests that ranged from 0.7 miles (1.1 km) to 10.5 miles (16.9 km) from the nearest turbine corridor (Table 4, Figure 4). These nests did not have evidence of occupancy during the 2011 survey and no additional historical data exists to determine recent use (McCarty and Jacobson 2011). One raptor nest not included in the total count of golden eagle nests was located on a transmission tower and is a historical golden eagle nest site (based on data from the Arizona Heritage Data Management System [HDMS] 2012). The transmission tower nest was occupied by red-tailed hawks in 2008 and 2009; nest status was unknown in 2010 and BLM reported that the nest was again occupied by red-tailed hawks in 2011 (Thompson 2011).

2.3.2 2011 Raptor Nests

During the course of eagle nest surveys, five non-eagle nest sites were documented within approximately 0.6 miles (about one km) of the proposed turbine corridors. Thompson (2011) stated that these nests were likely red-tailed hawk nests; however, birds were only seen on three of the five nests. Most of the nests (4) were in Joshua trees and one was on a transmission line tower. The transmission tower nest is a historical golden eagle nest site based on data from the Arizona HDMS (2012), as described above in Section 2.3.1. Thompson (2011) also reported a newly built, active red-tailed hawk nest in 2011 that was identified by the BLM on a transmission tower.

2.3.3 2012 Golden Eagle Nest Survey Results

A total of 89 golden eagle nests were detected at an estimated 16 golden eagle breeding areas in the Project area plus 10-mile-radius survey area (1 breeding area in Project area, 15 outside Project area) including one previously undocumented breeding area (Black Mountains South, Figure 5, Table 5). Eight breeding areas were classified as occupied, with five of those breeding areas containing one active nest each. The remaining eight breeding areas were classified as unoccupied. In general, eagle pairs in temperate regions remain on their breeding areas year-round, but may not be present at the nest cliff during survey visits unless they are tending eggs

Table 4. 2011 Golden Eagle Nest Data Collected by WEST for the Mohave County Wind Farm and 10-mile Survey Buffer (Thompson 2011)

Nest ID	Date Located	Nest Status[1]	Nest Condition[2]	Nest Substrate	# Nests at Location	Breeding Area	Breeding Area Status[3]
0	3/9/2011	Inactive	Good	Cliff	3	Detrital Wash	Occupied
1	3/9/2011	Inactive	Bad	Cliff	2	Detrital Wash	Occupied
2	3/9/2011	Inactive	Good	Cliff	1	Detrital Wash	Occupied
3	3/9/2011	Inactive	Good	Cliff	4	Table Mountain	Unoccupied
4	3/9/2011	Inactive	Good	Cliff	1	Senator Mountain	Unoccupied
5	3/9/2011	Inactive	Good	Cliff	1	Senator Mountain	Unoccupied
6	3/9/2011	Inactive	Good	Cliff	1	Squaw Peak	Unoccupied
7	3/9/2011	Inactive	Good	Cliff	3	Squaw Peak	Unoccupied
8	3/9/2011	Inactive	Bad	Cliff	1	Squaw Ridge North	Unoccupied
10	3/9/2011	Inactive	Good	Cliff	1	Squaw Ridge North	Unoccupied
11	3/9/2011	Inactive	Good	Cliff	1	Gypsum Ledges	Unoccupied
12	3/9/2011	Inactive	Good	Cliff	1	Gypsum Ledges	Unoccupied
13	3/9/2011	Inactive	Good	Cliff	1	Gypsum Ledges	Unoccupied
14	3/9/2011	Inactive	Good	Cliff	1	Gypsum Ledges	Unoccupied
16	3/9/2011	Inactive	Good	Cliff	1	Temple Bar	Unoccupied
17	3/9/2011	Inactive	Bad	Cliff	1	Temple Bar	Unoccupied
18	3/9/2011	Inactive	Good	Cliff	1	Temple Bar	Unoccupied
20	3/9/2011	Inactive	Good	Cliff	2	Salt Spring	Unoccupied
22	3/9/2011	Inactive	Good	Cliff	1	Virgin Canyon	Unoccupied
26	3/9/2011	Inactive	Good	Cliff	1	Golden Rule Ridge	Unoccupied
28	3/9/2011	Inactive	Good	Cliff	1	Black Mountains North	Unoccupied
29	3/10/2011	Inactive	Good	Cliff	2	Highway 93	Unoccupied
30	3/10/2011	Inactive	Good	Cliff	1	Wilson Ridge	Unoccupied
31	3/10/2011	Inactive	Good	Cliff	1	Detrital Wash	Occupied
32	4/21/2011	Inactive	Good	Cliff	1	Great West Mine	Unoccupied[4]
33	4/21/2011	Inactive	Good	Cliff	1	Great West Mine	Unoccupied[4]

1. Status based on evidence of occupancy in current year (e.g., fresh nest materials, presence of adults or young).
2. Condition based on presence of a well-defined nest structure and intact nest materials.
3. One of the additional breeding areas (AGFD 9) surveyed by AZGFD in February, and not included here, was occupied.
4. Unoccupied breeding area status based on combined data from AZGFD (February survey) and WEST (April survey, Thompson 2011).

Table 5. 2012 Golden Eagle Nest Data for the Mohave County Wind Farm and 10-mile Survey Buffer (Tetra Tech 2012)

Breeding Area	Phase 1	Phase 2		Breeding Area Status	Nest Status
	Ground-based Survey 1/14-1/17/2012	Aerial Survey – Flight 1 03/10/2012	Aerial Survey – Flight 2 04/29/2012		
Highway 93	Occupied, adult observed perched and flying around nest site	Active, adult incubating	Active, 3-week-old chick in nest	Occupied	Active
Great West Mine	Not surveyed	Unknown, no signs of occupancy at known nests	Active, 3.5-week-old chick in nest	Occupied	Active
Detrital Wash	Not surveyed	Occupied, fresh nest lining and mute	Active, 3-week-old chick in nest	Occupied	Active
Table Mountain	Not surveyed	Occupied, fresh nest lining	Occupied, fresh nest lining	Occupied	Inactive
Senator Mountain	Unoccupied, no recent sign of occupancy at known nests	Unoccupied, no signs of occupancy at known nests	Unoccupied, no signs of occupancy at known nests	Unoccupied	Inactive
Squaw Peak	Unoccupied, no recent sign of occupancy at known nests	Occupied, fresh nest lining and mute	Active, adult brooding 1-3-day-old chick	Occupied	Active
AGF4	Nest documented by Thompson 2011 no longer present	Cliff nest found near location of historic nest - Unoccupied, no signs of occupancy at nest	Unoccupied, no signs of occupancy at nest	Unoccupied	Inactive
Black Mountains North	Not surveyed	Not surveyed	Unoccupied, known nest occupied by red-tailed hawk	Unoccupied	Inactive
Black Mountains South	Not surveyed	Not surveyed	Unoccupied, no signs of occupancy at two newly documented nests	Unoccupied	Inactive
Squaw Ridge North	Occupied, fresh mute on front of nest	Not surveyed	Occupied, greenery in nest and mute on back wall	Occupied	Inactive
Gypsum Ledges	Not surveyed	Not surveyed	Occupied, lots of mute	Occupied	Inactive
Temple Bar	Not surveyed	Not surveyed	Active, two 4.5-week-old chicks in nest	Occupied	Active
Salt Spring	Not surveyed	Not surveyed	Unoccupied, no signs of occupancy at known nests	Unoccupied	Inactive

Table 5. 2012 Golden Eagle Nest Data for the Mohave County Wind Farm and 10-mile Survey Buffer (Tetra Tech 2012) (continued)

Breeding Area	Phase 1	Phase 2		Breeding Area Status	Nest Status
	Ground-based Survey 1/14-1/17/2012	Aerial Survey – Flight 1 03/10/2012	Aerial Survey – Flight 2 04/29/2012		
Virgin Canyon	Not surveyed	Not surveyed	Unoccupied, no signs of occupancy at known nest	Unoccupied	Inactive
Golden Rule Ridge	Not surveyed	Not surveyed	Unoccupied, no signs of occupancy at known nest	Unoccupied	Inactive
Wilson Ridge	Unoccupied, single known nest occupied by red-tailed hawk[1]	Not surveyed	Not surveyed	Unoccupied	Inactive

1. Ground-based survey conducted on 4/12/2012.

or young. Unoccupied breeding areas may become occupied in subsequent breeding seasons, and breeding pairs in occupied breeding areas may not lay eggs every year. Therefore, it is possible that breeding areas lacking active nests in 2011 and 2012 could contain active nests in the future.

The five active nests were located in the following breeding areas: Highway 93, Squaw Peak, Temple Bar, Detrital Wash, and Great West Mine (Figure 5). There was at least one nestling in each active nest and a minimum of six young in total at the five nests on April 29, 2012. Ages of observable young ranged from 3 days to 4.5 weeks (Table 5). Focal nest observations at the Highway 93 and Squaw Peak active nests did not detect any eagle movements in or near the nests for four consecutive weeks (May 21 – June 15), indicating that young in these nests did not likely survive to fledging. Success of the four nestlings at the Temple Bar, Detrital Wash and Great West Mine active nests was unknown after the last observation on April 29, 2012; however, they are assumed to have been successful to derive maximum productivity estimates. Mean productivity at the five active nests was 0.8 young, assuming that the four unknown-status nestlings successfully fledged. Mean population productivity for the 10-mile radius survey area was 0.50 fledglings per occupied breeding area assuming that the four nests with unknown-productivity status nestlings fledged. These values are lower than the mean population productivity for temperate latitudes (0.87 fledglings per occupied breeding area; Kochert et al. 2002).

The Squaw Peak breeding area was the only breeding area documented within the Project area (Figure 5) and it contained an active nest. Ground surveyors first determined that the nest was active on April 23, 2012 when an incubating female was observed on the nest. Active status of the nest was confirmed during the aerial survey on April 29, 2012 when an adult was observed brooding at least one, 1-3 day-old nestling. The body of the female obscured the contents of the nest, so the exact number of young could not be determined. However, focal nest observations on May 31, 2012 indicated that the nest had likely failed.

3 RISK ASSESSMENT

The following sections describe risks to golden eagles at the Project area (Alternative A), with additional details provided for California condor and all other bird species. The risk assessment uses Alternative A (maximum of 283 turbines) as a worse-case scenario to analyze potential impacts to golden eagles, California condors, and other birds.

3.1 Collision

3.1.1 Golden Eagles

The collision risk analysis uses a weight-of-evidence approach to estimate the risk of eagle fatalities at the Project. BP Wind Energy has performed focused surveys of golden eagle flights to document the use of space by eagles breeding in and moving through the Project area and its vicinity, and has used these data to inform the risk assessment in combination with nest-location information. The subsections that follow describe a quantitative fatality projection using the model from the Draft ECP Guidance (USFWS 2011a), a summary of the results of nest surveys as they relate to collision risk, a comparative analysis of other western wind projects that have pre-construction eagle use data and post-construction eagle fatality data, and a qualitative analysis of the availability of orographic (mountain generated) updrafts within the Project area based on topography and prevailing winds, which may increase the risk near certain topographic features by concentrating eagle use near the RSA.

3.1.1.1 USFWS Fatality Model

The USFWS model as described in the Draft ECP Guidance (USFWS 2011a) assumes that risk of collision is proportional to use, and that use is distributed evenly across the study area (i.e. the model does not account for spatial variation). To estimate the potential number of annual fatalities, Tetra Tech used a spreadsheet-based version of the model, which was provided to Tetra Tech by USFWS in April 2012 (version: October 2011; E. Bjerre, USFWS, pers. comm., 2012). The model used the data on eagle minutes in the RSA available from the point counts, described above (Section 2.1), to estimate potential annual golden eagle fatalities. The analysis of data from the 2007-2011 avian point counts assumed that each golden eagle sighting within the RSA during a 20-minute point count equates to one minute of total time within the RSA; the same assumption used by USFWS in its analyses of such data (B. Millsap, USFWS, pers. comm., 2011). This assumption was necessary because prior to the release of the Draft ECP Guidance in 2011, avian surveyors did not routinely record eagle minutes flying within the RSA.

The 2012 eagle point count data were recorded during 2-hour point counts, and included direct measurements of eagle minutes flying within the Project area at heights corresponding to the maximum extent of proposed RSAs (30-150m above-ground) within unlimited radius plots (mean radius achieved = 1.6 km). The count protocol recommended in the Draft ECP Guidance (USFWS 2011a) uses all eagle minutes below 175 m above ground and within an 800-m fixed radius of the count point. Eagle minutes were collected from unlimited radius plots averaging 1.6 km, larger than those recommended in the Draft ECP Guidance, because eagles are easily monitored at distances greater than 800 m within the Project area. Eagle minutes entering the quantitative model were limited to those within the range of RSAs, because strikes can only occur at those heights; the architecture of the model inherently assumes that any eagle minutes entered are those within the hazardous area defined by a rotor radius, and any minutes outside of that area therefore inflate the fatality estimate. The rotor radius used for the analysis was 60 m, slightly larger than the radius of the largest turbine being considered for the Project.

Point count results were grouped into the 2007/2008, 2010/2011, and 2012 survey periods for analysis (see Section 2.0). The USFWS Excel-based model requires the number of 20-minute point counts as an input, and when count durations differ among years, it is necessary to convert all of the counts to a standard count duration. Thus, because point count duration in 2012 was longer than in the previous years (2 hours per survey versus 20 min per survey), Tetra Tech converted the number of counts (2-hour duration) in 2012 to the equivalent number of 20-minute count periods prior to analysis. To incorporate interannual variability in seasonal sampling and eagle detections, the sample effort (N) and eagle minutes in the RSA (t) were averaged across years for each season. These average seasonal values were then totaled to produce an average annual value which was used as the model input (Table 6).

Sampling was not conducted in the summer because of the harshness of the desert environment and the resulting assumption that eagles would not be present during summer months. Although summer was not sampled, BP Wind Energy wanted to produce a conservative fatality estimate that assumed some post-construction eagle use of the Project area would occur during summer. Tetra Tech therefore interpolated summer eagle minutes by

Table 6. Variables and Constants Used in the Calculation of Potential Eagle Fatalities for the Mohave County Wind Farm.

Symbol	Name	Description (Units)
t	Eagle minutes	Minutes of eagle flight detected at RSA height during point counts (minutes)
N	Sample effort	The number of 20-minute point count periods surveyed
s	Sample duration	The duration of an individual point count. Because this was 20 minutes in 2007-2011, and 2 hours in 2012, the 2012 sample effort (N) was converted to the number of 20-minute periods (minutes)
a	Sample area	The area sampled by the point counts (km^2)
E	Mean exposure minutes	The mean number of exposure minutes per sample minute in the sampled area (eagle minutes/min/km^2)
h	Hazardous area	Total area within one rotor radius of all turbines (km^2)
T	Total daylight hours	Total hours of daylight assuming 12-hour per day average
ε	Expansion factor	Scaling factor that scales mean exposure minutes to the hazardous area (h) and total daylight hours (T). ε = T x h.
C	Average collision probability	The probability that an eagle flying through the RSA of a turbine will collide with the turbine
F	Eagle fatalities	Estimated eagle fatalities per year

assuming that sampling effort (*N*) and eagle minutes in the RSA (*t*) in summer were the average of the values for spring and fall. This assumption is likely conservative because it assumes eagles remain in the desert during summer, which they may not do. Mean exposure minutes, defined by USFWS as the average number of eagle minutes per minute of sample per square kilometer (km^2) (see Table 6 for description of variables), were calculated as:

Mean exposure minutes (E) $= t/N/a/s$

where *t* was eagle minutes in the RSA, *N* was the number of point counts, *a* was the total area sampled, and *s* was the duration of a point count (Table 6). For each survey season, the mean exposure minutes were adjusted using an expansion factor (ε) that corrected for the total area within one rotor radius of the turbines (hazardous area, *h*) and the total daylight hours (T) per season assuming an average of 12 hours daylight per day. From mean exposure minutes, Tetra Tech calculated the estimated annual fatality rate (F) using the expansion factor (ε) and the average collision probability (C = 0.0067) calculated from studies in Whitfield (2009) by the USFWS using mixture models as:

Eagle Fatalities (F) = E x ε x C.

Tetra Tech calculated the estimated annual fatalities for two categories of alternatives described in the draft EIS (BLM 2012): Alternative A (maximum of 283 turbines), and Alternatives B and C (maximum of 208 turbines). To account for uncertainty due to interannual variation not captured by averaging, Tetra Tech constructed an 80 percent upper confidence limit based on a t-distribution (Zar 1996). These values do not account for the 1.25-mile no-build buffer or removed turbine strings and are therefore conservative.

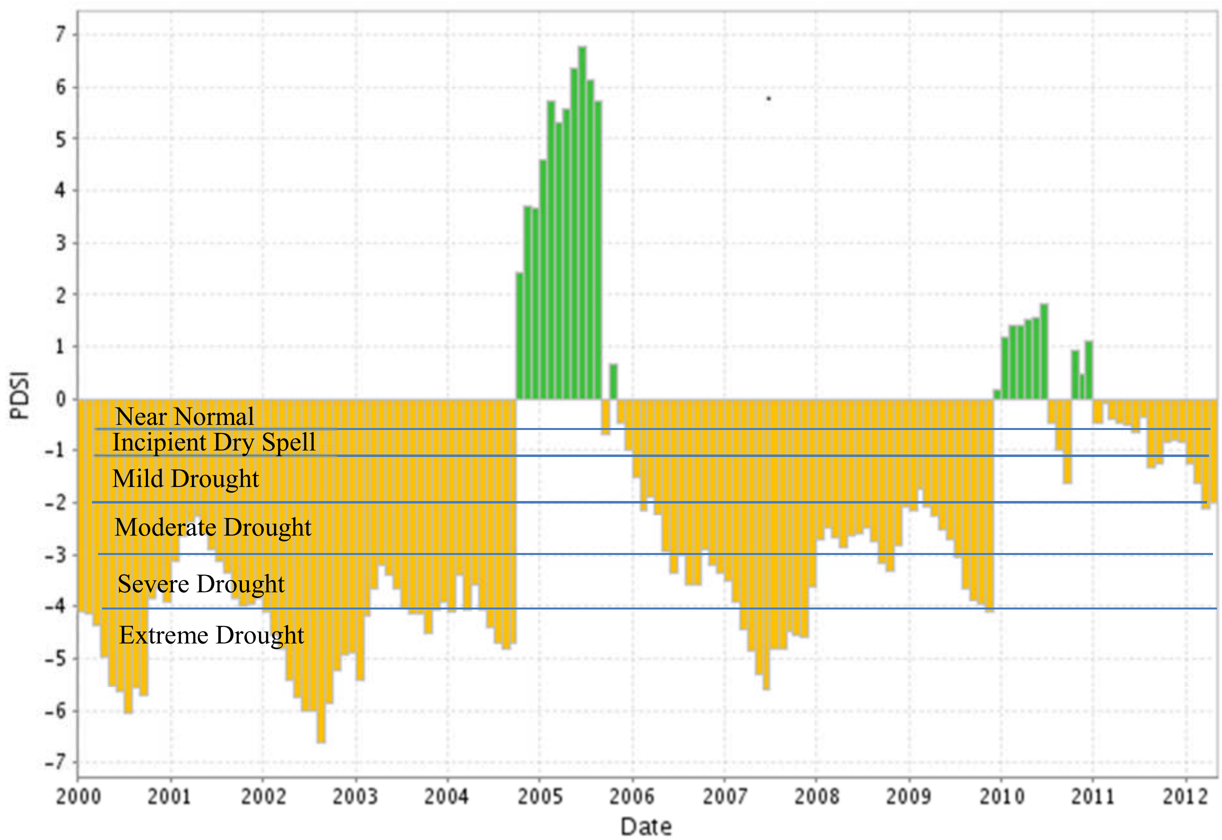
Alternative A – 283 turbines. Average annual eagle minutes across the three sample years (*t* ± SD), equaled 5.75 ± 2.40 minutes. Applying the USFWS model to these data produced a mean exposure minute estimate (E) of 0.0035 eagle minutes/hour/km^2. The expansion factor for this option (ε) was 14,025.6 hours x km^2. The resulting estimated potential eagle fatalities per year (upper 80 percent confidence interval [CI]) based on 283 turbines were 0.33 (0.45) eagle fatalities per year. Annual fatality rates corresponding to these estimates would result in 1.65 (2.25) eagle fatalities over a 5-year period and 9.9 (13.5) eagle fatalities over the anticipated 30-year life of the Project.

Alternatives B and C – 208 turbines. Average annual eagle minutes across the three sample years (*t* ± SD), equaled 5.75 ± 2.40 minutes. Applying the USFWS model to these data produced an exposure minutes estimate (E) of 0.0035 eagle minutes/hour/km^2. The expansion factor for this option (ε) was 10,300.1 hours x km^2. The resulting estimated potential eagle fatalities per year (upper 80 percent CI) based on 208 turbines were 0.24 (0.33) eagle fatalities per year. Annual fatality rates corresponding to these estimates would result in 1.20 (1.65) eagle fatalities over a 5-year period and 7.2 (9.9) eagle fatalities over the anticipated 30-year life of the Project.

Caveats and Uncertainties in the Model

The data used in the model capture more temporal variation than spatial variation. Surveys were conducted during 2007/2008, 2010/2011, and 2012. Golden eagle reproductive activity varies in relation to weather conditions (e.g., Steenhof at al. 1997). Tetra Tech therefore examined weather conditions in these years using the Palmer Drought Severity Index (PDSI) which uses temperature and rainfall data to represent the severity of the dry or wet spell (NCDC 2011). The PDSI varies from -6.0 to +6.0, with index values between -0.49 and +0.49 designated “near normal”, and values farther from 0.0 indicating increasing divergence from normal conditions. Tetra Tech used the PDSI results to assess how representative weather conditions were of “typical” conditions in the area. The time frames sampled at the Project area captured eagle activity during a period of moderate to extreme drought (PDSI <-2.0; 2007/2008) and of near normal to slightly wet conditions (2010/2011, 2012; NCDC 2011; Figure 6). With respect to spatial variation, the surveys conducted in 2007/2008 captured eagle use in the northeastern section of the proposed Project area whereas the 2010/2011 data captured eagle use in the northwestern section of the proposed Project area, and the 2012 surveys covered the entire Project area including the previously unsurveyed southern portion. Surveys in 2012 documented two active eagle nests and associated movements within or immediately near the Project area, and these observations are reflected in the fatality estimate.

Golden eagle use of the Project area likely varies based on the number of active golden eagle nests in the Project area and its vicinity. The number of active breeding areas has been shown to be driven by prey availability (Bates and Moretti 1994, Steenhof et al. 1997, McIntyre and Adams 1999) and weather conditions prior to the nesting season (i.e., severity of winter; Steenhof et al. 1997). In Idaho, Marzluff et al. (1997) found that some eagles responded to low prey density by using larger areas; however, some eagles maintained small territories and focused on alternate prey when preferred prey was scarce. In desert populations, Bittner and Meador (2011) have interpreted long-term drought conditions as a driver of low eagle productivity, although Lightfoot et al. (2011) did not find a correlation between rainfall and rabbit abundance. Tetra Tech reviewed the PDSI to evaluate the nest surveys of 2011 and 2012 in the context of drought. Based on the PDSI for northwest Arizona, the area was under severe drought conditions in 2009; however, precipitation conditions were near normal to slightly wet in 2010 and 2011 and near normal in early 2012 (Figure 6; PDSI values are -1.9 to +1.9). The greater breeding activity in 2012 within the Project area and 10-mile radius versus 2011, despite the similar conditions, suggests that conditions other than regional moisture levels may be driving reproductive effort.



* PDSI values: -4.0 or less (Extreme Drought), -3.0 to -3.9 (Severe Drought), -2.0 to -2.9 (Moderate Drought), -1.0 to -1.9 (Mild Drought), -0.5 to 0.9 (Incipient Dry Spell), -0.49 to +0.49 (Near Normal), +0.5 to +0.9 (Incipient Wet Spell),+1.0 to +1.9 (Slightly Wet), +2.0 or +2.9 (Moderately Wet), +3.0 or +3.9 (Very Wet), +4.0 or above (Extremely Wet).

Figure 6. Palmer Drought Severity Index for Northwest Arizona from January 2000 to April 2012*

3.1.1.2 Nest Survey Data

Golden eagle nest surveys conducted in 2011 and 2012 indicated the presence of 16 golden eagle breeding areas (8 occupied in 2012) in the Project area plus 10-mile-radius survey area (1 within Project area, 15 outside Project area), comprising 89 potential golden eagle nests (5 containing young in 2012). Among the 89 nests were 16 alternate nests considered to be part of the Squaw Peak breeding area. These observations suggest that the Project may potentially present risks to breeding eagles and their young from collision with turbines. Distances of active eagle nests within the Project area to the nearest turbine siting corridors are considered in detail in the disturbance/displacement section (Section 3.3.1), but nest proximity may also potentially influence risk of collision for some individuals. As a conservative avoidance and minimization measure, BP Wind Energy will implement a no-build buffer within 1.25 miles (2 km) of the 2012 active Squaw Peak nest and the currently known alternate nests within that breeding area. This buffer increased the ranges of distances between the turbine siting corridors and the nearest active nest from 0.3-0.9 miles (0.5-1.5 km) to 1.3 miles (2.0 km) depending on the development alternative. It should be noted that the only known-fate survival study of golden eagles associated with a wind farm, conducted at Altamont Pass, California, suggests that proximity to nests is less important than individual flight behavior in predicting risks of collision and electrocution (Hunt 2002).

3.1.1.3 Comparison of Western Wind Projects

As a third line of evidence, Tetra Tech examined existing, publicly available data for wind projects west of the Mississippi River that have information available concerning both pre-construction eagle use and post-construction fatality monitoring results. Tetra Tech found a total of 15 studies from four western states meeting these criteria (Figure 7). The pattern of fatalities and activity levels at these projects suggests that eagle fatalities are low when mean use by eagles is <0.05 eagles/20 minutes (0.15 eagles/hour), which is consistent with the threshold for predicting low risk of fatalities stated in the USFWS Region 2 ECP checklist (USFWS 2011b). The overall mean use at the Project area 2007-2012 was 0.02 eagles/20 minutes, and the eagle fatality rate for the Project area is therefore likely to be low if use equates to risk. The variation in fatality rates, however, indicates that there is not a simple, linear relationship between use and fatalities. Some projects with high mean use experience low numbers of fatalities, whereas other projects with comparable or lower use have experienced greater numbers of fatalities indicating that site-specific differences are important. Additionally, because these studies do not share identical methodologies (e.g., radius of avian use survey plots, fatality search intervals), and there is variance associated with time a given facility was monitored (range: 1-3.5 years), comparisons of eagle use and fatalities represent generalizations only.

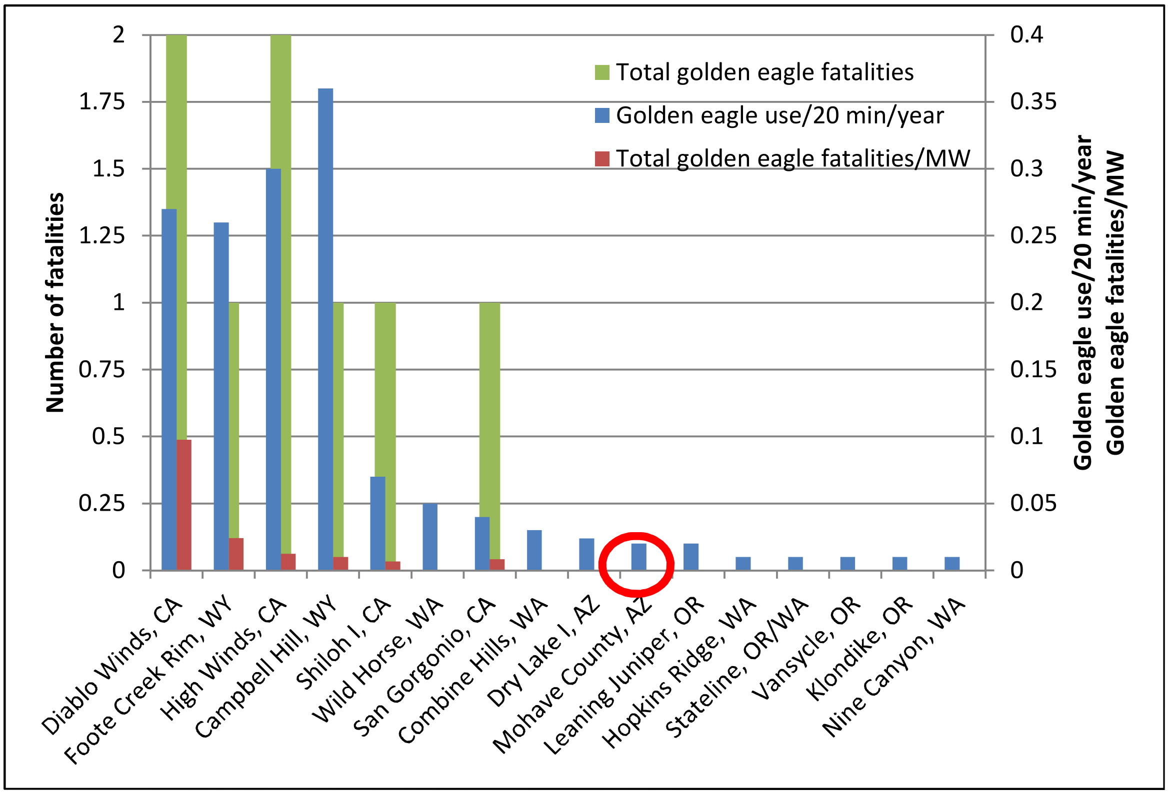


Figure 7. Mean Use by Golden Eagles (Eagle Use/20 min; Pre-construction), Total Golden Eagle Fatalities, and Total Golden Eagle Fatalities/MW (Post-construction) at 15 Wind Energy Projects in the Western U.S. Compared to Mean Use at Mohave County Wind Farm (Value Circled in Red).

3.1.1.4 Qualitative Analysis of Winds and Topography

One of the primary risk factors identified in the Draft ECP Guidance (USFWS 2011a) is the interaction of topographic features and wind to create favorable conditions for slope soaring or kiting (stationary or near-stationary flight using headwinds) in the vicinity of turbines. Slope soaring is typically favored by conditions that produce orographic (mountain caused) updrafts; these conditions include the upwind side of steep slopes and those oriented perpendicular to prevailing winds. Additionally, the Draft ECP Guidance suggests that saddles and low-lying areas between peaks may be riskier than other features.

Topography of the Project area is varied with steep ridges, gentle slopes, and flat areas (primarily in the southwestern portion) divided by valleys of variable widths (Figure 8). Elevations within the Project area range from approximately 585 to 1169 m (1,920 to 3,836 feet) above sea level indicating that there is notable topographic relief.

Tetra Tech examined the slope and aspect of proposed turbine siting corridors to assess the existence of risk factors associated with slope soaring, kiting, saddles and low-lying areas (Figures 8 and 9). After the removal of turbines within the 1.25-mile no-build buffer, most areas within the proposed turbine siting corridors are on low to moderate slopes with the exception of two corridors in the northeastern portion of the Project area (Figure 8). These corridors incorporate moderate to high slopes in some portions of the corridors, but they are generally set back from the steepest slopes. Aspects within the turbine siting corridors are primarily east-northeast and west-southwest whereas prevailing winds within the Project area are south to south-southwest and north to north-

northeast (Figure 9). Assuming that the greatest potential for orographic updrafts as described above occurs on steep slopes oriented from south to south-southwest or north to north-northwest, risks to eagles are probably highest along the ridge in the northwestern portion of the Project area, the short, parallel ridges in the eastern portion of the Project area and the low hills in the west-central portion of the Project area. This suggests that most of the proposed turbine siting corridors will have relatively low risk to eagles with the exception of corridors near these features; however, the no-build buffer within 1.25 miles (2 km) from the known Squaw Peak nests removed the turbine siting corridors from the northwestern portion of the Project area, thus minimizing risk to eagles.

3.1.1.5 Weight of Evidence Conclusions

The weight of evidence from the combination of quantitative and qualitative analysis for golden eagles suggests that there is a low risk to eagles from the Project overall. Some eagle fatalities (≤1.0 per year) are predicted by the quantitative analysis before the application of advanced conservation practices, and the qualitative analyses support the conclusion that the rate of fatalities will be low. The use of the Project area by golden eagles appears to be lower than the other project in the region with publicly available data (Perrin Ranch Wind Energy Facility, Coconino County, AZ), which recorded 60 eagle minutes over a survey period similar to the 2012 surveys of the Project area. Despite the higher rate of eagle use, Perrin Ranch estimated a similar annual eagle fatality rate (0.014-0.59 eagles per year, depending on estimation method) to that calculated for the Project (mean = 0.24-0.33, depending on development alternative), due primarily to the smaller number of turbines at Perrin Ranch.

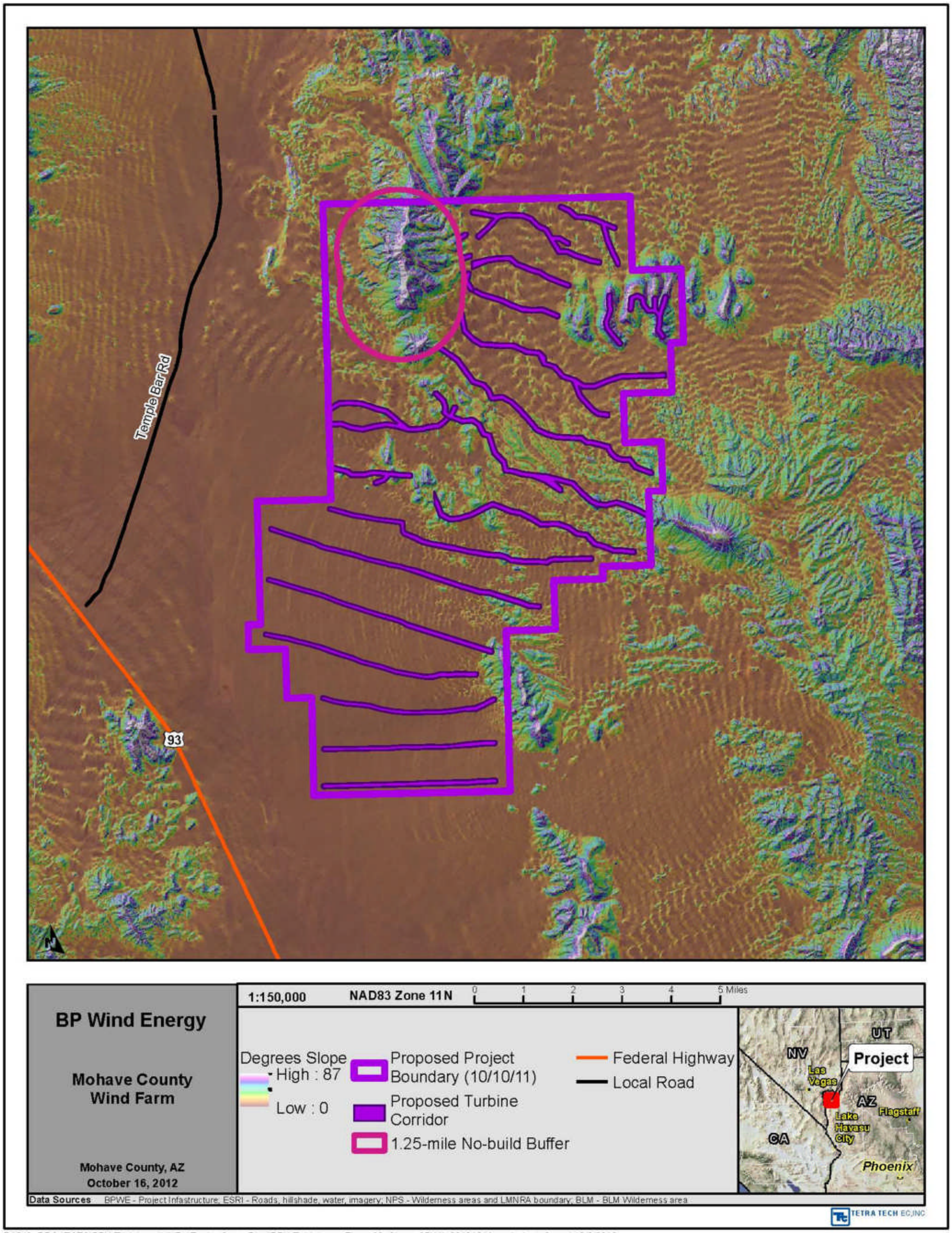


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Figure 8. Slope (in Degrees) of Land within the Mohave County Wind Farm

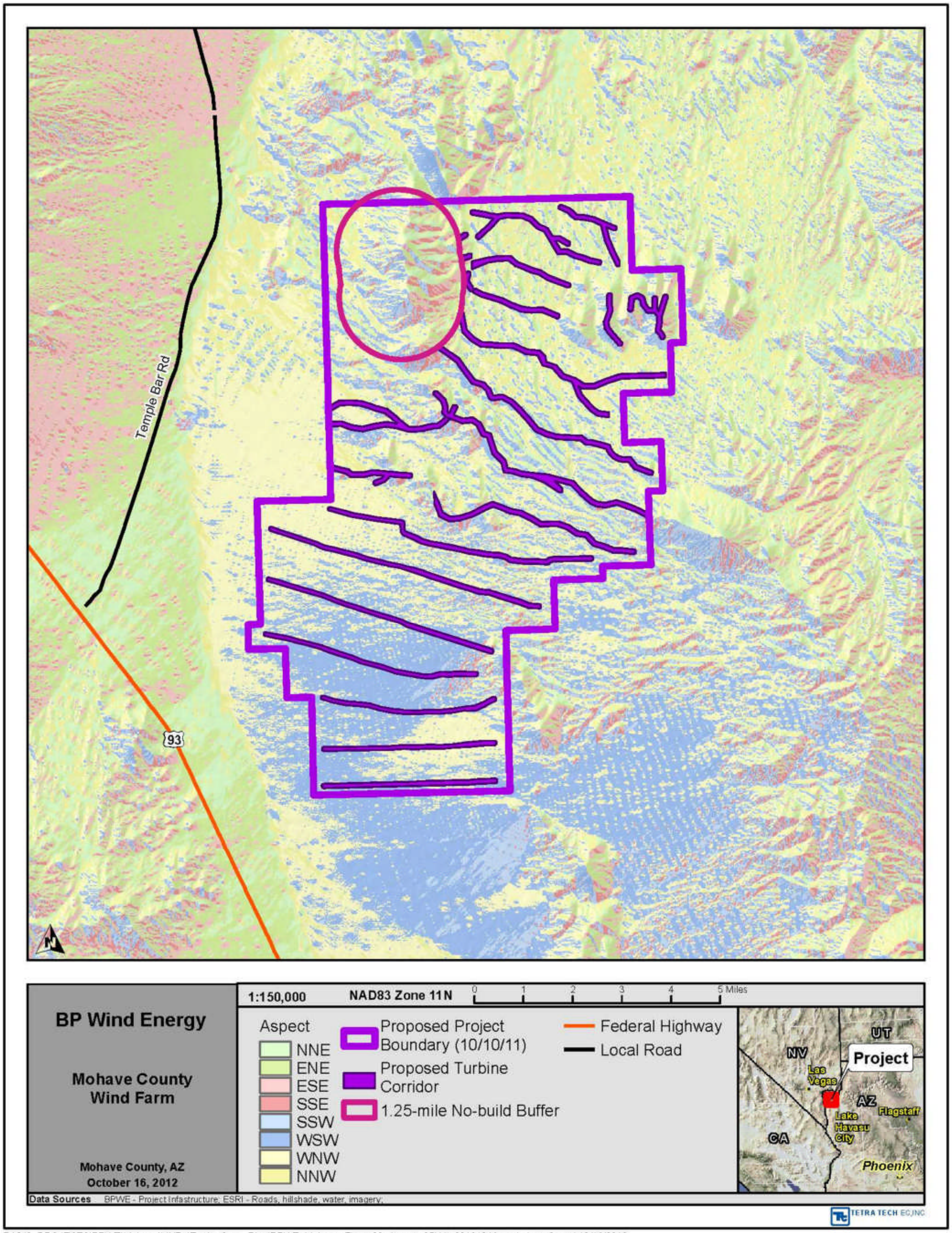

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Figure 9. Aspect of Land Surface within the Mohave County Wind Farm

3.1.2 California Condor

On December 12, 2011, the USFWS provided an evaluation of federally listed threatened or endangered species known to occur in Mohave County and the potential to be affected by the Project. In this evaluation, the USFWS agreed with the BLM's initial determination that there were no federally listed threatened or endangered species, and/or critical habitat would be affected by the Project with the rationale that they currently do not occur in the area. The USFWS identified concerns about potential impacts to the non-essential population of California condor. Additionally, the USFWS was contacted on December 16, 2010 about the potential for California condors to utilize the Project area. On that date, the USFWS provided information through the Peregrine Fund that California condors have been moving their use away from the Project area for about a decade (USFWS 2010, BLM 2012). Although current telemetry shows that condors do not use the Project area, they are a wide-ranging species that can travel long distances and may expand beyond their current range during the life of this Project. Therefore, there is the potential for the species to occur in the Project area in the future.

In addition to the avoidance and minimization measures detailed in Sections 4-6, the following measures would be implemented to address potential impacts to condors:

- Prior to the start of construction, BP Wind Energy will contact the BLM Kingman Field Office and the Phoenix office of the USFWS to determine whether recent telemetry efforts from the Peregrine Fund indicate California condors have been detected in proximity to the Project area. BP Wind Energy will also notify both agencies when construction is complete. Once per year during Project operation for the life of the project, BP Wind Energy will re-contact both agencies as part of their due diligence to determine whether California condors have been sighted in proximity to the Project area.
- If a condor occurs at the construction site, construction activities that could result in injury to condors would cease until the condor leaves on its own or until techniques are employed by permitted personnel that results in the condor leaving the area.
- The worker environmental training program will include California condors to educate construction and site workers and provide proper guidance about avoiding any interaction. In addition, the WEAP will include procedures for notification of both the BLM Kingman Field Office and the Phoenix office of the USFWS if condors occur at the site during construction.
- Non-permitted personnel cannot haze or otherwise interact with condors.
- The construction site would be cleaned up (e.g., trash removed, scrap materials picked up) at the end of each day that work is being conducted to minimize the likelihood of condors visiting the site (see Sections 4-6).
- In the event that any large dead animals or carcasses (e.g., cattle, horses, burros) are detected by construction or O&M staff, the BLM Kingman Field Office will be notified. No further action will be taken unless directed by BLM and consistent with existing laws and regulations.

3.1.3 Other Non-eagle Bird Species

Birds have been identified as a group at risk from collisions with wind turbines (Erickson et al. 2005, Drewitt and Langston 2006, Arnett et al. 2007, Strickland et al. 2011). Specifically, migrant passerines (e.g., songbirds) are found more often in post-construction fatality monitoring compared to other groups of birds (Arnett et al. 2007). At newer generation wind energy facilities outside of California, approximately 60 percent of documented fatalities have been songbirds, of which 50 percent are nocturnal migrants, a group which has had the most fatalities reported by number among bird species (Erickson et al. 2001a, Johnson and Stephens 2011, Strickland et al. 2011). It is estimated that less than 0.01 percent of migrant songbirds that pass over wind farms are killed, based on radar data and fatality monitoring (Erickson 2007). Locally breeding songbirds may experience lower fatality rates than migrants because many of these species tend not to fly at turbine rotor heights during the breeding season, in contrast to species like nocturnal migrants which typically fly at greater heights and are at risk of collision when ascending and descending from nightly migration flights (Young et al. 2007). However, some breeding songbird species have behaviors that increase their risk of collisions with turbines (e.g., horned lark, Erickson et al. 2004, Kerlinger et al. 2006b).

The habitat conditions and results of the on-site avian surveys for the Project area suggest there are no major concentrations of non-eagle bird species during the breeding season or during migration (Thompson et al. 2011a). Black-throated sparrow, common raven, horned lark, and turkey vulture comprised over 50 percent of all avian observations within the Project area during point count surveys. Avian use of the Project area peaked in the spring (0.97 large birds/20 min, 2.33 small birds/20 min), with lower use in the winter and fall for both size classes. A total of 64 species were detected at the Project area during point counts, songbird migration surveys, and incidental observations, 54 of which were potential residents (Appendix A). Of the individual birds detected during point counts (excluding incidentals), 86.7 percent were of the 31 resident species detected. Songbird migration surveys detected 31 species, of which 5 were migrants, and results of the comparison between washes and ridges indicate that the Project area is not a high-use stopover area for migrants (Thompson et al. 2011a). It is likely that birds seeking standing water for stopover bypass the Project area in favor of Lake Mead. The dominance of resident species in the point counts suggests that fatality rates will be low at the Project area. This interpretation is reinforced by the dominance of species (with the exception of horned lark) that are not commonly reported as fatalities at wind farms. Although horned lark have been frequently reported as fatalities at wind facilities (e.g., Young et al. 2003b, Kerlinger et al. 2006b, Johnson and Erickson 2011), Project-related fatalities are unlikely to have population impacts given the stable population trend within the surrounding Sonoran and Mohave Desert Bird Conservation Region (BCR 33, NABCI 2000; Sauer et al. 2011) and the widespread and abundant nature of the species (Beason 1995).

Despite the observation that most avian fatalities at wind farms are songbirds, raptor fatality (including eagles) historically has received the most attention. Raptor fatality at newer wind projects has been low relative to older-generation wind farms, although there is substantial regional variation in raptor fatality rates (Erickson et al. 2002, 2004; Johnson et al. 2002; Kerns and Kerlinger 2004; Jain et al. 2007). Raptors constitute approximately 6 percent of reported bird fatalities, but generally have a smaller percentage of birds observed using wind farms during pre-construction surveys (Strickland et al. 2011).

Mean raptor use (including eagles) within the Project area was low (0.23 birds/20 min) in the avian point count surveys conducted from 2007-2011 suggesting that raptor fatality will be low if use is proportional to risk (Young et al. 2003b, Strickland et al. 2011). Raptor species that are found on-site primarily include American kestrel, red-tailed hawk, and turkey vulture. Fatalities of these species have occurred at wind farms (Kerns and Kerlinger 2004; Erickson et al. 2004), and fatality rates appear to be related to abundance (Strickland et al. 2011). Therefore, they are the most likely potential raptor fatalities at the Project area. Turkey vulture, in particular, may have increased susceptibility to collision because of higher use within the RSA than the other raptor species observed. However, risks to raptors appear to be low for the Project because topographic features that encourage risky behaviors like slope-soaring and kiting (USFWS 2011a) are limited and discontinuous (occurring mostly in the northwest portion of the Project area) and the majority of those features are associated with the 1.25 mile no-build buffer. In addition, use of the Project area by raptors is low (ranked 39th out of 44 facilities based on data provided in Thompson et al. [2011a]; note that Thompson et al.'s [2011a] ranking of the Project was lower due to exclusion of turkey vultures). Of those raptor species most likely to become fatalities (e.g. American kestrel, red-tailed hawk, turkey vulture), turbine-related fatality at the Project is unlikely to cause population-level impacts given their widespread and abundant nature (Ferguson-Lees and Christie 2001).

The collision risk for non-eagle birds at the Project will likely be low. This conclusion is based on the summary above and information known on collision risk. Nationally reported avian fatality rates average 2.43 birds/MW/year and range from 0.15 to 11.02 birds/MW/year (Table 7a). Avian fatality rates at facilities in the western U.S. within desert regions (defined as having < 20 inches [50 cm] annual precipitation; University of California Museum of Paleontology 2012) average 2.05 birds/MW/year and range from 0.31 to 3.19 birds/MW/year (Table 7b). For subgroups, such as small (≤ 10-inches) birds and large (> 10 inches) birds, fatality rates have generally been reported on a per turbine basis. Nationally, small birds including songbirds are killed at an average rate of 2.40 small birds/turbine/year (range 0.02-5.70 small birds/turbine/year, Table 7a), with a western desert regional average of 2.71 small birds/turbine/year (range 0.02-5.70 birds/turbine/year; Table 7b). Large birds (a group including raptors, waterfowl, gamebirds, etc.) have an average fatality rate of 0.32 large birds/turbine/year nationally (range 0.00-1.19 birds/turbine/year, Table 7a), and 0.43 large birds/turbine/year in the western desert U.S. (range 0.02-1.19 birds/turbine/year, Table 7b).

Table 7a. Estimates of Mean Bird Fatalities per Turbine and per Megawatt at Wind Facilities Nationally in the U.S.

Wind Facility, State	Region	Habitat	Estimated Mean Bird Fatality /Turbine/Year	Estimated Mean Bird Fatality /MW/Year	Estimated Raptor Fatality /Turbine/Year	Estimated Raptor Fatality /MW/year	Estimated Large Bird Fatality /Turbine/Year	Estimated Small Bird Fatality /Turbine/Year
Ainsworth, NE (Derby et al. 2007)	Western	Mixed grass prairie	2.68	1.63	0.10	0.06	0.19	2.48
Altamont, CA (Smallwood and Karas 2009)	Western Desert	Agricultural cropland	-	1.56	1.79	-	-	-
Big Horn, WA (Kronner et al. 2008)	Western Desert	Mixed grass prairie	3.81	2.54	0.23	0.15	-	-
Biglow Canyon Phase I (2008), OR (Jeffrey et al. 2009a)	Western Desert	Dryland agriculture and grazeland	2.90	1.76	0.06	0.03	0.35	2.55
Biglow Canyon Phase II (2010/2011), OR (Enk et al. 2012a)	Western Desert	Dryland agriculture and grazeland	5.98	2.60	0.06	0.03	0.28	5.70
Biglow Canyon Phase III (2010/2011), OR (Enk et al. 2012b)	Western Desert	Dryland agriculture and grazeland	5.25	2.28	0.11	0.05	0.26	4.99
Blue Sky Green Field, WI (Gruver et al. 2009)	Eastern	Agricultural cropland	11.83	7.17	-	-	-	-
Buena Vista, CA (Insignia 2009)	Western Desert	Desert grasslands	1.15	1.15	0.44	-	-	-
Buffalo Gap II, TX (Tierney 2009)	Western	Juniper-oak woodlands	0.22	0.15	-	-	-	0.11
Buffalo Mountain Expanded, Inclusive Phases (2005), TN (Fiedler et al. 2007)	Eastern	Forest	1.80	1.10	-	-	-	-
Buffalo Mountain Phase I (2000-2003), TN (Nicholson et al. 2005)	Eastern	Forest	7.27	11.02	-	-	-	-
Buffalo Ridge Phase I (1996-1999), MN (Johnson et al. 2000)	Eastern	Agricultural cropland	0.98	2.86	-	-	0.05	0.82

Table 7a. Estimates of Mean Bird Fatalities per Turbine and per Megawatt at Wind Facilities Nationally in the U.S. (continued)

Wind Facility, State	Region	Habitat	Estimated Mean Bird Fatality /Turbine/Year	Estimated Mean Bird Fatality /MW/Year	Estimated Raptor Fatality /Turbine/Year	Estimated Raptor Fatality /MW/year	Estimated Large Bird Fatality /Turbine/Year	Estimated Small Bird Fatality /Turbine/Year
Buffalo Ridge Phase II (1998-1999), MN (Johnson et al. 2000)	Eastern	Agricultural cropland	2.27	3.03	-	-	0.20	2.00
Buffalo Ridge Phase III (1999), MN (Johnson et al. 2000)	Eastern	Agricultural cropland	4.45	5.93	-	-	0	4.45
Casselman, PA (Arnett et al. 2009)	Eastern	Forest	4.69	-	-	-	-	-
Cedar Ridge (2010), WI (BHE Environmental 2011)	Eastern	Agricultural cropland	6.14	-	-	-	-	3.65
Crescent Ridge, IL (Poulton 2010)	Eastern	Agricultural cropland	-	-	-	-	-	-
Diablo Winds, CA (WEST 2006)	Western Desert	Desert grasslands	1.19	1.80	0.21	0.32	0.47	0.72
Dry Lake I, AZ (Thompson et al. 2011b)	Western Desert	Desert scrub and grazeland	4.66	2.22	-	-	-	-
Elkhorn Valley, OR (Jeffrey et al. 2009b)	Western Desert	Dryland agriculture and grazeland	1.06	0.64	0.10	0.06	0.31	0.75
Foote Creek Rim, Phase I, WY (Young et al. 2003)	Western Desert	Mixed grass prairie	1.50	-	0.03	-	0.02	1.46
Forward Energy, WI (Grodsky and Drake 2011)	Eastern	Agricultural cropland	3.27	2.18	-	-	-	-
High Winds (2003-2005), CA (Kerlinger et al. 2006b)	Western Desert	Agricultural cropland	2.45	1.36	-	-	-	-
Hopkins Ridge, WA (Young et al. 2007)	Western Desert	Agricultural cropland	2.21	1.23	0.25	-	0.76	1.45
Judith Gap, MT (TRC Environmental 2008)	Western Desert	Agricultural cropland	4.52	3.01	0.14	-	0.69	3.83

Table 7a. Estimates of Mean Bird Fatalities per Turbine and per Megawatt at Wind Facilities Nationally in the U.S. (continued)

Wind Facility, State	Region	Habitat	Estimated Mean Bird Fatality /Turbine/Year	Estimated Mean Bird Fatality /MW/Year	Estimated Raptor Fatality /Turbine/Year	Estimated Raptor Fatality /MW/year	Estimated Large Bird Fatality /Turbine/Year	Estimated Small Bird Fatality /Turbine/Year
Kewaunee County, WI (Howe et al. 2002)	Eastern	Agricultural cropland	1.29	1.95	-	-	-	-
Klondike II, OR (NWC and WEST 2007)	Western Desert	Dryland agriculture and grazeland	4.71	3.14	0.17	0.11	0.25	4.46
Klondike III Phase 1, OR (2007-2009), OR (Gritski et al. 2010)	Western Desert	Dryland agriculture and grazeland	5.65	3.19	0.27	0.15	0.78	4.86
Klondike IIIa Phase 2 (2008-2010), OR (Gritski et al. 2011)	Western Desert	Dryland agriculture and grazeland	4.20	2.80	0.09	0.06	1.19	3.01
Klondike Phase I, OR (Johnson et al. 2003)	Western Desert	Dryland agriculture and grazeland	1.42	0.95	0	-	0.26	1.16
Maple Ridge (2008), NY (Jain et al. 2009)	Eastern	Agricultural cropland	3.42	2.07	-	-	0.08	3.07
Mars Hills (2008), ME (Poulton 2010)	Eastern	Forest	2.04	1.36	-	-	-	-
Moutaineer, WV (Kerns and Kerlinger 2004)	Eastern	Forest	4.04	2.69	-	-	-	-
Nine Canyon, WA (Erickson et al. 2003a)	Western Desert	Agricultural cropland	3.59	-	0.065	-	0.28	3.31
San Gorgonio Phase I and Phase II, CA (Anderson et al. 2005)	Western Desert	Desert grasslands	0.04	-	0.003	-	0.02	0.02
Stateline (2001-2003), OR/WA (Erickson 2004)	Western	Dryland agriculture and grazeland	1.93	-	0.06	-	0.23	1.70
Stateline (2006), OR/WA (Erickson et al. 2007)	Western	Dryland agriculture and grazeland	0.81	1.23	0.07	-	0.18	0.63

Table 7a. Estimates of Mean Bird Fatalities per Turbine and per Megawatt at Wind Facilities Nationally in the U.S. (continued)

Wind Facility, State	Region	Habitat	Estimated Mean Bird Fatality /Turbine/Year	Estimated Mean Bird Fatality /MW/Year	Estimated Raptor Fatality /Turbine/Year	Estimated Raptor Fatality /MW/year	Estimated Large Bird Fatality /Turbine/Year	Estimated Small Bird Fatality /Turbine/Year
Top of Iowa (2003), IA (Jain 2005, Jain et al. 2011)	Western	Agricultural cropland	0.38	0.42	-	-	-	-
Top of Iowa (2004), IA (Jain 2005, Jain et al. 2011)	Western	Agricultural cropland	0.76	0.84				
Tuolumne (Windy Point), WA (Enz and Bay 2010 as cited in Johnson and Erickson 2011)	Western Desert	Dryland agriculture and grazeland	-	3.20	-	0.29	-	-
Vansycle, OR (Erickson et al. 2000)	Western	Dryland agriculture and grazeland	0.63	-	-	-	0.13	0.50
Wild Horse, WA (Erickson et al. 2008)	Western Desert	Mixed grass prairie	2.79	1.55	0.17	0.09	0.48	2.31
Mean for All Western Facilities			**2.56**	**1.79**	**0.21**	**0.12**	**0.38**	**2.30**
Range for Western Facilities (NWCC 2010 values)			**0.04 – 5.98**	**0.15 – 3.20 (0 - 6.3)**	**0 – 1.79**	**0.03 – 0.32 (0 – 0.86)**	**0.02 – 1.19**	**0.02 – 5.70**
National Mean			**3.08**	**2.43**	**0.21**	**0.12**	**0.32**	**2.40**
Range for National Facilities (NWCC 2010 values)			**0.04 – 11.83**	**0.15 – 11.02 (0 – 14.0)**	**0 – 1.79**	**0.03 – 0.32 (0 – 0.86)**	**0 – 1.19**	**0.02 – 5.70**

Table 7b. Estimates of Mean Bird Fatalities per Turbine and per Megawatt at Wind Facilities in Desert Regions of the Western U.S.

Wind Facility, State	Region	Habitat	Estimated Mean Bird Fatality /Turbine/Year	Estimated Mean Bird Fatality /MW/Year	Estimated Raptor Fatality /Turbine/Year	Estimated Raptor Fatality /MW/year	Estimated Large Bird Fatality /Turbine/Year	Estimated Small Bird Fatality /Turbine/Year
Altamont, CA (Smallwood and Karas 2009)	Western Desert	Agricultural cropland	-	1.56	1.79	-	-	-
Big Horn, WA (Kronner et al. 2008)	Western Desert	Mixed grass prairie	3.81	2.54	0.23	0.15	-	-
Biglow Canyon Phase I (2008), OR (Jeffrey et al. 2009a)	Western Desert	Dryland agriculture and grazeland	2.9	1.76	0.06	0.03	0.35	2.55
Biglow Canyon Phase II (2010/2011), OR (Enk et al. 2012a)	Western Desert	Dryland agriculture and grazeland	5.98	2.6	0.06	0.03	0.28	5.70
Biglow Canyon Phase III (2010/2011), OR (Enk et al. 2012b)	Western Desert	Dryland agriculture and grazeland	5.25	2.28	0.11	0.05	0.26	4.99
Buena Vista, CA (Insignia 2009)	Western Desert	Desert grasslands	1.15	1.15	0.44	-	-	-
Diablo Winds, CA (WEST 2006)	Western Desert	Desert grasslands	1.19	1.8	0.21	0.32	0.47	0.72
Dry Lake I, AZ (Thompson et al. 2011b)	Western Desert	Desert scrub and grazeland	4.66	2.22	-	-	-	-
Elkhorn Valley, OR (Jeffrey et al. 2009b)	Western Desert	Dryland agriculture and grazeland	1.06	0.64	0.10	0.06	0.31	0.75
Foote Creek Rim, Phase I, WY (Young et al. 2003)	Western Desert	Mixed grass prairie	1.5	-	0.03	-	0.02	1.46
High Winds (2003-2005), CA (Kerlinger et al. 2006b)	Western Desert	Agricultural cropland	2.45	1.36	-	-	-	-
Hopkins Ridge, WA (Young et al. 2007)	Western Desert	Agricultural cropland	2.21	1.23	0.25	-	0.76	1.45
Judith Gap, MT (TRC Environmental 2008)	Western Desert	Agricultural cropland	4.52	3.01	0.14	-	0.69	3.83
Klondike Phase I, OR (Johnson et al. 2003)	Western Desert	Dryland agriculture and grazeland	1.42	0.95	0	-	0.26	1.16

Table 7b. Estimates of Mean Bird Fatalities per Turbine and per Megawatt at Wind Facilities in Desert Regions of the Western U.S. (continued)

Wind Facility, State	Region	Habitat	Estimated Mean Bird Fatality /Turbine/Year	Estimated Mean Bird Fatality /MW/Year	Estimated Raptor Fatality /Turbine/Year	Estimated Raptor Fatality /MW/year	Estimated Large Bird Fatality /Turbine/Year	Estimated Small Bird Fatality /Turbine/Year
Klondike II, OR (NWC and WEST 2007)	Western Desert	Dryland agriculture and grazeland	4.71	3.14	0.17	0.11	0.25	4.46
Klondike III Phase 1, OR (2007-2009), OR (Gritski et al. 2010)	Western Desert	Dryland agriculture and grazeland	5.65	3.19	0.27	0.15	0.78	4.86
Klondike IIIa Phase 2 (2008-2010), OR (Gritski et al. 2011)	Western Desert	Dryland agriculture and grazeland	4.20	2.80	0.09	0.06	1.19	3.01
Nine Canyon, WA (Erickson et al. 2003a)	Western Desert	Agricultural cropland	3.59	-	0.07	-	0.28	3.31
San Gorgonio Phase I and Phase II, CA (Anderson et al. 2005)	Western Desert	Desert grasslands	0.04	-	<0.01	-	0.02	0.02
Tuolumne (Windy Point), WA (Enz and Bay 2010 as cited in Johnson and Erickson 2011)	Western Desert	Dryland agriculture and grazeland	-	3.2	-	0.29	-	-
Wild Horse, WA (Erickson et al. 2008)	Western Desert	Mixed grass prairie	2.79	1.55	0.17	0.09	0.48	2.31
Mean for Western Facilities in Desert Regions			**3.11**	**2.05**	**0.23**	**0.12**	**0.43**	**2.71**

Risk of bird fatalities at the Project is expected to be lower than at the average wind farm nationally and regionally because of the low abundance and species richness recorded during avian surveys. This risk will be further reduced through measures taken during the design, construction, and operational phases of the Project (Sections 4-6). Key avoidance and minimization measures include a 1.25-mile no-build buffer around the Squaw Peak breeding area, construction of above-ground power lines following Avian Power Line Interaction Committee (APLIC) guidelines, burial of collection lines where possible, lighting minimization, ground disturbance restrictions, and low-impact turbine and met tower design.

3.2 Electrocution

Utility lines, particularly distribution lines, can potentially result in electrocution of golden eagles because their wing span is large enough that the bird can simultaneously contact two conductors or a conductor and grounded hardware (APLIC 2006). Therefore, any structures that allow for circuit completion (i.e., flesh-to-flesh contact between energized parts or an energized and grounded part) pose an electrocution risk. To protect birds from possible electrocution, APLIC recommends that lines in areas with eagles have a horizontal separation of 60 inches (150 cm) and a vertical separation of 40 inches (100 cm) between phase conductors or between a phase conductor and grounded hardware. Therefore, the risk of electrocution for the Project is likely to be low because the generation interconnection tie line and any collection lines that are not buried will follow APLIC guidelines for the design of overhead lines.

3.3 Disturbance/Displacement

3.3.1 Golden Eagles

Golden eagle disturbance or displacement is possible during construction or operation of the Project. The potential for displacement or disturbance for eagles is somewhat offset by the baseline disturbance in the Project area which includes recreational uses such as backpacking, wildlife viewing, horseback riding, hunting, primitive camping, hiking, mountain biking, and off-road vehicle (ORV) use; daily tourist helicopter overflights; and livestock grazing operations. Project construction may disturb golden eagles if they are nesting within line-of-sight of the Project or if the areas under active construction are preferred foraging areas. Project operations may disturb golden eagles if the presence of the operational turbines causes golden eagles to avoid using the Project area. However, evidence of fatalities at other wind farms suggests that golden eagles do not avoid operational facilities (Pagel et al. 2011).

Few studies have been conducted with respect to raptor nest densities and activity before and after project construction, and most of these studies have produced descriptive, rather than experimental, data. Several studies conducted at western wind energy facilities produced somewhat equivocal results, but generally suggest that wind energy facilities do not displace nesting raptors or reduce nest densities over the long term (Howell and Noone 1992; Erickson et al. 2003a, 2004; Johnson et al. 2000b, 2003; Young et al. 2006, 2010; Gritski et al. 2008). For example, post-construction studies at the Leaning Juniper Wind Farm in Oregon suggest that raptor nests > 0.5 miles (0.8 km) from turbines were not disturbed by the facility (Gritski et al. 2008). Other studies have found no clear relationship between nest occupancy and distance from turbines (Johnson et al. 2003, Young et al. 2006), and some have suggested that species differ in their response to construction activities (Johnson et al. 2000b; Erickson et al. 2003a, 2004). It is necessary to look outside the western U.S. to find a before-after/control impact study of avian use. Such a study was conducted at the Buffalo Ridge wind-energy facility in Minnesota, and it found evidence that northern harriers (*Circus cyaneus*) avoided turbines in the first year following construction. Two years following construction, however, no large-scale displacement was detected (Johnson et al. 2000a).

Based on the 2012 nest survey, there are 16 golden eagle breeding areas in the Project area plus the 10-mile-radius search area, one within the Project area and 15 outside the Project area (Figure 5). Eight of the breeding areas were occupied in 2012 (as determined by the presence of adult eagles in the vicinity of a nest), and five of these were active (i.e. contained eggs, young, or incubating adults at the time of the survey). The Squaw Peak occupied breeding area is within the northwestern portion of the Project area; all other documented occupied breeding areas are outside the Project area up to 10 miles (16 km) from the outer boundary of the Project area. Because the Squaw Peak breeding area is within the Project area and was occupied in 2012 (although not in 2011), and the next closest breeding areas to the Project area (AGF4 and Senator Mountain) were unoccupied in 2011 and 2012, the discussion of disturbance as it relates to nests is focused on the Squaw Peak breeding area.

In 2012, the Squaw Peak active nest was on the west side of the ridge, with the ridge blocking views eastward out of the nest. Prior to establishing a 1.25-mile (2 km) no-build buffer, under Alternative A, the Squaw Peak active nest in 2012 was 0.3 miles (0.5 km) from the nearest turbine siting corridor. With the 1.25-mile buffer in place there are no turbine siting corridors west of the ridge and the nearest turbine siting corridors are located to the east of the ridge is 1.3 miles (2.0 km) away (Figure 1). Similarly, under Alternatives B and C, the Squaw Peak active nest in 2012 is 0.9 miles (1.5 km) from the nearest turbine siting corridor without the buffer, but the nearest turbine siting corridor with the buffer in place is 1.3 miles (2.0 km) east of the ridge. With the no-build buffer in place the distance to the nearest turbine siting corridor exceeds that of any publicly available buffer distance recommended for avoiding disturbance to golden eagles (0.3-1.6 km [0.2-1.0 miles]; Olendorff and Zeedyk 1978, Call 1979, Fuller in Suter and Joness 1981, Howard in Suter and Joness 1981, Woffinden in Suter and Joness 1981, Suter and Joness 1981, Holmes et al. 1993). Additionally, nest disturbance will be minimized through the implementation of avoidance and minimization measures during siting, construction and operations (see Sections 4-6), as well as implementation of a 1.25 mile no-build buffer around the Squaw Peak breeding area and a curtailment program during the first five years of operation based on the 5-year term of the permit (see Section 8.9). Eagle breeding activity varies from year to year, and occupancy of breeding areas in the future cannot be predicted.

3.3.2 Non-eagle Bird Species

In addition to fatality associated with wind farms, concerns have been raised that some bird species may avoid areas near turbines after the wind farm is in operation (Drewitt and Langston 2006). For example, at the Buffalo Ridge wind energy facility in Minnesota, densities of male songbirds were lower in Conservation Reserve Program (CRP) grasslands containing turbines than in CRP grasslands without turbines. The authors suggested that the reduced density may be due to avoidance of turbine noise and maintenance activities, and to reduced habitat quality from the presence of access roads and gravel pads surrounding the turbines, although none of these factors were examined in the study (Leddy et al. 1999). Reduced abundance of grassland songbirds was found within 50 m of turbine pads for a wind farm in Washington and Oregon, but the investigators attributed displacement to the direct loss of habitat or reduced habitat quality and not the presence of the turbines (Erickson et al. 2004). Research at two sites in North and South Dakota (Shaffer and Johnson 2008) suggests that certain grassland songbird species (two of four studied) may avoid turbines by up to 200 m. None of these studies have addressed whether these avoidance effects are temporary (i.e., the birds may habituate to the presence of turbines over time) or permanent.

Construction activities and the presence of turbines and other Project features may disturb or displace birds. The impacts to birds from disturbance or displacement from the Project are likely to be short-term and limited to distances of 200 m or less (Leddy et al. 1999, Drewitt and Langston 2006, Shaffer and Johnson 2008). Pearce-Higgins et al. (2012) found little evidence for a post-construction decrease for ten species of birds at wind projects in upland habitats in the United Kingdom. However, disturbance related effects were detected during construction. The risk of disturbance/displacement will be further reduced through avoidance and minimization measures taken during the design, construction, and operational phases of the Project (Sections 4-6). Key measures include minimizing disturbance impacts and implementation of an Integrated Reclamation Plan and Noxious Weed Management Plan as required by BLM.

3.4 Habitat Fragmentation

Habitat fragmentation can exacerbate the problem of habitat loss for birds by decreasing patch area and increasing edge habitat. Habitat fragmentation can reduce avian productivity through increased nest predation and parasitism and reduced pairing success of males (Robinson et al. 1995). However, the construction of the Project is not likely to significantly increase the degree of habitat fragmentation of the area because the wind farm is located on habitat that is already fragmented due to roads, trails, and multiple uses within the area. The majority of the Project falls within the low value (i.e., highly fragmented) category in the Habimap unfragmented areas model (AZGFD 2012a). Potential habitat fragmentation resulting from the Project will be reduced through avoidance and minimization measures taken during the design, construction, and operational phases of the Project (Sections 4-6). Key measures include minimizing disturbance impacts and implementation of an Integrated Reclamation Plan and Noxious Weed Management Plan.

4 PROJECT PLANNING AND DESIGN AVOIDANCE AND MINIMIZATION MEASURES

This section identifies impact avoidance and minimization measures that have been or shall be incorporated into planning and design for the Project. This section first describes no-build areas and describes measures outlined in the EIS. Parallel measures considered during construction and operations are described in Sections 5 and 6, respectively.

Regardless of alternative selected, BP Wind Energy has committed to implementing a no-build buffer within 1.25 miles (2 km) of the Squaw Peak golden eagle nests documented in pre-construction studies. As a result, no turbines or any other Project-related infrastructure will be constructed within 1.25 miles (2 km) of the nests. BP Wind Energy has also committed to not constructing turbines in two township-range sections in the vicinity of Squaw Peak (Sections 20 and 21 in T29N, R20W). These no-build areas would result in avoidance and minimization of impacts to golden eagles due to the reduction of turbines in the vicinity of nests.

Both Alternatives B and C reduce the maximum number of turbines to 208 by removing turbines from the northwestern (Alternative B) edge or southern edge (Alternative C) of the Project area but differ in the location of the turbine strings (BLM 2012). Either development alternative would result in potential avoidance and minimization of impacts to golden eagles and other avian species due to the reduction in turbine numbers and the 1.25-mile no-build buffer.

This section identifies Best Management Practices (BMPs) as identified in Appendix B of the Draft EIS:

- The area disturbed by installation of meteorological towers (i.e., footprint) shall be kept to a minimum.
- Meteorological towers shall not be located in sensitive habitats or in areas where ecological resources known to be sensitive to human activities are present. Installation of towers shall be scheduled to avoid disruption of wildlife reproductive activities or other important behaviors.
- Meteorological towers installed for site monitoring and testing shall be inspected periodically for structural integrity.
- The Project shall be planned to utilize existing roads and utility corridors to the maximum extent feasible, and to minimize the number and length/size of new roads, lay-down areas, and borrow areas. If new roads are necessary, they shall be designed and constructed to the appropriate standard.
- BP Wind Energy shall review existing information on species and habitats in the vicinity of the Project area to identify potential concerns.
- BP Wind Energy shall conduct surveys for federal and/or state-protected species and other species of concern (including special status plant and animal species) within the Project area and design the Project to avoid (if possible), minimize, or mitigate impacts to these resources.
- BP Wind Energy shall identify important, sensitive, or unique habitats in the vicinity of the Project and design the Project to avoid (if possible), minimize, or mitigate impacts to these habitats (e.g., locate the turbines, roads, and ancillary facilities in the least environmentally sensitive areas; i.e., away from riparian habitats, streams, wetlands, drainages, or critical wildlife habitats).
- The BLM shall prohibit the disturbance of any population of federally listed plant species.
- BP Wind Energy shall evaluate avian use of the Project area and design the Project to minimize or mitigate the potential for bird strikes (e.g., development shall not occur in riparian habitats and wetlands). Scientifically rigorous avian use surveys shall be conducted.
- Turbines shall be configured by BP Wind Energy to avoid landscape features known to attract raptors to the greatest extent possible, if site studies show that placing turbines there would pose a significant risk to raptors.
- BP Wind Energy shall determine the presence of active raptor nests (i.e., raptor nests used during the breeding season). Measures to reduce raptor use at the Project area

(e.g., minimize road cuts, maintain either no vegetation or non-attractive plant species around the turbines) shall be considered.

- A habitat restoration plan shall be developed to avoid (if possible), minimize, or mitigate negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. The plan shall identify revegetation, soil stabilization, and erosion reduction measures that shall be implemented to ensure that all temporary use areas are restored. The plan shall require that restoration occur as soon as possible after completion of activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
- Procedures shall be developed by BP Wind Energy to mitigate potential impacts to special status species. Such measures could include avoidance, relocation of Project facilities or lay-down areas, and/or relocation of biota.
- Facilities shall be designed to discourage their use as perching or nesting substrates by birds, where practicable. Met tower design represents a trade-off. The safest permanent met tower design for birds is a lattice-type design, rather than a guyed monopole; a lattice-type design met tower may provide some perching opportunities, but it reduces the risk of collision presented by guy wires.
- If pesticides are used on the site, an integrated pest management plan shall be developed to ensure that applications would be conducted within the framework of BLM and Department of Interior (DOI) policies and entail only the use of Environmental Protection Agency (EPA)-registered pesticides. Pesticide use shall be limited to non-persistent, immobile pesticides and shall only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.
- “Good housekeeping” procedures shall be developed by BP Wind Energy to ensure that during operation the site shall be kept clean of debris, garbage, carrion, fugitive trash or waste, and graffiti; to prohibit scrap heaps and dumps; and to minimize storage yards.
- BP Wind Energy shall develop a fire management strategy to implement measures to minimize the potential for a human-caused fire.
- BP Wind Energy shall develop a plan for control of noxious weeds and invasive species, which could occur as a result of new surface disturbance activities at the site. The plan shall address monitoring, education of personnel on weed identification, the manner in which weeds spread, and methods for treating infestations.
- An environmental monitoring program shall be developed to ensure that environmental conditions are monitored during the construction, operation, and decommissioning phases. The monitoring program requirements including adaptive management strategies, shall be established at the project level to ensure that potential adverse impacts of wind energy development are mitigated. The monitoring program shall identify the monitoring requirements for each environmental resource present at the site, establish metrics against which monitoring observations can be measured, identify potential mitigation measures, and establish protocols for incorporating monitoring observations and additional mitigation measures into standard operating procedures and BMPs.

This section identifies mitigation measures that BP Wind Energy has committed to as identified in chapter 4 of the Draft EIS:

- Minimizing surface area disturbance, controlling erosion, applying dust suppression practices, and returning disturbed areas as close as possible to the original condition including grade and vegetation.
- The Project shall be designed to minimize the use of exterior lighting. External lighting at the O&M building shall be minimal with downward-directed lighting. BP Wind Energy shall avoid night-lighting for facilities other than mandatory lighting on turbines to minimize attracting nocturnal migrant birds.
- The permanent met towers shall be a free-standing, lattice-tower design (Figure 10) to avoid the collision risk associated with guy wires.
- Electrical collection lines shall be underground, where feasible, to avoid bird collisions.
- The new transmission line for the Project shall be marked with bird diverters, which shall minimize the potential for bird collisions with the lines, if acceptable to the interconnector provider.
- The turbines used will have a tubular tower and not a lattice structure, to minimize perching opportunities for birds.

This section identifies additional avian impact avoidance and minimization measures that BP Wind Energy has committed to:

- New utility lines built by BP Wind Energy shall be designed following APLIC (2006) guidelines to prevent electrocution. APLIC guidelines include recommended distances by which phase conductors should be separated (minimum of 60 inches), or the use of perch diverters and/or specifically designed avian protection materials in areas where this distance is not feasible (APLIC 2006). Phase covers and/or pole caps shall be used on metal poles. Protective covers shall be used for equipment on switch poles if they are located in known raptor use areas (e.g., areas where raptor flights have been documented in field surveys).
- BP Wind Energy will develop an ECP (this document) that follows the Draft ECP Guidance issued by the USFWS in January 2011.

Figure 10. Permanent Met Tower Design (Photo from Idaho Falls, Idaho)

5 CONSTRUCTION PHASE AVOIDANCE AND MINIMIZATION MEASURES

This section identifies wildlife impact avoidance and minimization measures that shall be incorporated during construction of the Project. This section describes no-build areas and avoidance and minimization measures outlined in the EIS. Parallel measures considered during siting and operations are described in Sections 4 and 6, respectively.

Regardless of alternative selected, BP Wind Energy has committed to implementing a no-build buffer within 1.25 miles (2 km) of the Squaw Peak golden eagle nests documented in pre-construction studies. As a result, no turbines or any other Project-related infrastructure will be constructed within 1.25 miles (2 km) of the nests. BP Wind Energy has also committed to not constructing turbines in two township-range sections in the vicinity of Squaw Peak (Sections 20 and 21 in T29N, R20W). These no-build areas would result in avoidance and minimization of impacts to golden eagles due to the reduction of construction and disturbance in the vicinity of nests.

This section identifies BMPs as identified in Appendix B of the Draft EIS:

- The area disturbed by construction and operation of the Project (i.e., footprint) shall be kept to a minimum.
- The number and size/length of roads, temporary fences, lay-down areas, and borrow areas shall be minimized.
- Topsoil from all excavations and construction activities shall be salvaged and reapplied during reclamation.
- In accordance with the habitat restoration plan, all areas of disturbed soil shall be reclaimed using weed-free native grasses, forbs, and shrubs. Reclamation activities shall be undertaken as early as possible on disturbed areas.
- Electrical collector lines shall be buried where feasible in a manner that minimizes additional surface disturbance (e.g., along roads or other paths of surface disturbance). Overhead lines may be used in cases where burial of lines would result in further habitat disturbance or where burial of lines is not feasible.
- Guy wires on permanent meteorological towers shall be avoided; however, they may be necessary on temporary meteorological towers installed during site monitoring and testing.
- As a part of worker environmental training, all construction employees shall be instructed to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. In addition, pets shall not be permitted on-site during construction.
- Project personnel and contractors shall be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure safe and efficient traffic flow and to reduce wildlife collisions and disturbance.
- BP Wind Energy shall develop a fire management strategy to implement measures to minimize the potential for a human-caused fire.
- Erosion, stormwater runoff, and transport of sediment and other contaminants shall be minimized through implementation of a stormwater pollution prevention plan, which shall

be developed as a requirement of the construction stormwater permit required for the Project.

- If pesticides are used on the site, an integrated pest management plan shall be developed to ensure that applications would be conducted within the framework of BLM and DOI policies and entail only the use of EPA-registered pesticides. Pesticide use shall be limited to non-persistent, immobile pesticides and shall only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.
- BP Wind Energy shall develop a plan for control of noxious weeds and invasive species, which could occur as a result of new surface disturbance activities at the site. The plan shall address monitoring, education of personnel on weed identification, the manner in which weeds spread, and methods for treating infestations.
- A habitat restoration plan shall be developed to avoid (if possible), minimize, or mitigate negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. The plan shall identify revegetation, soil stabilization, and erosion reduction measures that shall be implemented to ensure that all temporary use areas are restored. The plan shall require that restoration occur as soon as possible after completion of activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
- A monitoring program shall be developed to ensure that environmental conditions are monitored during the construction, operation, and decommissioning phases. The monitoring program requirements including adaptive management strategies, shall be established at the project level to ensure that potential adverse impacts of wind energy development are mitigated. The monitoring program shall identify the monitoring requirements for each environmental resource present at the site, establish metrics against which monitoring observations can be measured, identify potential mitigation measures, and establish protocols for incorporating monitoring observations and additional mitigation measures into standard operating procedures and BMPs.

This section identifies mitigation measures that BP Wind Energy has committed to as identified in chapter 4 of the Draft EIS:

- Conduct vegetation clearing during the non-breeding bird season.
- If the bird breeding season cannot be avoided, conduct bird nest surveys in areas to be cleared and flag a non-disturbance area to avoid destroying active nests.
- Restricting travel within the Project area to the roads developed for the Project and enforcing posted speed limits on those roads to minimize the generation of dust. The magnitude of the limits would be based on the localized soil stability conditions and would not exceed 25 miles per hour (mph) (40 kilometers per hour).
- Develop and implement a spill prevention, control and countermeasures (SPCC) Plan that outlines procedures to prevent the release of hazardous substances into the environment, thereby avoiding water resource contamination. The SPCC Plan would include containment measures that would be implemented in areas where chemicals, fuel, and oil are stored. Spill response kits containing items such as absorbent pads would be located on equipment and in the on-site temporary storage facilities to respond to accidental spills.

- All noise-producing equipment and vehicles using internal combustion engines would be equipped with exhaust mufflers, air-inlet silencers where appropriate, and any other shrouds, shields, or other noise-reducing features in good operating condition that meet or exceed original factory specification. Mobile or fixed “package” equipment (e.g., arc-welders, air compressors) would be equipped with shrouds and noise control features that are readily available for that type of equipment.
- All mobile or fixed noise-producing equipment used on the Project, which is regulated for noise output by a local, state, or Federal agency, would comply with such regulation while in the course of Project activity.
- The Project will comply with all applicable federal, state and Mohave County requirements with respect to noise levels during construction and operation.
- Avoid or minimize impacts on burrowing owls by following AZGFD Burrowing Owl Project Clearance Guidance for Landowners (AZGFD 2009), to survey for burrowing owls and to institute the appropriate conservation measures for burrowing owls that occupy burrows in or near the construction footprint.

6 OPERATIONAL PHASE AVOIDANCE AND MINIMIZATION MEASURES

This section summarizes measures that shall be taken to avoid and minimize impacts to wildlife during long-term operation of the Project. Additional details on the specific avoidance and minimization measures related to post-construction fatality monitoring are provided in Section 7, and details related to operational mitigation and monitoring are provided in Section 8. Parallel measures considered during siting and construction are described in Sections 4 and 5, respectively, from the BMPs and mitigation measures already committed in the Draft EIS.

The primary avoidance and minimization measures BP Wind Energy has committed to during operations include: 1) a 1.25 no-build buffer around the Squaw Peak breeding area, 2) a curtailment zone for the first 5 years of operations that extends beyond the no-build buffer to account for the expected spatial use of eagles when the breeding area is occupied, corresponding to the 5-year duration of an eagle take permit, 3) three different types of post-construction fatality monitoring that includes standardized monitoring, responsive monitoring, and implementation of the WIRS by operations staff.

BP Wind Energy voluntarily committed to a multi-year monitoring framework that includes two years of standardized post-construction fatality monitoring for all birds; additional responsive monitoring as needed; standardized post-construction fatality monitoring in Years 5, 10, 15, 20, and 25; eagle behavioral monitoring if an eagle fatality occurs; and incidental monitoring for the life of the Project. BP Wind Energy will provide agencies with an annual report each year for the life of the Project. See Section 7 for monitoring details.

Collectively, each of these three categories of avoidance and minimization measures are intended to reduce risk and go beyond data collection to inform and shape future actions as part of the operational mitigation and adaptive management program detailed in Section 8. Specifically, data gathered during the 5-year curtailment program around the no-build buffer and curtailment zone will evaluate the effectiveness of the curtailment program to reduce risk of collision, as well as potential disturbance to eagles actively nesting in the Squaw Peak area (see Section 8.9). In addition, the three types of fatality monitoring are designed to test predictions of use during pre-construction studies against actual fatalities during operations to improve risk predictions. Responsive monitoring in particular is expected to be used to detect exceedances of thresholds and to identify and correct problems on-site if unexpected levels of fatalities are recorded.

This section identifies BMPs as identified in Appendix B of the Draft EIS:

- Inoperative turbines shall be repaired, replaced, or removed in a timely manner. Requirements to do so shall be incorporated into the due diligence provisions of the rights-of-way authorization. BP Wind Energy shall be required to demonstrate due diligence in the repair, replacement, or removal of turbines; failure to do so could result in termination of the rights-of-way authorization.
- As part of the worker environmental training, employees, contractors, and site visitors shall be instructed to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. In addition, no pets shall be allowed on-site.
- A monitoring program shall be developed to ensure that environmental conditions are monitored during the construction, operation, and decommissioning phases. The monitoring program requirements including adaptive management strategies, shall be established at the project level to ensure that potential adverse impacts of wind energy development are mitigated. The monitoring program shall identify the monitoring requirements for each environmental resource present at the site, establish metrics against which monitoring observations can be measured, identify potential mitigation measures, and establish protocols for incorporating monitoring observations and additional mitigation measures into standard operating procedures and BMPs.
- As part of the monitoring program, observations of potential wildlife problems including wildlife fatalities, shall be reported to the BLM authorized officer and AZGFD area Wildlife Manager for Game Management Unit 15BW.
- BP Wind Energy shall develop a fire management strategy to implement measures to minimize the potential for a human-caused fire.
- “Good housekeeping” procedures shall be developed by BP Wind Energy to ensure that during operation the site shall be kept clean of debris, garbage, carrion, fugitive trash or waste, and graffiti; to prohibit scrap heaps and dumps; and to minimize storage yards.
- Project personnel and contractors shall be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure safe and efficient traffic flow and to reduce wildlife collisions and disturbance.

This section identifies mitigation measures that BP Wind Energy has committed to as identified in chapter 4 of the Draft EIS:

- Restricting travel within the Project area to the roads developed for the Project and enforcing posted speed limits on those roads to minimize the generation of dust. The magnitude of the limits would be based on the localized soil stability conditions and would not exceed 25 mph.

- A site-specific worker environmental training program shall be developed and implemented throughout the Project operating life. All employees and contractors working in the field shall be required to attend the environmental training session prior to working on-site. This training shall include information regarding the sensitive biological resources, restrictions, protection measures, individual responsibilities associated with the Project, and the consequences of non-compliance.
- The Project shall be designed to minimize the use of exterior lighting. External lighting at the O&M building shall be minimal with downward directed lighting. BP Wind Energy shall avoid night-lighting for facilities other than mandatory lighting on turbines to minimize attracting nocturnal migrant birds.
- Develop and implement a spill prevention, control and countermeasures (SPCC) Plan that outlines procedures to prevent the release of hazardous substances into the environment, thereby avoiding water resource contamination. The SPCC Plan would include containment measures that would be implemented in areas where chemicals, fuel, and oil are stored. Spill response kits containing items such as absorbent pads would be located on equipment and in the on-site temporary storage facilities to respond to accidental spills.
- The Project will comply with all applicable federal, state and Mohave County requirements with respect to noise levels during construction and operation.

This section identifies additional avian impact avoidance and minimization measures that BP Wind Energy has committed to:

- BP Wind Energy voluntarily committed to a multi-year monitoring framework that includes two years of standardized post-construction fatality monitoring for all birds; additional responsive monitoring as needed; standardized post-construction fatality monitoring in Years 5, 10, 15, 20, and 25; eagle behavioral monitoring if an eagle fatality occurs; and incidental monitoring for the life of the Project. BP Wind Energy will provide agencies with an annual report each year for the life of the Project. See Section 7 for monitoring details.

7 POST-CONSTRUCTION FATALITY MONITORING

BP Wind Energy will voluntarily conduct three types of standardized post-construction fatality monitoring throughout the life of the Project to evaluate the impacts to birds relative to expected fatality thresholds (Section 8). First, BP Wind Energy will conduct standardized post-construction fatality monitoring for the first two years of the project and at 5-year intervals thereafter starting with year 5. Second, if estimated fatality rates are greater than the anticipated thresholds, additional responsive monitoring will be conducted. Third, BP Wind Energy will also conduct incidental monitoring for the life of the Project as part of their Wildlife Incident Monitoring System (WIRS).

Due to the potential for eagle fatalities, additional eagle-specific standardized post-construction fatality monitoring will be implemented to expand the area of the Project searched. In addition, eagle behavioral studies may be initiated if an eagle fatality occurs.

7.1 Initial Post-construction Fatality Monitoring

BP Wind Energy will conduct standardized post-construction fatality monitoring during the first two years following the initiation of Project operations (Table 8). The objective of post-construction fatality monitoring is to estimate the number of bird fatalities that occur at the Project, which is based on the number of carcasses found during carcass searches conducted under operating turbines. Both the probability that a carcass persists on-site long enough to be detected by searchers (carcass persistence) and the ability of searchers to detect carcasses (searcher efficiency) can bias the number of carcasses located during standardized searches. Therefore, this post-construction monitoring plan includes (1) methods for conducting standardized carcass searches to monitor potential injuries or fatalities associated with Project operation; (2) carcass persistence trials to assess seasonal, site-specific carcass persistence (due to removal by scavengers or other means); and (3) searcher efficiency trials to assess observer efficiency in finding carcasses. Annual Project fatality rates will then be calculated by correcting for the bias (i.e., underestimation) due to searcher efficiency and carcass persistence time.

A subset of turbines (20 percent) will be monitored for all birds, with up to an additional 30 percent monitored specifically for eagle fatalities. The same general technical approach will be used for both eagles and non-eagle birds; however, some search parameters (e.g., transect width, search interval) will be modified for eagle-only searches in response to increased detectability and carcass persistence of eagle carcasses (see Section 7.6.3). Full details of the standardized fatality monitoring protocol, including fatality documentation and fatality rate estimation, are provided below in Section 7.6.

7.2 Long-term Fatality Monitoring

Beginning in Year 5 and every five years thereafter, BP Wind Energy will conduct another year of standardized post-construction fatality monitoring following the same approach used during the initial monitoring period (Table 8). Long-term monitoring surveys may have reduced level of effort for searcher efficiency and carcass persistence trials if the data suggest baseline parameters estimated during the initial monitoring period are representative over multiple years. Data collected during long-term monitoring will also be used to evaluate previously established thresholds (Section 8.3.1). Full details of the standardized fatality monitoring protocol, including fatality documentation and fatality rate estimation, are provided below in Section 7.6.

Table 8. Post-construction Monitoring Frequency

Monitoring Year	Type Of Standardized Fatality Monitoring Performed	WIRS Performed
Year 1	Initial	X
Year 2	Initial	X
Year 3	Responsive, if thresholds exceeded or eagle fatality occurs	X
Year 4	Responsive, if thresholds exceeded or eagle fatality occurs	X
Year 5	Long-term	X
Years 6-9	Responsive, if thresholds exceeded or eagle fatality occurs	X
Year 10	Long-term	X
Years 11-14	Responsive, if thresholds exceeded or eagle fatality occurs	X
Year 15	Long-term	X
Years 16-19	Responsive, if thresholds exceeded or eagle fatality occurs	X
Year 20	Long-term	X
Years 21-24	Responsive, if thresholds exceeded or eagle fatality occurs	X
Year 25	Long-term	X
Years 26-30	Responsive, if thresholds exceeded or eagle fatality occurs	X

7.3 Responsive Monitoring

Additional post-construction fatality monitoring will occur if an eagle fatality is detected or if the designated non-eagle bird fatality thresholds have been exceeded during initial or long-term monitoring (Table 8; see Section 8 for types of levels of thresholds and adaptive management). Monitoring in these years will focus on the turbine(s) when and where the eagle fatality or threshold exceedance occurred; therefore, effort may be reduced in temporal or spatial scales (i.e., target seasons instead of entire year or target spatial “hot spots”). As outlined in Section 8, BP Wind Energy will identify and attempt to address any eagle fatalities and threshold exceedances quickly rather than waiting for the annual report.

If an eagle fatality occurs, the responsive monitoring will use the methods specified in the standardized carcass search protocol for eagles (Section 7.6.3). This monitoring will be focused at the turbine where the fatality occurred, and at a minimum of one turbine on either side (east, west) within the turbine string. If evidence suggests that a cluster of turbines around the problem turbine are equal in collision risk (e.g., similar topography), then the fatality monitoring may be expanded to encompass additional turbines.

7.4 Eagle Behavioral Monitoring

If an eagle fatality occurs, eagle behavioral surveys may be performed concurrently with fatality monitoring. The objective of these behavioral surveys is to gain insight into the cause of the fatality and any future risk of eagle collisions. Selection of the areas for behavioral monitoring would be based on the location of the fatality and information about eagle use in the area, if available. This information would be used to inform additional avoidance and minimization measures and adaptive management to reduce the risk of future eagle collisions.

7.5 Wildlife Incident Monitoring System

In addition to the standardized fatality monitoring BP Wind Energy will also implement the WIRS (Appendix B), which will start immediately after commercial operation and continue for the life of the Project. WIRS is an approach BP Wind Energy uses at all operating facilities to provide a means of recording bird species found dead or injured in the Project area by Project staff, thereby increasing the understanding of wind turbine and wildlife interactions. WIRS provides a set of standardized instructions for Project personnel to follow in response to wildlife incidents in the Project area. Each incident will be documented on a data sheet and reported to the designated environmental affairs contact. The data will be logged in a tracking spreadsheet maintained by the environmental affairs team. Further detail of the protocol can be found in Appendix B. A quarterly review of the reported incidents will be undertaken by environmental affairs. This review frequency may be modified based on the results of the reporting. The WIRS will be the sole source of fatality monitoring in years without standardized fatality monitoring, but will only provide supplemental information in years with standardized fatality monitoring (Table 8).

7.5.1 Training

Site personnel will be trained to follow WIRS procedure and fill out the WIRS reporting form (Appendix C). Additionally, posters identifying BLM Sensitive species and AZGFD SGCN Tier 1A and 1B species will be prepared and posted at the O&M facility. Training will be performed by qualified consultants or in-house environmental staff qualified to conduct the training. Training specifics will be described within the environmental monitoring program protocol.

7.5.2 Reporting

BP Wind Energy will identify and report any threshold exceedances quickly rather than waiting for the annual report. Any incident involving a threatened or endangered bird species or a bald or golden eagle will be reported to the USFWS, AZGFD, BLM, and Reclamation (depending on location of incident) within 24 hours of detection/discovery of a confirmed threatened, endangered, or eagle species.

Bird casualties discovered by Project staff will be documented and recorded as part of the WIRS. This information will be used as a means of tracking impacts to all birds from the Project, but will not be used in fatality estimates. Although not specified within BP Wind Energy's standard WIRS protocol, if injured birds are found, the designated AZGFD Wildlife Manager will be notified.

7.6 Standardized Post-construction Fatality Monitoring

7.6.1 Technical Approach

The following sections describe the protocol for standardized fatality monitoring. This monitoring framework consists of standardized carcass searches conducted at a sample of the Project turbines. However, the number of fatalities found during searches represents a minimum number of fatalities at a project because not all fatalities that occur are found by observers. Therefore, both carcass persistence trials and searcher efficiency trials will be conducted concurrently with standardized fatality monitoring to account for the bias attributable to carcass removal by scavengers and searcher efficiency. Annual fatality rates (e.g., birds/turbine/year and birds/operational MW/year) will then be estimated using statistical methods that adjust the number of carcasses found for detection biases. Both per turbine and per megawatt estimates provide different ways of scaling fatality information to be comparable to other projects. Annual fatality rates will be calculated for all bird species combined, small (≤ 10 inches) and large (>10 inches) birds, raptors, and sensitive species. In some cases, the sample size for a species group of interest, such as eagles or other sensitive species, may be too small to allow for the calculation of accurate fatality estimates (see Section 7.6.6). In these cases, numerical counts of total fatalities detected during standardized and WIRS (see Section 7.5) searches for each of these species or species groups will be substituted in place of rate estimates. BP Wind Energy believes that these numerical totals will accurately approximate total eagle fatalities at the Project because standardized sampling for eagle fatalities will be targeted to areas that field surveys have shown to have the highest eagle use; operational (WIRS) searches will also have a high probability of detecting eagle fatalities due to the training of personnel and the large size of an eagle carcass. Final details of the sampling strategy will be developed in consultation with USFWS.

The field and analytical methods proposed below are consistent with post-construction fatality monitoring being conducted, or proposed, for other wind projects elsewhere in the U.S. (Johnson et al. 2003; Young et al. 2003; Arnett et al. 2005, 2009; Jain et al. 2007; Huso 2011, Strickland et al. 2011). Methods and timing outlined here may be modified over the course of the study as Project-specific information is gained to maximize the effectiveness and efficiency of the monitoring program (e.g., search interval, number of turbines searched, plot size). The standardized post-construction fatality monitoring consists of two components, non-eagle bird species monitoring and eagle monitoring (Table 9).

7.6.2 Standardized Carcass Searches – Non-eagle bird species

The objective of the non-eagle bird fatality monitoring is to identify the bird species found as fatalities at the Project and to statistically estimate fatality rates. This section outlines the methods for the standardized carcasses searches, which constitute the initial step in generating the fatality estimate (i.e., finding the carcasses under the turbines). These values then will be adjusted to account for detection bias (see Section 7.6.6). The methods for standardized carcass searches include the sampling duration and intensity, search plot size and configuration, and fatality documentation.

Table 9. Comparison of Non-eagle and Eagle Post-Construction Fatality Sampling Design

Component	Non-eagle	Eagle
Turbine section	Random	Turbines assumed to have higher eagle risk based on eagle use
Percent turbines searched	20 percent	Up to 50 percent
Search plot size	2x maximum blade tip height	2x maximum blade tip height
Search interval	7-14 days, depending on the season	28 days
Distance between transects	6 m	12 m
Searcher efficiency trials	Yes	Yes
Carcass persistence trials	Yes	No
Method of calculating estimated fatalities for the Project	Huso estimator (or other similar metric), fatalities per turbine and per MW	Number of eagles found

7.6.2.1 Sampling Duration and Intensity

Standardized post-construction fatality monitoring will consist of standardized searches of 20 percent of the turbines and will be conducted for the first two years of operation and at 5-year intervals (Strickland et al. 2011). To avoid bias in the fatality estimate, turbines will be selected in a stratified random manner based on habitat type and topography. To do this, habitat and topography will be determined for each turbine location and the sample turbines will be randomly selected from the habitat and topography categories in proportion to how often they occur in these categories. The same turbines will be searched in both years of the initial monitoring period to avoid confounding effects from individual turbines with variation among years but in subsequent survey years individual turbine selection may be adaptively managed.

The survey year will be divided into seasons to allow for the inclusion of season-specific searcher efficiency probabilities and carcass persistence times. A search interval of no greater than 7 days will be used during spring, summer, and fall to minimize the detection bias associated with carcass persistence time for small birds (Strickland et al. 2011). The search interval may be adjusted to reduce bias (i.e., the interval between searches may be reduced or increased), if needed, based on searcher efficiency and carcass persistence. A search interval of 14 days will be used for winter, as the winter sampling period may have lower bird and scavenger use (e.g., coyotes, Laundré and Keller 1984). Large birds have longer carcass persistence times than small birds; therefore, both search intervals are appropriate for large birds (Strickland et al. 2011).

Seasonal sampling intervals will be as follows:

- Spring: March 1 to May 31 – 7-day search interval, approximately 13 searches.
- Summer: June 1 to August 15 – 7-day search interval, approximately 11 searches.
- Fall: August 16 to November 15 – 7-day search interval, approximately 13 searches.
- Winter: November 16 to February 28 – 14-day search interval, approximately 8 searches.

7.6.2.2 Search Plot Size and Configuration

A square search plot centered on the turbine with sides equal to two times the maximum blade tip height will be used following the USFWS Land-based Wind Energy Guidelines (USFWS 2012b) and based on the distance bird carcasses are found from wind turbines at other post-construction fatality studies (Strickland et al. 2011). Linear transects will be established within search plots following the USFWS-recommended distance of approximately 6 m (20 feet) apart (USFWS 2012b). This spacing should be adequate for the Project because of the limited ground cover within the Project area, but may be adjusted based on actual conditions to maximize visual coverage. Searchers will walk along each transect searching both sides out to 3 m (10 feet) for fatalities during all seasons.

7.6.2.3 Fatality Documentation

During the set-up for carcass surveys, a sweep survey will be conducted to remove any fatalities that occur before the study is initiated. These carcasses will be documented in the same manner as those found during the standardized carcasses searches; however, they will not be included in the statistical analysis because the statistical analysis requires a known search interval (i.e., an estimate of when fatalities occurred).

Searchers will assume that carcasses found are a result of turbine collisions unless the cause of death can be clearly attributed to a non-turbine cause. Although an unknown number of fatalities may result from natural predation, disease, or anthropogenic events (e.g., shooting), the condition of the carcasses when found rarely facilitates determining the cause of death.

Carcasses found during standardized carcass searches will be labeled with a unique number, and species, sex, age, date, time found, location (Global Positioning System [GPS] coordinate, and distance/direction from the turbine), condition (e.g., intact, scavenged, feather spot), observer, turbine number, and any comments that may indicate cause of death will be collected. All carcasses will be photographed in situ. Once documented, carcasses will be marked in a standardized fashion (e.g., clipping of primary flight feathers) to indicate they have already been recorded.

Searchers may discover carcasses incidental to standardized carcass searches (e.g., outside of a search plot or of a scheduled survey date). For each incidentally discovered carcass, the searcher will identify, photograph, and record data for the carcass as would be done for carcasses found during standardized scheduled searches, but will code these carcasses as incidental discoveries. Incidental discoveries will not enter into the statistical calculation of fatality rate for reasons noted above for carcasses found during initial set-up.

Most native birds in North America are protected under the MBTA and cannot be salvaged without a permit from the USFWS. In addition to a federal permit, an Arizona Scientific Collecting License is required to handle native wildlife. This plan assumes that bird carcasses will be left in place and will not be salvaged unless otherwise directed by the appropriate agencies after discovery.

7.6.3 Standardized Carcass Searches – Eagles

The objective of eagle-specific fatality monitoring is to determine the number of eagle fatalities, if any, at the Project. It is unlikely that the number of eagle fatalities can be statistically estimated for the Project because of the anticipated small sample size (see Section 7.6.3.3 for additional detail). Therefore, eagle fatalities will be presented as the number of eagle carcasses found unless sufficient fatalities occur to also estimate a rate. To maximize the likelihood that the eagle fatalities are found, standardized eagle carcass searches will be conducted in addition to the standardized non-eagle bird species searches and will focus on areas believed to be of higher risk to eagles. If non-eagle bird fatalities are found during eagle searches, data will be collected and reported as incidentals because including them in the calculation of the non-eagle bird fatality estimate would introduce bias.

Eagle fatality monitoring methods will follow the same protocol as non-eagle bird species except where noted here.

7.6.3.1 Sampling Duration and Intensity

In addition to the 20 percent of turbines being searched as part of the non-eagle fatality monitoring, up to an additional 30 percent of the Project turbines will be searched following the standardized eagle carcass survey monitoring protocol, for a total of up to 50 percent of Project turbines searched. Once the non-eagle search turbines are randomly selected, BP Wind Energy will identify the remaining turbines that may be higher risk to eagles based on the pre-construction data. The turbines monitored for eagles will be selected based on known eagle locations and suspected risk factors (e.g., proximity to nests, steep slope, aspect, presence of saddles, known locations of eagle use: USFWS 2011a). The same turbines will be searched in both years of the initial monitoring period to avoid confounding effects from individual turbines with variation among years, but in subsequent survey years individual turbine selection may be adaptively managed. The remaining turbines that are not searched systematically will be monitored by operations staff under BP Wind Energy's WIRS operational monitoring program (see Section 7.5).

Large birds generally have longer carcass persistence times than small birds and can often be in place for longer than 30 days (e.g., NWC and WEST 2004, Gritski et al. 2010). Based on these results, the search interval will be initially set at 28 days because of the large size of eagles. This interval has been used for other fatality monitoring projects (Oregon EFSC 2009a,b, 2010, Strickland et al. 2011) where large birds such as eagles are the target of monitoring. The 28-day search interval will be compared to the carcass persistence time calculated for large birds as part of non-eagle bird fatality monitoring (Section 7.6.4) to ensure that the search interval maximizes the likelihood that an eagle fatality will be detected. The final search interval will be the shorter of either the lower 90 percent bootstrapped confidence interval for carcass persistence trials (Section 7.6.4) or 28 days.

7.6.3.2 Search Plot Size and Configuration

Search plot size will follow the non-eagle methods (Section 7.6.2.2). However, based on the anticipated higher visibility of an eagle carcass compared to a small bird, linear transects will be established within search plots approximately 12 m (40 feet) apart and the searchers will walk along each transect searching both sides out to 6 m (20 feet) for fatalities. This transect spacing has been used in numerous fatality monitoring studies (e.g., Arnett et al. 2009, Gritski et al. 2010) and is based on the anticipated higher visibility of an eagle carcass compared to small birds.

7.6.3.3 Fatality Documentation

Per-turbine eagle fatality estimates likely cannot be generated because these estimates require a sample size of at least 5 fatalities (M. Huso, USGS, 2012, pers. comm.). Because the Project is not anticipated to have this level of eagle fatalities, the summary of eagle fatalities will likely be limited to a count of eagle carcasses found. This count will provide a reasonable estimate of the Project-level of eagle fatalities because the sampled turbines will be selected to maximize the likelihood of finding an eagle fatality based on the pre-construction data used to evaluate risk. Any eagle fatality data collected under BP Wind Energy's WIRS program (see Section 7.5), will also be documented and included in the total.

7.6.4 Carcass Persistence Trials

Carcass persistence time estimates the amount of time a carcass remains on-site prior to its disappearance from the search area due to scavenging or other means (e.g., due to forces such as wind and rain or decomposition beyond recognition). The objective of the carcass persistence trials is to document the length of time carcasses remain in the search area. Carcass persistence trials will be conducted in multiple seasons to evaluate seasonal differences in carcass persistence (i.e., due to changes in scavenger population density or type) and possible differences in the size of the animal being scavenged.

Carcasses used in the trials will be selected to best represent the size of a range of species. For large birds, carcasses may include domestic waterfowl, pheasant, or similar species legally obtained from game farms. For small birds, carcasses may include European starlings, house sparrows, or other non-native species not legally protected.

Assuming adequate carcass availability, one carcass persistence trial will be conducted at non-searched turbines during each of the spring, summer, fall, and winter seasons with at least 15 carcasses of each bird size class (large bird, small bird) placed per season. Carcass persistence trials will not be conducted at eagle monitoring plots because it is assumed that carcass persistence values obtained at non-eagle plots are representative. Additionally, carcass persistence trials during long-term monitoring may have reduced level of effort if the data suggest consistency among years.

Each carcass used for the carcass persistence trial will be placed randomly within the area beneath non-searched turbines. Random locations will be generated and loaded into a GPS as waypoints to allow the accurate placement of the carcasses by field personnel. Carcasses will be dropped from waist height and allowed to land in a random posture. Each trial carcass will be discreetly marked (e.g., small tag or wire wrapped around one leg) prior to dropping so that it can be identified as a study carcass if it is found by other searchers or wind facility personnel. Personnel will monitor the trial carcasses on days 1, 2, 3, 4, 7, 10, 14, 21, and 30. When checking the carcass, searchers will record the condition as intact (normal stages of decomposition), scavenged (feathers pulled out, chewed on, or parts missing), feather spot (only feathers left), or gone (cannot be found). Changes in carcass condition will be cataloged with pictures and detailed notes; photographs will be taken at placement and any time major changes have occurred. At the end of the 30-day period, any evidence of carcasses that remain will be removed and properly disposed of.

Estimates of the probability that a carcass persisted between search intervals and therefore was available to be found by searchers, will be used to adjust carcass counts for bias using methods presented in Huso 2011 or similar analysis method. To date, Huso (2011) presents the most bias-free equation for determining the average probability of persistence, which takes into account the length of the search interval and the carcass persistence time:

$$\hat{r} = \frac{\hat{\bar{t}}(I - e^{-I/\hat{\bar{t}}})}{I}$$

Where *t* is the estimated mean persistence time and *I* is the length of the interval. A bootstrapped estimate and 90 percent confidence interval will be calculated based on 5,000 iterations for carcass persistence time. Bootstrapping is a statistical re-sampling procedure where the data are re-sampled with replacement to obtain an estimate and confidence interval.

7.6.5 Searcher Efficiency Trials

The ability of searchers to detect carcasses is influenced by a number of factors including the skill of an individual searcher in finding the carcasses, the vegetation composition within the search area, and the characteristics of individual carcasses (e.g., body size, color). The objective of searcher efficiency trials is to estimate the percentage of bird fatalities that searchers are able to find. Estimates of searcher efficiency are then used to adjust carcass counts for detection bias. Searcher efficiency trials will be conducted in all seasons to account for seasonal differences in searcher efficiency. However, searcher efficiency trials during years of long-term monitoring may have reduced level of effort if the data suggest consistency among years. Carcass species used in the trials and marking and placement techniques will be the same as those in the carcass persistence trials.

Searcher efficiency trials will begin when standardized carcass searches start. Personnel conducting the searches will not know when trials are conducted or the location of the efficiency-trial carcasses. Trials will be conducted multiple times throughout each season and will incorporate testing of each member of the field crew. Assuming adequate carcass availability, at least 15 carcasses of each bird size class (large bird, small bird) will be placed per season for searcher efficiency trials. At least 10 carcasses per size and season are needed to estimate searcher efficiency. Searcher efficiency trials will be conducted at non-eagle and eagle monitoring turbines. The number of carcasses placed prior to the search (i.e., the number available for detection during each trial) will be verified immediately after the trial by the person responsible for distributing the trial carcasses. Any carcasses not found by searchers will be collected after the trial.

The probability of a carcass being observed is expressed as *p*, the proportion of trial carcasses that are detected by searchers in the searcher efficiency trials. The probability will be estimated by carcass size class (large bird, small bird) and season. A bootstrapped estimate and 90 percent confidence interval will be calculated based on 5,000 iterations for searcher efficiency.

7.6.6 Fatality Rate Estimation

To calculate the Project-wide fatality rate (birds/turbine/year and birds/MW/year) and the total Project fatalities, BP Wind Energy will use the Huso estimator (Huso 2011) or other appropriate statistical methods. The fatality rate can be calculated for large birds, small birds, raptors (including eagles), or sensitive species (BLM Sensitive species and AZGFD SGCN Tier 1A and 1B species) under the following conditions:

- At least 5 fatalities within the subgroup are found; and
- The 95 percent confidence interval of the Project fatality estimate for all birds at the Project lies within two standard deviations (SD) of the mean value for all birds at desert region facilities in the western U.S. (Table 7b), indicating that the Project estimate is reasonably precise.

The estimation of fatality rates will incorporate fatalities documented during standardized carcass searches adjusted for bias. Specifically, fatality estimates will take into account:

- Search interval;

- Observed number of carcasses found during standardized searches during the monitoring year for which operation of the facility cannot be ruled out as the cause of death;
- Carcass persistence, expressed as the probability that a carcass is expected to remain in the study area (persist) and be available for detection by the searchers during carcass persistence trials; and
- Searcher efficiency, expressed as the probability of trial carcasses found by searchers during searcher efficiency trials.

The Huso estimator (2011) uses the following equation to estimate fatalities: $\hat{f}_{ijk} = \frac{c_{ijk}}{\hat{p}_{jk} * \hat{r}_{jk} * \hat{v}_{jk}}$ where $\hat{f}_{ijk}$ is the estimated fatality at the i^{th} turbine during the j^{th} search in the k^{th} category and c_{ijk} is the observed number of carcasses at the i^{th} turbine during the j^{th} search in the k^{th} category. The variable $\hat{r}_{jk}$ is a function of the average carcass persistence time, which was described earlier, and the length of the search interval preceding a carcass being discovered. The variable $\hat{r}_{jk}$ is calculated using the lower value of I, the actual search interval when a carcass is found or $\widehat{\tilde{I}}$, the effective search interval, and is estimated through searcher efficiency trials previously described. $\hat{v}_{jk}$ is the proportion of the effective search interval sampled where $\hat{v}$ = min (1, $\tilde{I}/I$). $\hat{p}_{jk}$ is the estimated probability that a carcass in the k^{th} category that is available to be found will be found during the j^{th} search. The variables $\hat{p}_{jk}$, $\hat{r}_{jk}$, and $\hat{v}_{jk}$ are assumed not to differ among turbines but can differ with carcass type, size class, and season. To obtain an estimate of the number of fatalities per turbine the following equation is used: $\hat{f} = \frac{\sum_{i=1}^{u} \sum_{j=1}^{n_i} \sum_{k=1}^{2} \hat{f}_{ijk}}{t}$ where n_i is the number of searches at turbine i (i = 1,…, u) and t is the effective number of turbines searched. A bootstrapped estimate and 90 percent confidence interval will be calculated based on 5,000 iterations for the fatality estimate. The 90 percent confidence interval represents the upper and lower bounds of the range of fatality rates that has a 90 percent probability of containing the true fatality rate. The 90 percent confidence interval is useful in a management context as a means of assessing the range of fatality rates that are probable given the number of carcasses that were detected. It should be noted that the upper 90 percent confidence limit corresponds to 95 percent probability that the true fatality rate is lower than the upper 90 percent confidence limit.

It is anticipated that if eagle fatalities occur, the number of fatalities will be too small (e.g., 5 or fewer) for the fatality estimate to be reasonably free of bias. Thus, the raw number of fatalities found should represent the total number of Project-related fatalities. The monitoring methods were designed to maximize the probability of detecting an eagle fatality, so that numerical counts reasonably represent the total number of Project-related eagle fatalities.

An annual monitoring report will be prepared to summarize non-eagle and eagle fatalities (if any) associated with operations of the Project for the life of the Project (See Section 9). In years with only WIRS monitoring the report will be limited to details of the fatalities detected (e.g., numbers, species identification (when possible), condition, time and date, location). Annual reports will be provided to USFWS, AZGFD, BLM, and Reclamation for review.

8 MITIGATION AND ADAPTIVE MANAGEMENT

8.1 Identification of Compensatory Mitigation Approach

BP Wind Energy asked AZGFD to provide information on causes of eagle fatalities in Arizona during a phone call on October 13, 2011 and received the following summary of eagle fatalities: 1) secondary poisoning (eating carcasses baited to kill coyotes as predator control for livestock), 2) road and traffic related impacts from carcass scavenging, 3) drowning in stock tanks, 4) shooting/poaching, and 5) electrocution. BP Wind Energy and Tetra Tech evaluated these options, along with the potential of lead abatement as suggested by Dr. Robert Murphy of USFWS, to ensure that 1) they were feasible from a business perspective, 2) the USFWS would view as acceptable mitigation without being pre-decisional, and 3) without being pre-decisional that BLM, Reclamation, and Western would determine that there was sufficient compensatory mitigation to sign their respective RODs. Of the options suggested, BP Wind Energy considered three of the potential mitigation options as most feasible. These mitigation options included 1) roadside carcass search/removal to minimize the chance of eagles being hit by vehicles while scavenging on carcasses, 2) contributing to a silent witness poaching reporting system to minimize intentional killing of eagles, and 3) prey base improvement off-site to increase the habitat quality for eagles. BP Wind Energy then evaluated these options based on their acceptability under the BLM IM 2010-156 and the BGEPA and concluded that the roadside carcass search/removal best met their requirements. Thus, the mitigation discussion presented here focuses on developing a roadside carcass search/removal program.

The proposed compensatory mitigation strategies outlined in this document represents the first attempts to implement carcass search/removal as a means of reducing collisions of eagles feeding on roadside carcasses. Although power pole retrofitting has received considerably more attention as a mitigation strategy (USFWS 2011a), the USFWS is actively encouraging the development of alternative compensation models (such as this proposal for a carcass search/removal program) to provide options to applicants from an administrative and feasibility perspective. It is BP Wind Energy's understanding that the USFWS believes a test of carcass search/removal as a mitigation strategy will provide valuable data for the overall eagle permitting program as well as conservation benefits to eagles, but that such testing may be best suited for sites like the Project area that have low eagle use and low projected eagle fatality. As such, it is also BP Wind Energy's understanding that the USFWS will consider flexibility in testing new compensatory mitigation strategies like the proposed carcass search/removal program in the spirit of broadening the suite of tools and options available to applicants.

8.1.1 Evidence for Eagle Fatalities Due to Vehicle Collisions

Vehicle collisions have been identified as a cause of eagle fatalities by a variety of sources (Tables 10-12). Data on recent incidental reports of eagle fatalities from the AZGFD for 2000 – 2011 show that 5 of 24 (21 percent) recorded incidental fatalities collected by AZGFD were due to vehicle collisions (Table 10). A review of longer-term records by AZGFD indicated that 12 of 34 (35 percent) fatalities from 1997-2012 were due to vehicle collisions, including 6 golden eagles in 2012 to date, although the agency believes vehicle collision rates to be overestimated due to reporting bias that favors roadways (K. Jacobson, AZGFD, 2012, pers. comm.; Table 10). Of the reports in the public domain across the US, there were 119 records of vehicle collisions with golden eagles (Table 11). Public domain sources of vehicle collision data consist of band return records from the United States Geological Survey Bird Banding Lab (Craig and Craig 1998, Harmata 2002, USGS 2010), reports to the USFWS National Wildlife Heath Center (Philips 1986), and radio telemetry (Hunt 2002). These 119 records represented 5 percent of human-related causes of fatalities in golden eagles in the materials reviewed (Tetra Tech 2011). Interviews with rehabilitation facilities in Arizona and New Mexico provide additional support that golden eagle injuries are regularly occurring as a result of vehicle collisions (Table 12). BP Wind Energy also contacted USFWS law enforcement to evaluate if USFWS data can provide additional evidence. Law enforcement indicated no data for this purpose are available (N. Chavez, 2011, pers. comm.). All of these data except Hunt 2002 were collected incidentally; therefore, the true number of eagle fatalities associated with vehicle collisions is likely underestimated and higher than presented here.

Table 10. Known Causes of Golden Eagle Fatalities in Arizona from AZGFD

Cause	**Year**											
	<2000	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012***	**Total**
Lead	1	1				1		1			**	**4****
Vehicle collision	1			1	2			2			**6**	**12**
Electrocution			1								**	**1****
Other				1	1	4	4		1	3	**	**14****
TOTAL	**2**	**1**	**1**	**2**	**3**	**5**	**4**	**3**	**1**	**3**	**6****	**34**

*As of July 2012
**Number of non-vehicle golden eagle fatalities in 2012 not provided by AZGFD

Table 11. Golden Eagle Vehicle Collision Data from the Reports, Databases, and Peer-reviewed Literature

Author	**Years**	**Vehicle collision**	**Type of observation**	**Geographic area**	**Type of observation**
Craig and Craig 1998	1991-1997	1	USFWS band return	East-central Idaho	Incidental
Harmata 2002	1977-1999	1	USFWS band return	Rocky Mountain West	Incidental
Hunt 2002	1998-2001	4	Radio telemetry	Altamont Pass, California	Systematic
Phillips 1986	1981-1985	100	Reported to USFWS National Wildlife Health Center	Western U.S.	Incidental
Russell and Harden 2009	1990-2008	13	Wildlife rehabilitation admission	New Mexico	Incidental
USGS 2010	1960-2010	23	Band returns	All U.S.	Incidental

Table 12. Golden Eagle Fatalities from Rehabilitation Centers

Center	Eagles per year	Primary causes	State
Wild at Heart	1-2 eagles (mostly bald eagles)	Lead poisoning, aspergillosis	Arizona
Rocky Mountain Raptor Program	~3 bald eagles, ~3 golden eagles	Lead poisoning, electrocution, hit by car	Colorado
Liberty Wildlife Rehabilitation Foundation	3-10 eagles per year, species vary	Lead poisoning, gunshot, collisions (vehicles, turbines)	Arizona

8.1.2 Existing Information on Vehicle and Wildlife Collisions

In general, wildlife collision data is focused on ungulates and collision rates vary among studies (Table 13). However, most wildlife collisions occur at night, on paved, unfenced primary roads that are open to the public where roads cross migration corridors (Gleason and Jenks 1993, Forman and Alexander 1998, Gunther et al. 1998, Kline and Swann 1998, Dussault et al. 2006, Grovenburg et al. 2008, McShea et al. 2008, Myers et al. 2008). The experts Tetra Tech consulted for input to Section 8.1.3 (see Table 16) unanimously agreed that ungulates and other large carcasses are more likely to attract scavenging eagles. For example, coyotes are known to be a preferred carrion source, and are commonly used when trapping golden eagles for research efforts (B. Millsap, USFWS, 2012 pers. comm.). Unlike small prey items which are easily carried away, golden eagles tend to feed on large prey at the kill site because they cannot carry items more than 5-7 pounds (2.3–3.2 kilograms) in sustained flight (Palmer 1988, Kochert et al. 2002); therefore, eagles tend to remain along roadsides while feeding on large sources of carrion. Tetra Tech therefore focused on large carcasses for this literature review. For ungulates in particular, most collisions occur during the fall rut in areas where ungulate density is highest (Dussault et al. 2006, Bissonette et al. 2008, Grovenburg et al. 2008, McShea et al. 2008, Myers et al. 2008).

Studies of wildlife-vehicle collisions generally fall into two categories: 1) those investigating a broad area for potential hotspots of animal-vehicle collisions, and 2) those investigating already identified hotspots. Results from both types of studies are provided here to provide context on collision rates (Table 13). Four studies have collected systematic data on vehicle/wildlife collisions in Arizona. Dodd et al. (2007) studied 17 miles (27 km) of State Route 260 in central Arizona and documented a mean elk/vehicle collision rate of 1.6 collisions per mile per year.

Table 13. Summary of Wildlife-vehicle Collision Rates in the U.S.

Author	Focal species	State	Type of Study/type of manipulation	Wildlife fatalities[1]		
				General	With manipulation	Without manipulation
Bissonette and Kessar 2008	Deer	Utah	Broad area	0.84 DVCs/mile/year	-	-
Craighead et al. 2009	Deer, elk, moose	Montana	Hotspot/ Wildlife fence	-	4.3 UVC/mile/year	10.9 UVC/mile/year
Dodd et al. 2007	Elk	Arizona	Hotspot	1.6 elk collisions/mile/ year	-	-
Dodd and Gagnon 2010	Elk	Arizona	Hotspot/ Wildlife fence	-	2.86 elk collisions/km	0.68 elk collisions/km
Gleason and Jenks 1993	Deer	South Dakota	Hotspot	6.3 deer fatalities/km	-	-
Grovenburg et al. 2008	Deer	South Dakota	Broad area	1.32 deer fatalities/mile/ year	-	-
Gunther et al. 1998	Bison, moose, antelope, white-tailed deer, black bear	Wyoming	Broad area	0.44 large mammal road fatalities/mile/ye ar	-	-
Kline and Swann 1998	All vertebrates	Arizona	Broad area	11.5/mile/year and 6.0/mile/year (depending on location)	-	-
Myers et al. 2008	Deer	Washington	Broad area	0.19 collisions/mile/ year (eastern), 0.63 collisions/mile/ year (western)	-	-
Wakeling et al. 2008 (reviewed in Gagnon et al. 2009)	Bighorn sheep	Arizona	Hotspot	2.1 sheep per mile per year	-	-

1. Collision rates are presented as they were provided in the reference. DVC = deer vehicle collisions, UVC = ungulate vehicle collisions.

After State Route 260 was re-constructed and fencing implemented to funnel elk toward underpasses, the mean elk/vehicle collision rate decreased to 0.68 collisions per km per year (1.1 collisions per mile per year; Dodd and Gagnon 2010). Kline and Swann (1998) conducted systematic surveys of carcasses along roads at the Saguaro National Park and found 11.5 carcasses per mile in the Tucson Mountain District and 6.0 carcasses per mile in the Rincon Mountain District, 36 percent of which were mammals. Wakeling et al. (2008, reviewed in Gagnon et al. 2009) documented 17 collisions per year for bighorn sheep along an eight-mile section of highway along U.S. Highway 191 in east central Arizona (2.1 sheep/vehicle collisions per mile per year). Additional data associated with the U.S. Highway 93 highway alignment estimated bighorn sheep fatalities of 10 sheep per year on Highway 93 prior to the highway alignment (Cunningham and Hanna 1992 as cited in AZGFD 2011a). In 2011, 4 bighorn sheep fatalities were documented (AZGFD 2011a).

Arizona Department of Transportation (ADOT) tracks motor vehicle crash facts (ADOT 2011). These reports show that over the period from 1997 to 2010, approximately 1 percent of all vehicle crashes in the state occurred as a result of collisions with animals (Table 14).

Table 14. Statewide Crashes in Arizona (ADOT 2011)

Year	Total Number of Crashes	Total Number of Crashes Due to Animal Collision	Collisions with Animals - Urban	Collisions with Animals - Rural	Proportion of all Collisions Due to Animals
2010	106177	1561	182	1379	0.01
2009	106767	1787	206	1581	0.02
2008	119588	1481	187	1294	0.01
2007	140371	1677	187	1490	0.01
2006	140197	1398	204	1194	0.01
2005	139265	1163	175	988	0.01
2004	138547	1489	209	1280	0.01
2003	130895	1414	154	1260	0.01
2002	134228	1791	223	1568	0.01
2001	131573	1638	177	1461	0.01
2000	131368	1671	152	1519	0.01
1999	125764	1480	155	1325	0.01
1998	120293	1136	114	1022	0.01
1997	114174	1285	158	1127	0.01

8.2 Overview of Carcass Search/Removal as Compensatory Mitigation

BP Wind Energy will implement a roadside carcass search/removal program in which roads in target areas will be surveyed at regular intervals for eagles and carcasses of mammals, and any large carcasses will be removed from the roads and translocated to the nearest reasonably safe and accessible site away from the road. This translocation will keep the carcasses available to eagles while reducing the risk of vehicle collisions. Carcass search/removal and concurrent eagle occurrence surveys will be conducted from September 15 through April 15 (7-month period) when the primary food sources for golden eagles are more limited, and the eagles tend to feed more frequently on carrion (e.g., roadkill; see Section 8.1.2; Kochert et al. 2002), placing them at greater risk of collision than at other times of the year. This timing will also capture the ungulate breeding (rut) period, during which ungulates are more active and more susceptible to vehicle collisions than at other times of year (Dussault et al. 2006, Bissonette et al. 2008, Grovenburg et al. 2008, McShea et al. 2008, Myers et al. 2008). Surveys will initially be conducted at 3- to 4-day intervals, which AZGFD believes to be optimal timing in Arizona (AZGFD 2012b).

8.3 Implementing Mechanisms

BP Wind Energy is proposing a contribution of funds to the AZGFD to expand their current carcass removal program. In the current program, the state's objective is to reduce the collision risk to humans and wildlife by removing incidentally found carcasses from the roadside either by completely removing carcasses from an area or by moving carcasses several hundred feet off the road (D. Kephart, AZGFD, 2012, pers. comm.). The implementing mechanism will be a contract with the AZGFD Research Branch that can be implemented once a scope of work and cost are agreed upon. An alternative mechanism that the USFWS has indicated is also feasible may involve hiring consultants independently. BP Wind Energy's current preference is to use the AZGFD contracting mechanism.

8.4 Bottom-up and Top-down Approaches for Mitigation

BP Wind Energy and AZGFD concurrently developed approaches for a carcass search/removal program, both of which were focused on identifying, quantifying, and reducing uncertainty associated with carcass search/removal as a mitigation strategy. Both approaches also represent independent lines of evidence for deriving the same outcome, in other words, the total number of road miles of carcass search/removal that would be needed to provide compensatory mitigation for the take of one eagle. BP Wind Energy focused on a "bottom-up" parameterization that was based on the rates of carcass occurrence and use of those carcasses by eagles (hereafter, the "bottom-up approach"). The approach developed by AZGFD focused on a "top-down" parameterization (hereafter the "top-down approach") to carcass search/removal based on statewide estimates of eagle densities, fatality rates, and population size. Although both approaches present different strategies and input parameters, they are included here to bracket the range in the total number of miles needed to provide compensatory mitigation for the take of one eagle. Using both approaches to bracket the total level of effort needed is a way of addressing uncertainty while being conservative, which BP Wind Energy understands to be a key component of acceptability for testing a new compensatory mitigation model for the USFWS.

The following sections describe the key parameters of both approaches. The nine step bottom-up approach is presented in Section 8.5 and the three step top-down approach is presented in Section 8.6. In each step, the logical framework is described, input values are identified, calculations are executed, underlying assumptions are identified, a level of certainty is described, and a testing/adaptive management strategy is provided. Finally, a synthesis of the miles of road where carcass search/removal will need to be completed to compensate for the take of one eagle is provided and a description of how the adaptive management framework will inform assumptions in both approaches (Section 8.7).

8.5 Bottom-up Approach for Mitigation

This section presents the nine-step bottom-up method developed by BP Wind Energy and Tetra Tech for estimating the number of eagles saved from vehicle collisions as a result of implementation of a roadside carcass search/removal program (Table 15). This approach is based on estimating the number of roadside carcasses available to eagles and the number and proportion of eagles using those carcasses which get struck by vehicles. The subsections below present the input values and logic process, calculations, assumptions, certainty, and testing/adaptive management strategies.

Table 15. Summary of Steps Taken to Calculate the Number of Golden Eagles Saved per Mile of Road Where Carcasses are Removed

Step	Metric	Values	Units	Certainty
Step 1	Location of area to be targeted for mitigation	-	-	Moderate – based on AZGFD eagle nest surveys and Species of Economic and Recreational Importance database
Step 2	Annual rate of carcass occurrence	0.2-0.3	Per mile per 7-month period	Moderate - can be substantiated with real data, although data may not be location specific.
Step 3	Carcasses available for eagles	20-30 (calculation)	Total carcasses per 100 miles of road per 7-month period	Moderate - can be substantiated with real data, although data may not be location specific.
Step 4	Percent of carcasses with eagles	20	Percent	Low - no data to substantiate. Based on expert opinion.
Step 5	Number of eagles per carcass	1	Eagles	Moderate - experts consistent in their opinions.
Step 6	Number of eagles using carcasses	4-6 (calculation)	Eagles using carcasses per 100 miles of road per 7-month period	Low to moderate - calculation based on other data with low to moderate confidence.
Step 7	Percent of eagles on carcasses involved in vehicle collisions	5	Percent	Low - no data to substantiate. Based on expert opinion.
Step 8	Number of eagles that would be involved in vehicle collisions	0.2-0.3	Eagles saved per 100 miles of road per 7-month period	Low - calculation based on other low certainty data.
Step 9	Miles of road to be used for carcass search/removal implementation	333-500 (calculation)	Miles of carcass search/removal during a 7-month period to mitigate for one eagle (i.e., number of miles required to be searched during each 3-4 day search interval)	Low to moderate –based on certainty of previous steps

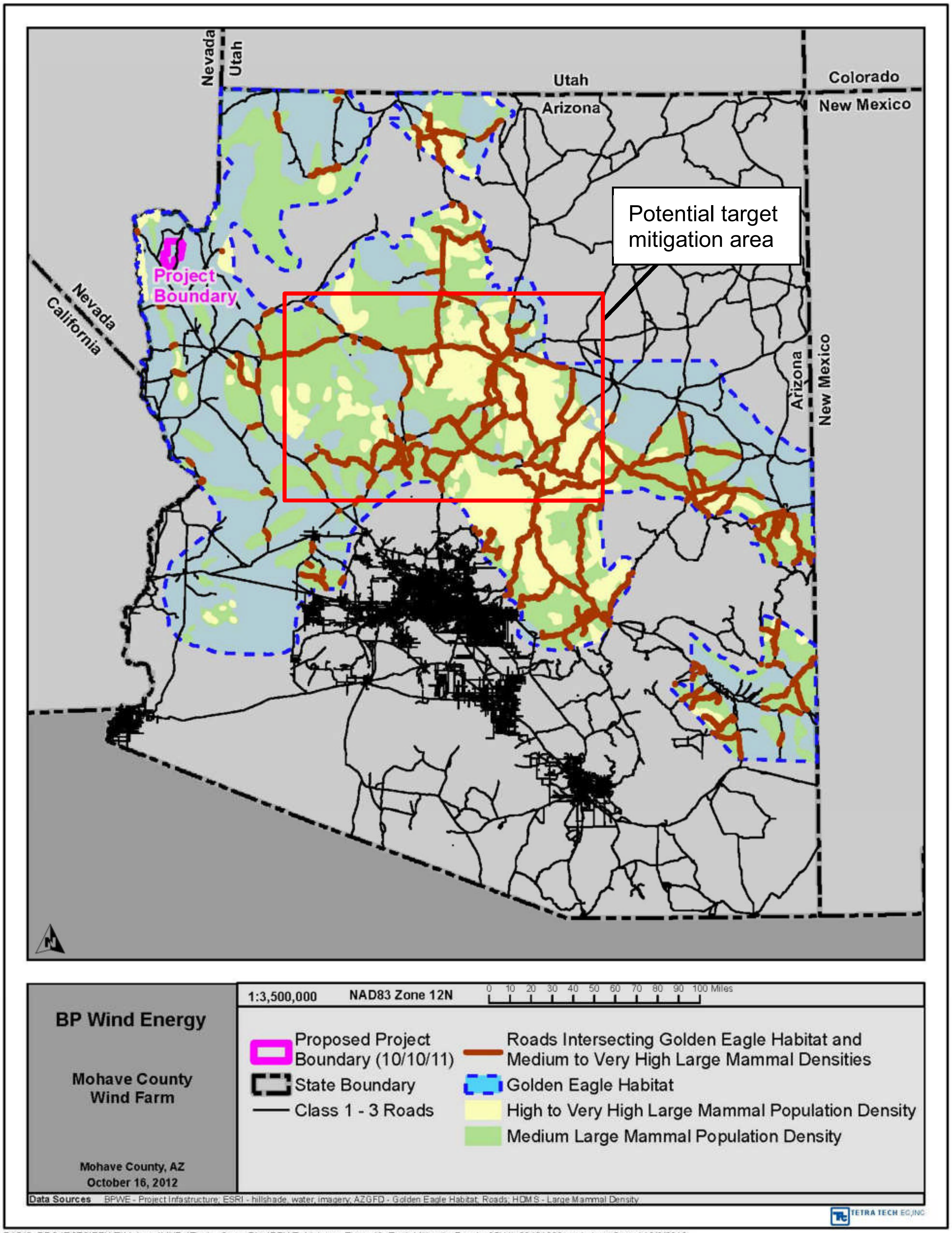
8.5.1 Step 1: Determine Where Mitigation Efforts Should Be Targeted Within Arizona

AZGFD requested that mitigation be within the state of Arizona and within the natal dispersal distance of the eagles impacted to ensure the benefits of mitigation accrue to the local population of eagles (K. Jacobson, AZGFD, 2012, pers. comm.). Golden eagles that breed in northwestern Arizona are non-migratory, and are likely permanent residents; however, individuals that breed north of 55 degrees latitude migrate south and could possibly overwinter in Arizona (Kochert et al. 2002). Non-breeding adult and immature golden eagles, however, may move over large distances (Kochert et al. 2002), and may be encountered anywhere in Arizona. Year-round population densities are approximately 1.2 eagles per 1,000 km^2 (1.2 eagles per 386 mi^2 or 0.31 eagles per 100 mi^2) for Arizona (Boeker 1974). Information regarding winter densities of eagles in Arizona is not available, but elsewhere in the region winter densities of golden eagles in Texas and New Mexico were generally low overall with Texas having fewer wintering golden eagles (8 per 1,000 km^2 or 2 per 100 mi^2) than New Mexico (62 per 1,000 km^2 or 16 per 100 mi^2; Boeker and Bolen 1972).

The carcass search/removal program will be most successful in areas where eagles and large carcasses overlap. To identify mitigation areas used by eagles, BP Wind Energy will evaluate the intersection of roadways within areas identified as suitable golden eagle habitat (Figure 11; derived from the top-down strategy, Section 8.6.1.1). Only road classes 1-3 in a digitized road surface GIS layer obtained from ADOT were incorporated. These classes include all interstate freeways, highways, and major arteries throughout the state, including unpaved roads with speed limits exceeding 40 mph. A total of 5,440 miles (8,755 km) of potential mitigation roadways (i.e., roads in suitable golden eagle habitat) were identified based on golden eagle suitable habitat in Arizona (Figure 11). To focus mitigation efforts on areas with increased potential for carcass occurrence, we incorporated a spatial layer that showed densities of large mammal of Species of Economic and Recreational Importance (SERI) for which quantified population densities were available (HDMS 2012). These included bighorn sheep, black bear, elk, javelina, mountain lion, mule deer, and pronghorn. The density categories of low, very low, and scarce were excluded in order to highlight those areas with elevated (i.e., medium, high, very high) large mammal densities. Density categories reflected on the map represent the maximum density category of all species present in a given area. Of the roadways identified in golden eagle habitat, 2,635 miles (4,242 km) intersected with areas of elevated large-mammal population densities. Based on this analysis, BP Wind Energy will target roads in northcentral Arizona for carcass search/removal, because this region contains a large amount of golden eagle habitat that supports elevated densities of large mammals; red box in Figure 11).

Assumptions: This step assumes that AZGFD data are representative of areas with breeding golden eagles and large mammal populations and that vehicle strikes occur only on class 1-3 roads.

Certainty: Certainty in these values is moderate because an extensive survey of golden eagle nests was conducted by AZGFD in the last 1-2 years (AZGFD 2011b, SGEMC 2012), and all known vehicle strikes of golden eagles in Arizona occurred on class 1-3 roads selected (M. Piorkowski, AZGFD, 2012 pers. comm.).



P:\GIS_PROJECTS\BPWE\Mohave\MXDs\Eagle_Cons_Plan\BPWE_Mohave_Figure13_EagleMitigationRoads_85i11i_20121009.mxd - Last Saved 10/9/2012

Figure 11. Preliminary Roadways Identified for the Implementation of a Carcass Search/removal Program Using a Kernel Analysis to Define Golden Eagle Habitat and SERI Data on Large Mammal Population Densities (Tribal Lands and the Phoenix Metro Area Were Not Reported or Included in Analyses).

Test/Adaptive Management: To determine whether eagle abundance is sufficient in the target area to make it appropriate for carcass search/removal, road surveys with regular stops based on the protocol outlined in Eakle et al. (1996) or equivalent methods will be used to estimate seasonal eagle occurrence in the target area. This method will entail roadside golden eagle surveys from the roads where carcass search/removal is conducted from September to April. Eagle occurrence surveys will be conducted by the same personnel performing carcass search/removal, and will be concurrent with carcass search/removal surveys. Each survey team will consist of 1-2 surveyors who will drive the roads scanning for eagles and road-killed carcasses and will also make regular stops to scan for eagles. Technical details of the survey protocol will be developed in consultation with USFWS, BLM, Reclamation, and AZGFD.

Tetra Tech set a minimum threshold value for eagle abundance on the survey route based on the ratio (0.75) of the average year-round population density of golden eagles in Arizona to the average year-round population density in New Mexico (Boeker and Bolen 1972, Boeker 1974) where Eakle et al.'s (1996) study was performed. This ratio (0.75) was used to calculate the minimum threshold of abundance based on the relative abundance of eagles detected per km of roads surveyed reported by Eakle et al. (1996; 34.9 eagles/1,000 km (56.2 eagle/1,000 miles) in fall-winter and 9.7 eagles/1,000 km (15.6 eagles/1,000 miles in spring-summer)) for New Mexico. This approach produced a minimum threshold of 26.2 eagles/1000 km (42.2 eagles/1,000 miles) in fall-winter and 7.3 eagles/1,000 km (11.7 eagles/1,000 miles) for spring-summer. A weighted average of these values was then calculated (22.2 eagles/1,000 km or 35.8 eagles/1,000 miles) and used as the minimum threshold for eagle abundance for the 7-month period (September 15 through April 15). If the concurrent surveys do not detect eagle use in the target area equivalent to this threshold, BP Wind Energy will evaluate alternate mitigation locations in Arizona using the most recent golden eagle data. Additional statewide golden eagle nest surveys are planned by AZGFD for 2013 and 2014, and these may aid in further refinement of the target mitigation area (AZGFD 2012b). See Step 2 for testing/adaptive management for carcass occurrence.

8.5.2 Step 2: Evaluate the Annual Rate of Carcass Occurrence

Because carcass occurrence rates impact the level of effort, developing an initial data-driven value and adaptive management program are critical to the success of this approach. Annual carcass occurrence values reported in Arizona for large mammals range from 1.1 carcasses per mile per year for elk (0.68/km; Dodd and Gagnon 2010) to 2.1 carcasses per mile per year for bighorn sheep (1.2/km; Wakeling et al. 2008, reviewed in Gagnon et al. 2009). Whereas these values are derived from areas having perceived wildlife-vehicle collision problems, and may therefore be high compared to other portions of the state, they represent the best data available for this step. In an effort to be conservative, Tetra Tech weighted these empirical carcass occurrence rates by 0.25 to account for the likelihood that typical carcass occurrence rates in areas with large mammals will be considerably lower than were found in these surveys. The resulting estimate of carcass occurrence rate ranged from 0.3 – 0.5 carcasses per mile of roads per year, or 0.2 – 0.3 carcasses per mile of roads per 7-month period.

Assumptions: This step assumes that the adjusted rates of carcass occurrence are reflective of the rates of carcass occurrence throughout the state, and that carcass occurrence is uniform throughout the mitigation period.

Certainty: Certainty is moderate because the estimate is based on actual rate data for portions of the state; however, it is unknown how well the scaled data will extrapolate to other areas of the state that may have lower or higher rates of carcass occurrence.

Test/Adaptive Management: Once the carcass search/removal program has begun, the rate of carcass occurrence within the target mitigation area can be estimated from the number and locations of carcasses encountered. In order to evaluate if the estimated carcass occurrence rate is adequate in the target mitigation area, the number of carcasses found per mile will be calculated and if this value is less than 0.2 carcasses per mile of roads for the 7-month period then BP Wind Energy will evaluate other potential mitigation areas in Arizona.

8.5.3 Step 3: Calculate the Number of Carcasses Available for Eagles per 100 miles of road

Here, the number of carcasses available annually for eagles per 100 miles of roadway in suitable golden eagle habitat is estimated. A 100-mile metric was chosen because it was the appropriate order of magnitude for this effort to result in an estimate of eagles saved between 0.1-1.0. Multiplying 100 miles by the low end of the range of carcasses per mile per 7-month period (0.2, from Step 2) yielded an estimate of 20 carcasses per 100 miles per 7-month period along roadways in suitable golden eagle habitat. Using the high end of the range of carcasses per mile per year (0.3, from Step 2) yielded an estimate of 30 carcasses per 100 miles of road per 7-month period.

Assumptions: This step makes the same assumption as Step 2, and also assumes that the scale of the analysis in Sections 8.5.1 and 8.5.2 represents a reasonable scale at which to evaluate suitable eagle habitat. It also assumes that roads are equally distributed across suitable golden eagle habitat.

Certainty: Same as Step 2.

Testing/Adaptive Management: Same as Step 2.

8.5.4 Step 4: Calculate the Percentage of Carcasses Used by Golden Eagles

Because estimates of the percentage of roadkill carcasses that might be used by golden eagles are not available in the literature, Tetra Tech interviewed eagle experts David Bittner, Peter Bloom, Gregg Doney, Teryl Grubb, Alan Harmata, Thomas Maechtle, and Brian Millsap. These experts have collectively studied golden eagles for over 200 years, with an average individual experience of greater than 30 years (Table 16). All of the experts interviewed by Tetra Tech have spent considerable time monitoring carcasses and live lures set out for eagle capture, or monitoring carcasses along roads for eagle attendance. The eagle experts suggested that the range of carcasses having associated eagles likely varied from 0-85 percent depending on the time of year, location of the carcass, weather conditions, prey availability, and other variables. To be conservative, Tetra Tech assumed that 20 percent of the carcasses will attract foraging golden eagles.

Assumptions: Assumed that 20 percent of the carcasses will attract foraging golden eagles during some part of any given day.

Table 16. Eagle Experts Contacted and Their Associated Expertise, Affiliation, and Years of Experience

Expert	Expertise	Affiliation	Years of Experience
David Bittner	Eagle ecology Eagle trapping	Wildlife Research Institute	44
Peter Bloom	Eagle trapping Eagle ecology	Bloom Biological, Inc.	35
Gregg Doney	Eagle trapping	Independent raptor researcher	20
Teryl Grubb	Eagle ecology Eagle use of carcasses on roads	USFS Rocky Mountain Research Station	35
Alan Harmata	Eagle ecology Eagle trapping	Montana State University	35
Thomas Maechtle	Eagle trapping Eagle ecology	Big Horn Environmental Consultants	30
Brian Millsap	Eagle trapping Eagle ecology	USFWS	34
Daniel Driscoll	Eagle ecology Eagle trapping	American Eagle Research Institute	28

Certainty: Certainty in this value is low because these data have not been collected systematically and because there are multiple variables that could change the probability that an eagle uses a carcass.

Testing/Adaptive Management: A subset of translocated carcasses will be monitored using cameras to validate BP Wind Energy's estimate of the percentage of carcasses that are used by eagles. If less than 5 percent of the carcasses are visited by eagles over the 7-month period of the carcass search/removal program and weather conditions are normal for the area, BP Wind Energy will evaluate other potential mitigation areas in Arizona using the most recent golden eagle data, or will expand the mileage surveyed if additional mitigation is needed.

8.5.5 Step 5: Calculate the Number of Eagles Per Carcass

As with Step 4, Tetra Tech relied on information from eagle experts (Table 16) to provide data on the number of eagles per carcass. Answers were based primarily on experience with golden eagles, but some experts also included bald eagles in their answers; therefore, this value pertains to both species combined. Their answers suggested that 1 eagle per carcass was the most common (range 1-4 eagles per carcass); however, they have also seen large numbers of eagles in the vicinity of the carcass waiting for an opportunity to feed on the carcass (6-17 golden eagles). Because of the consistency in the responses, Tetra Tech assumed that a single eagle would feed on a carcass at a time.

Assumption: Assumed that a single eagle would feed on a carcass at a time.

Certainty: Certainty in this value is moderate because the experts were consistent that the most likely number of eagles per carcass was one.

Testing/Adaptive Management: Carcass search/removal surveys may also provide validation of the number of eagles per carcass, and a subset of carcasses will be monitored using cameras. Camera data will be used to determine the average and range of numbers of eagles photographed using carcasses.

8.5.6 Step 6: Calculate the Number of Eagles Using Carcasses

To determine the number of eagles using carcasses, Tetra Tech multiplied the estimated number of carcasses available in 100 miles of roadway per 7-month period (20-30, Step 3) by the proportion of carcasses used by eagles (0.2, Step 4) and the number of eagles per carcass (1, Step 5). This yielded a low estimate of 4.0 eagles using carcasses per 100 miles and a high estimate of 6.0 eagles using carcasses per 100 miles in a 7-month period.

Assumptions: Same as Steps 3, 4, and 5.

Uncertainty: Same as Steps 3, 4, and 5.

Testing/Adaptive Management: Same as Steps 2, 4, and 5.

8.5.7 Step 7: Evaluate the Percentage of Eagles Involved in a Vehicle Collision While Feeding on Carcasses

For this step, Tetra Tech asked the eagle experts (Table 16) what percentage of eagles that are feeding on roadside carcasses will likely have a vehicle collision. Responses ranged from “too many” to “rarely”. Two experts provided percentages; one was 1-5 percent and the other was < 20 percent. Based on these values, Tetra Tech used 5 percent.

Assumptions: Tetra Tech assumes that 5 percent of eagles feeding on roadside carcasses are struck by vehicles. The 5 percent rate of vehicle strikes assumed here falls within the range found at the population level (4-7 percent, Hunt 2002; Tetra Tech 2011; K. Jacobson, AZGFD pers. comm.). Tetra Tech interprets this information as supportive of the assumption.

Certainty: Tetra Tech’s certainty for this value is low because it likely depends on a range of values, and available data are anecdotal and have not been systematically collected.

Testing/Adaptive Management: This step can be evaluated if the number of eagles involved in a vehicle collision while exploiting carcasses in Arizona is measured. The number of eagles confirmed to have been killed by vehicle collision in the state during the 7-month period will serve as a minimum estimate of the total number killed, because some carcasses may be collected illegally and some carcasses may be overlooked (e.g., an eagle struck by a vehicle may move away from the roadway before dying). Assuming that AZGFD is able to obtain reasonably accurate records of eagle-vehicle collisions occurring during the carcass search/removal program, BP Wind Energy will be able to use this information and most recent estimate of statewide eagle fatalities from AZGFD to update the estimated proportion of eagle fatalities that is due to vehicle collisions.

8.5.8 Step 8: Calculate the Number of Vehicle-Eagle Collisions per Year in the Absence of Carcass Search/Removal

For this step Tetra Tech multiplied the number of eagles using available carcasses per 100 miles of road in a 7-month period (4-6, Step 6) by the percentage of eagles involved in a vehicle collision while feeding on carcasses (5 percent, Step 7). This equation provides the number of eagles that would be saved by implementing the carcass search/removal program for a 7-month period along 100 miles of road within the target mitigation area. This step yielded an estimate of 0.2 – 0.3 vehicle collisions per 100 miles of road per 7-month period.

Assumptions: Same as Steps 6 and 7.

Certainty: Certainty in this value is low because multiple data points used in this calculation were based on interpreting incidental observations. However, these data are the best available.

Testing/Adaptive Management: Same as Steps 6 and 7.

8.5.9 Step 9: How Many Miles of Roads Will Have Carcass Search/Removal

The following equation was used to determine the total number of mitigation miles per eagle. The estimated high and low ends of the range are presented here.

Total Mitigation Effort (high)

N = Number of eagles that are being mitigated x (100 miles of roads)/ (# eagles struck by vehicles per 100 miles of roads per 7-month period)

N = 1 eagle to be mitigated x 100 miles of roads/0.2 eagle collisions per 100 miles of roads per 7-month period

N = 500 miles of mitigation effort over a 7-month period

Total Mitigation Effort (low)

N = Number of eagles that are being mitigated x (100 miles of roads)/ (# eagles struck by vehicles per 100 miles of roads per 7-month period)

N = 1 eagle to be mitigated x 100 miles of roads/0.3 eagle collisions per 100 miles of roads per 7-month period

N = 333 miles of mitigation effort

Using these equations, if mitigation is required for one eagle, then carcass search/removal will need to occur over 333-500 miles of road for one 7-month period (September-April).

Assumptions: Same as Steps 1-8

Certainty: Certainty is low to moderate because the certainty levels of the input values range from low to moderate (see Steps 1-8)

Testing/Adaptive management: Same as Steps 1-8

8.6 Top-down Approach for Mitigation

This section presents the top-down approach developed by AZGFD for estimating the number of eagles saved from vehicle collisions as a result of implementation of a roadside carcass search/removal program. The top-down approach relies on the following three input parameters, which are detailed in the subsections below: (1) the eagle fatalities attributed to motor vehicle collisions; (2) the total number of road miles within habitat occupied by golden eagles; (3) the number of road miles to be managed. As with the bottom-up approach, the subsections below present the input values and calculations, assumptions, certainty, and testing/adaptive management strategies.

8.6.1 Step 1: Estimate the Number of Golden Eagles Killed by Vehicle Collision in Arizona

The potential effect of vehicle collisions on a given population of golden eagles may be estimated by the following equation:

$$k = n*m*v$$

where **k** is the expected number of golden eagles killed on roads annually; ***n*** is the estimated total number of golden eagles annually occurring in Arizona; ***m*** is the inverse of survivorship (i.e., mortality); and ***v*** is the proportion of golden eagle annual mortality attributed to vehicle collisions.

8.6.1.1 Step 1, Part a. Estimate n, the total number of golden eagles in Arizona

A systematic, late-summer survey of golden eagles was conducted annually during 2006-2011 by Nielson et al. (2012) in the Southern Rockies-Colorado Plateau BCR (BCR 16), which covers western Colorado, eastern Utah, northwestern New Mexico, and the northern one-third of Arizona (NABCI 2000). The annual density of golden eagles of all ages in the BCR, calculated from data in Nielson et al. (Table 5; 2012), was 0.003-0.009 eagles/km^2 (90 percent confidence interval). Areas of tribal lands also contain breeding eagles; however, these data are not publically available (R. Murphy, USFWS, 2012 pers. comm.).

Assuming that 1) adults comprise about one-half to two-thirds of the golden eagle population (based on a mean of 51.7-69.2 percent of golden eagles classified as adults or adults/subadults in annual late summer surveys across most of the western U.S. by Nielson et al. 2012), and 2) about one-fourth of adult golden eagles probably are nonbreeding individuals (based on simulations describing saturated breeding populations at Moffat's equilibrium; Table 3 in Millsap and Allen 2006), there may be 0.004-0.005 golden eagles/km^2 in this habitat. Given this collective perspective, an estimate of 0.003-0.009 golden eagles/km^2 for BCR 16, based on data in Nielson et al. (2012), seems a low approximation of the species' mean density in Arizona. However, this range seems more plausible when considering that the southwestern Arizona region supports few breeding golden eagles (Driscoll 2005), and is used below to derive a conservative population estimate within golden eagle habitat in Arizona (Figure 11).

Using records of occupied breeding areas acquired during surveys of golden eagle nests in Arizona in 2011 and 2012 (AZGFD 2011b, SGEMC 2012), a kernel analysis was performed to exclude areas of very low golden eagle nesting density (i.e., below that in the Mohave Desert portion of west central Arizona, noted above; Figure 11). A spatial configuration analysis (nearest neighbor) of documented occupied nests suggested uneven distribution of breeding areas throughout the state (AZGFD unpublished data). Nests were examined using a kernel analysis function with a 40-mile (64-km) buffer to highlight areas likely to be used by golden eagles (including breeding, foraging, and flight corridors; hereafter, golden eagle habitat). The 40-mile buffer distance was selected because it was inclusive of areas with high breeding densities but excluded low density areas (K. Jacobson, AZGFD, 2012 pers. comm.). This analysis was further refined to exclude most tribal lands and the Phoenix Metro Area (Figure 11). This area was also used in Step 2 (Section 8.6.2) and the bottom-up approach (Section 8.5.1) to estimate the potential road mitigation miles. The resulting area was digitized and became the functional unit to derive the state population size. This resulted in 121,868 km^2 (47,053 square miles) of the state (excluding tribal lands) deemed as suitable golden eagle habitat for the basis for estimating golden eagle population size (n). Total population was then estimated as:

$$n = d * a$$

where ***n*** = total number of golden eagles in a geographic unit of interest, ***d*** = estimated density (0.003 to 0.009/km^2, from above), and ***a*** = total area (km^2) in the geographic unit of interest (121,868 km^2 for the area of Arizona depicted in Figure 11). Thus,

$$n = 0.003 \text{ to } 0.009/km^2 * 121{,}868\ km^2 = 365 \text{ to } 1{,}097 \text{ golden eagles}$$

Use of the higher bound of the estimate (1,097 eagles) based on the upper 90 percent confidence internal of the eagle density may be justified to help account for occurrence of non-resident individuals during migration and winter periods. The lower bound seems implausible, however, because at least 428 breeding adults were represented by 214 distinctly separate breeding areas documented as occupied by breeding pairs during 2011-2012 nest surveys (AZGFD 2011b, SGEMC 2012), cross-referenced with a dataset of recently occupied (i.e., within the last 10 years) breeding areas obtained from Arizona's HDMS (2012). In order to adjust population size based on the Arizona breeding data, the same assumptions regarding adult composition in the population (see Section 8.6.1.1 above) were applied to the 428 breeding eagles estimated from nest surveys. This resulted in a reasonable, conservative estimate of the lower bound of a population estimate of 827 individual golden eagles. Thus, the population estimate on which this mitigation program is based is 827-1,097 golden eagles.

Assumptions: Data from Nielson et al. 2012 combined accurately reflects the range of breeding eagles within Arizona. Numbers of golden eagles migrating from other regions and overwintering in Arizona do not substantially influence the estimate of population size.

Certainty: Moderate. Based on multiple data sources that provide similar data ranges.

Test/Adaptive Management: Several independent efforts to quantify population size of golden eagles in Arizona are ongoing or anticipated in 2013-2014 and can be used to update the estimate of population size. The studies include completion by the end of the 2013 breeding season of a statewide aerial nest survey of accessible and suitable habitat within non-tribal land (includes Department of Defense lands) in each of Arizona's three main BCRs; a minimum of two years (2013-2014) of aerial nest surveys in concert with follow-up ground surveys to document occupancy of nests statewide; and regular monitoring of productivity of a representative sample of breeding areas within each of Arizona's main BCRs (McCarty and Jacobson 2011).

8.6.1.2 Step 1, Part b. Estimate m, the inverse of survivorship (i.e., mortality)

Two relatively unbiased estimates of golden eagle survival exist. First, annual survival rates for all age classes estimated from 2006-2011 golden eagle survey data in the western U.S. (Nielson et al. 2012) averaged 0.90 (n = 5, range 0.70 – 1.0). The second source is Hunt's (2002) radio-telemetry study of the species from the Altamont Pass Wind Farm in California. He reported estimates of 0.84 (SE = 0.04), 0.79 (0.02), and 0.91 (0.02) for juveniles, subadults, and adults, but acknowledged that juvenile and subadult survival rates were probably higher and lower, respectively, than in most populations. Survival rates of other species of *Aquila* eagles lie within the middle of the 0.80–0.90 range (e.g., 0.84 for *A. heliaca*; Rudnick et al. 2005).

Assumptions: Survival rates calculated by USFWS biologists B. Millsap and R. Murphy for the four BCRs (9, 10, 16, 17) sampled by late-summer aerial transect surveys are a good approximation of survival rates of golden eagles in Arizona. Data from Altamont Pass, California collected by Hunt (2002) are unbiased estimates of background vital rates and were not significantly biased by transmitter failures or the high rate of mortality due to collisions with wind turbines and electrocution (i.e., vehicle strikes are not compensatory with other sources of mortality). Survival rates of *Aquila* species are similar throughout the genus.

Certainty: Moderate, because although the estimates from Hunt 2002 represent unbiased data for the area, the location of the study in an area with high golden eagle fatalities due to wind farm collisions may bias the data when applied to the state of Arizona. Similarly, data from Nielson et al. 2012 results assume late summer sampling provides an unbiased estimation of eagles breeding in the desert and that estimates from BCR 16 apply to the entire state of Arizona.

Test/Adaptive Management: Survival of golden eagles in the western U.S. is being documented currently via satellite telemetry and results should be available within 2-3 years to improve upon this important demographic metric (R. Murphy, USFWS, 2012 pers. comm.).

8.6.1.3 Step 1, Part c. Estimate v, the proportion of golden eagle annual mortality attributed to vehicle collisions

Vehicle collisions represented 5 (21 percent) of 24 golden eagle fatalities reported in Arizona during 2000-2011, but this form of mortality is more likely to be discovered and reported than other sources. However, in the past year AZGFD documented six vehicle-collision fatalities of golden eagles in Arizona (K. Jacobson, pers. comm.). If annual mortality of the golden eagle in Arizona is 0.1-0.2 (inverse of survival rate, above) and the population size is at least 827 individuals (above), six fatalities attributed to vehicle collisions represent 4-7 percent of the year's mortality. Using radio telemetry, Hunt (2002) attributed four (4 percent) of 100 fatalities of golden eagles at the Altamont Wind Resource Area in California to vehicle collisions. This level may be lower than that in other areas because 1) some transmitter failures that occurred during the study may have been associated with vehicle collision, and 2) substantial mortality due to collision with wind turbines in the area may have been compensatory with some vehicle-collision mortality. Based on a comprehensive review of records in the U.S. public domain, 5 percent (119) of records of human-caused fatalities of golden eagles were due to vehicle collisions (Tetra Tech 2011). Stemming from close corroboration among the last three sources of information, the percentage of golden eagle fatalities in Arizona attributed to collision with vehicles likely is within or slightly above this 4-7 percent range and is less likely to be near the

21 percent level suggested by incidental reports from the state. Based on a synthesis of these collective sources, USFWS believes a range of 5-10 percent is a reasonable approximation of fatality rate (R. Murphy, USFWS, 2012 pers. comm.).

Assumptions: 1) data from Altamont Pass, California collected by Hunt (2002) are unbiased estimates of background vital rates and were not significantly biased by possible transmitter failures or the high rate of mortality due to collisions with wind turbines and electrocution (i.e., vehicle strikes are not compensatory with other sources of mortality); 2) incidental discoveries of vehicle-caused fatalities are reasonably representative of the incidence of this form of mortality.

Certainty: Low to moderate, because although the estimates from Hunt 2002 represent unbiased data for the area, the location of the study in area with high golden eagle fatalities due to wind farm collisions may bias the data when applied to the state of Arizona. Other records used to develop the estimate were based on incidentally collected information, and may therefore be biased.

Test/Adaptive Management: The proportion of golden eagle annual mortality attributed to vehicle collisions can be evaluated during the carcass search/removal program using the observed carcass use by eagles, availability of carcasses, and exposure of eagles to vehicle collisions. Additionally, results of telemetry work being executed by USFWS in New Mexico and elsewhere may provide insights relevant to golden eagle mortality rates in Arizona.

8.6.1.4 Step 1, Part d. Estimate k, expected number of golden eagles killed on roads annually

The number of golden eagles killed annually due to vehicle collisions in Arizona (k) is calculated from the product of the three parameters n, m, and v, calculated in Steps 1 part a, b, and c, respectively. Values used were recommended by USFWS (R. Murphy, pers. comm.). Both values of the vehicle-collision mortality rate (v = 0.05 and 0.10) were used to provide a range of values.

When v = 0.05, then k = 1097*0.20*0.05 = 11 golden eagles killed on roads annually in Arizona

When v = 0.10, then k = 1097*0.20*0.10 = 22 golden eagles killed on roads annually in Arizona

Assumptions: Same as Steps 1a-1c.

Certainty: Low to moderate based on information in Steps 1a-1c.

Test/Adaptive Management: Same as Steps 1a-1c.

8.6.2 Step 2: Estimate the Total Mileage of Roads within Habitat Suitable for Golden Eagles

Within the area of golden eagle habitat identified in Step 1 (Figure 11) GIS tools were used to calculate the mileage of roads for potential mitigation (see Section 8.6.1.1). The GIS analysis identified 5,440 miles (8,755 km) of roadways within golden eagle habitat as potential mitigation segments (Figure 11).

Assumptions: 1) golden eagle habitat is correctly defined, 2) golden eagle fatalities attributed to vehicle collisions in Arizona occur only on class 1-3 roads; 3) golden eagle fatalities attributed to vehicle collisions in Arizona are randomly distributed throughout areas with habitat suitable for the species; 4) carcasses that attract eagles to feed along roadways are distributed randomly throughout areas with suitable habitat for golden eagles.

Certainty: Moderate. Much of the suitable golden eagle habitat within the state of Arizona has been surveyed for golden eagle breeding areas in the past 2-3 years; however, there remain large areas of suitable habitat that have not been surveyed in recent years (AZGFD 2011b, SGEMC 2012). Data on wildlife-vehicle collisions suggest that primary paved roads have higher rates of collisions (see Section 9.1.2). All known vehicle strikes of golden eagles in Arizona occurred on class 1-3 roads (M. Piorkowski, AZGFD, 2012 pers. comm.).

Test/Adaptive Management: Ongoing monitoring of golden eagle breeding areas, in addition to other research on golden eagles in Arizona, will improve upon the definition of suitable golden eagle habitat. Statewide efforts to document golden eagle vehicle-collision fatalities will help refine the assumption about the distribution of golden fatalities. Monitoring of roads during the carcass search/removal program will provide information on whether carcass occurrence is distributed randomly or is concentrated in specific areas.

8.6.3 Step 3: Calculate the Number of Road Miles for Carcass Search/Removal to Offset the Loss of One Golden Eagle.

The number of miles over which the carcass search/removal program is implemented to prevent vehicle-collision fatality of one golden eagle is calculated by dividing the number of miles of roadway within the golden eagle habitat (Step 2) by the annual vehicle collision mortality estimate derived in Step 1.

Step 1 = 11-22 golden eagle fatalities per year

Step 2 = 5,440 miles

Number of road miles to mitigate for one golden eagle fatality = 5,440 miles/11 to 22 golden eagle fatalities per year = 247 to 495 miles (398 to 797 km).

Based on the above estimates and calculations, carcass search/removal would need to be conducted along 247 to 495 miles (398 to 797 km) to reduce vehicle collision fatalities of golden eagles by one individual.

Assumptions: Same as in Steps 1 and 2 above.

Certainty: Moderate, based on certainty of estimates used in Steps 1 and 2 above.

Test/Adaptive Management: same as Steps 1 and 2 above.

8.7 Comparison of the Bottom-Up and Top-Down Approaches

The bottom-up and top-down mitigation approaches obtain an estimate of miles required to mitigation for one eagle from either the local level (bottom-up) or the population level (top-down). These two approaches overlap in few input variables (Table 17); therefore, they represent relatively independent approaches to developing this mitigation strategy. Despite their differences, both the bottom-up and top-down approaches resulted in similar ranges of

Table 17. Comparison of Inputs and Adaptive Management Between Bottom-up and Top-down approaches

Input	Bottom-up	Top-down	Adaptive Management
Estimating number of eagles killed by cars			
Total number of golden eagles in Arizona		X	New and updated data including locally available data, current scientific literature, and carcass search/removal results should be assessed at regular intervals
Golden eagle mortality rates		X	New and updated data including locally available data, current scientific literature, and carcass search/removal results should be assessed at regular intervals
Probability of mortality due to car strikes	X	X	Monitoring of the mitigation area, in addition to incidental eagle-vehicle collision records, will evaluate the estimated probability of eagle-vehicle collisions
Estimating number of miles to be surveyed			
Total roads		X	Not subject to adaptive management
Total number of golden eagles in Arizona		X	New and updated data including locally available data, current scientific literature, and carcass search/removal results should be assessed at regular intervals
Annual rate of carcass occurrence	X		To be explicitly tested in adaptive management by calculating actual number of carcasses found
Total carcasses available for eagles	X		To be explicitly tested in adaptive management by calculating actual number of carcasses found
Percent of carcasses with eagles	X		To be explicitly tested in adaptive management by using game cameras
Number of eagles per carcasses	X		To be explicitly tested in adaptive management by using game cameras
Number of carcasses with eagles	X		Calculation based on above variables
Percent of eagles on carcasses involved in vehicle collisions	X		Calculation based on above variables
Number of eagles that would be involved in vehicle collisions	X	X	Evaluated with monitoring results and incidental eagle-vehicle collision records

mitigation miles. The bottom-up approach resulted in an estimated range of 333 to 500 miles (536 to 805 km) of mitigation per eagle, whereas the top-down mitigation resulted in an estimated range of 247 to 495 miles (398 to 797 km) of mitigation per eagle. To be conservative, BP Wind Energy will use the highest value and so will execute 500 miles (805 km) of mitigation over a 7-month mitigation period.

Although few of the input variables for the bottom-up and top-down approaches overlap, adaptive management and effectiveness monitoring for both approaches can help inform the other. Both approaches use the information collected on eagle use of carcasses either in the calculation of miles required (bottom-up) or to confirm that eagles are using carcasses in the mitigation area (top-down). Similarly, the bottom-up approach does not explicitly rely on population size or demographics, but these data can be used to inform the most advantageous location for mitigation.

8.8 Implementation of the Roadside Carcass Search/Removal Program

BP Wind Energy will execute a carcass search/removal program as a compensatory mitigation measure. BP Wind Energy recognizes that there is uncertainty associated with take and compensatory mitigation which can be adaptively managed. After initiation of commercial operation of the Project, BP Wind Energy will execute one 7-month period (September – April) of roadside carcass search/removal that results in the equivalent of one eagle saved during that period (Figure 12). If the adaptive management and testing outlined above indicates that the roadside carcass search/removal program has successfully mitigated for one eagle, BP Wind Energy will stop the mitigation unless an additional eagle fatality occurs. If an eagle fatality occurs, BP Wind Energy will resume the carcass search/removal program or will implement an equivalent alternative (e.g., power pole retrofitting; Figure 12) in order to stay one eagle equivalent ahead of actual fatalities. BP Wind Energy will evaluate the overall effectiveness of the carcass search/removal program by reviewing data collected as outlined in the test/adaptive management in Section 8.5 in consultation with USFWS, BLM, Reclamation, and AZGFD.

For any eagle fatality that occurs, BP Wind Energy will evaluate the fatality in the context of environmental conditions at the approximate time when the fatality occurred (e.g., unusual weather conditions, management activity within the Project area) and the location of the fatality and will actively manage any elements under BP Wind Energy's direct control (e.g., localized carcasses). If this review identifies a problem turbine with multiple fatalities, BP Wind Energy will consult with BLM, Reclamation, USFWS, and AZGFD. BP Wind Energy used the best available science to estimate golden eagle take associated with the Project; however, the models created by the USFWS are currently untested. This could result in take being greater than outlined in this ECP-BCS. If take were above the levels discussed here, BP Wind Energy would re-consult with USFWS, BLM, Reclamation, and AZGFD.

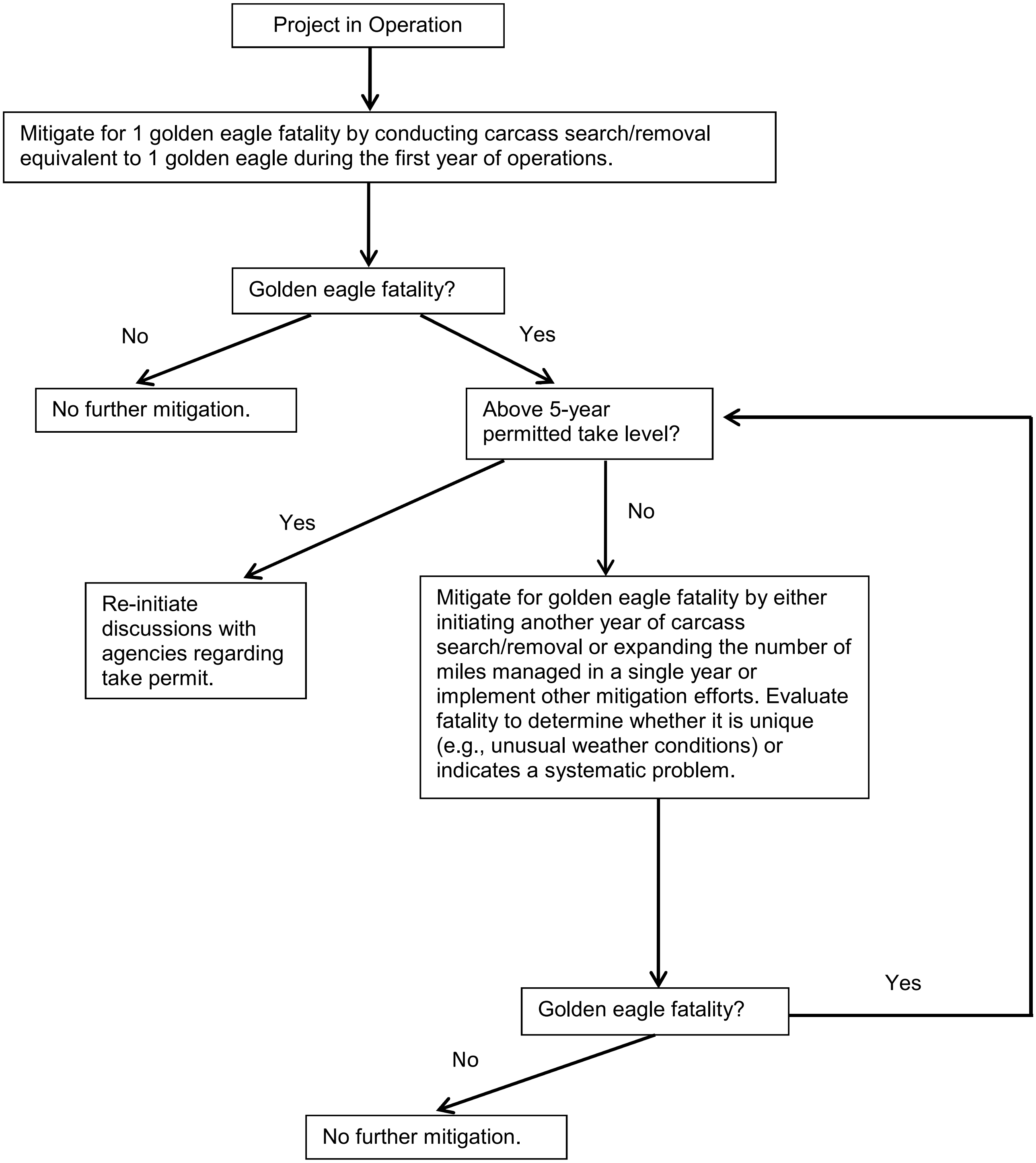


Figure 12. Adaptive Management of Golden Eagle Fatalities at the Mohave County Wind Farm

BP Wind Energy may choose or need to adaptively manage the carcass search/removal program. If the carcass search/removal program appears to be providing adequate mitigation but new data suggest that an alternative compensatory mitigation option (e.g., new cost-effective technology, availability of pooled mitigation fund) can provide a more cost-effective benefit to golden eagles, BP Wind Energy may choose an alternative mitigation approach in consultation with the agencies. In contrast, if early tests of the carcass search/removal program do not appear to be providing adequate mitigation based on the criteria described In Section 8.5 during the initial stage of the 7-month effort, BP Wind Energy will work with the USFWS, AZGFD, BLM, and Reclamation to 1) modify the carcass search/removal program or 2) conduct an alternative mitigation strategy which may include power pole retrofits or 3) implement other compensatory mitigation options. If early evaluation of the current carcass search/removal program is deemed unsuccessful based on criteria outlined in Section 8.5 and at least half of the mileage has been completed, it is BP Wind Energy's understanding that they will be given a credit for a minimum of half an eagle fatality for testing of the carcass search/removal program because given the best available information to date the USFWS concurs that this effort should provide protection to golden eagles and provide additional information to inform USFWS about the success of non-power pole mitigation options. Adaptive management with respect to the carcass search/removal program is addressed above in Section 8.7.

8.9 Operational Mitigation and Adaptive Management for Eagles

BP Wind Energy has committed to several eagle-specific avoidance and minimization measures relative to the Squaw Peak breeding area that was occupied in 2012. The Squaw Peak breeding area, in the northwestern corner of the Project footprint (Alternative A), includes a north-south ridgeline characterized by a break in topography north of Squaw Peak at the southern end of the ridgeline. Collectively the two features comprise the most distinct topographical rise within the Project area and contain the majority of golden eagle observations on the Project (Figures 2 and 3). Sixteen eagle nest structures, classified as a single breeding area, are scattered along the western face of an approximately 1-mile portion of the ridgeline; a nest in the center of this cluster was active in 2012.

During the first five years of operation, which coincide with the term of the incidental take permit, BP Wind Energy will create a curtailment zone where turbines will be curtailed during the breeding season when the Squaw Peak breeding area is occupied (see Section 8.9.1, Adaptive Management). The boundary of the curtailment buffer was collectedly derived by the USFWS, BLM, Reclamation, Western, AZGFD, and NPS during an in-person meeting on October 2, 2012 at the USFWS Phoenix office (Table 1). The initial curtailment zone was developed by the USFWS's Eagle Programmatic Permit Implementation Team (EPPIT; R. Murphy, USFWS, 2012 pers. comm.) following the general approach described in the Draft ECP Guidance for categorizing the level of risk where one-half of the mean nearest neighbor distance is considered the defended portion of each breeding area and thought to encompass the greatest activity by breeding eagles and their young (USFWS 2011a). Based on aerial surveys in late winter and spring 2012, 16 possible breeding areas were identified on and within 10 miles (16 km) of the Project boundary (Section 2.3.3). At least eight of these were classified as occupied, based on observations of adults incubating eggs, of nestlings or fledglings, or of adults near nests plus sign of recent activity at nests. EPPIT considered five other breeding areas as possibly occupied, based on signs of recent nest construction or refurbishment plus fresh whitewash at or near nests. Three other potential breeding areas were considered unlikely to be occupied; however, because each was represented only by a single nest structure that lacked recent construction activity. Because the USFWS considers the Project an "on-ramp" project, initiated several years before the January 2011 Draft ECP Guidance, the criterion of simultaneously occupied territories was generally used during review of the Project by the EPITT (R. Murphy, U.S. Fish and Wildlife Service, 2012 pers. comm.). Using the eight breeding areas verified as occupied and five others considered likely to be occupied, USFWS measured the distance from the center of each nest cluster to that of the nearest nest cluster. One-half of the mean inter-nest distance was 2.5 miles (4.0 km).

The initial curtailment zone was a 2.5 mile (4.0 km) radius circle centered on the active Squaw Peak nest. However, review by the USFWS EPPIT team and discussions with the resource agencies at the October 2012 meeting described above indicated that the documented eagle activity in conjunction with the topography and wind direction was suggestive that risk was not uniformly distributed within the 2.5-mile radius circle. Rather, risk was predicted to be higher to the west and the south and lower to the east of the ridgeline. The resource agencies agreed, based on best professional judgment, that the optimal curtailment zone would be reduced by about 1 mile (0.8 km) on its east side and extended about 0.5 to 1 mile (0.8 to 1.6 km) on its south and southwest sides (Figure 1).

8.9.1 Adaptive Management of Curtailment Program

BP Wind Energy developed a curtailment program focused on the breeding activity at the Squaw peak nest because telemetry studies of golden eagles have shown that the intensity of eagle use is highest surrounding an active nest (Watson et al. 2012; R. Murphy, USFWS, unpublished telemetry data). The scope of the curtailment program will focus on the first five years of operation as that is the period over which USFWS currently states they can authorize an eagle take permit (USFWS 2011a). Section 8.9.1.5 provides additional details on the adaptive management of curtailment program within that 5-year period. Although the curtailment program was not designed to address non-breeding or wintering eagles, if these types of individuals use the area, they will be documented during eagle use surveys (Section 8.9.1.2). BP Wind Energy will adaptively manage the timing of the curtailment program using occupancy surveys, eagle use surveys, and telemetry as a basis for determining when curtailment should begin and end. Occupancy surveys of the Squaw Peak breeding area will serve to determine when curtailment needs to be initiated in any given breeding season. Eagle use surveys, coupled with telemetry, will serve to determine when curtailment can be concluded in any given breeding season after being triggered. Finally, the spatial extent of curtailment within the existing curtailment zone will be based on eagle use survey results. As detailed in Section 8.9.1.4, curtailment will be triggered if occupancy surveys determine that the Squaw Peak breeding area is occupied. Curtailment of turbines within the curtailment zone will occur from 11:00 to 16:00 in December 1 – March 15, and from 4 hours after sunrise to 2 hours before sunset March 16 – August 31, or 2 months after the date fledgling eagles leave the nest based on golden eagle activity patterns (R. Murphy, USFWS, unpublished data). At least three years of eagle use data will be collected prior to considering any relaxation of the spatial extent or proposed timing of curtailment within the existing curtailment zone.

8.9.1.1 Occupancy Surveys

Starting in December when courtship and nest building begins (Driscoll 2010), monthly surveys will be performed to assess the occupancy of the Squaw Peak breeding area. Occupancy surveys will include a combination of ground-based and aerial surveys. It is expected that three ground vantage points should provide adequate visual coverage of the 16 known nests in the Squaw Peak breeding area. Ground-based surveys will occur for 4 hours per survey. A single aerial survey will also be conducted each breeding season in at least the first three years of operation between mid-March and April to capture the most likely period when egg laying or incubation could occur (Driscoll 2010). Occupancy of breeding areas and nests will be defined according to the Arizona Golden Eagle Survey and Monitoring Protocol (SGEMC 2011).

<u>Occupied Breeding Area</u>: An occupied Breeding Area must have a nest where at least one of the following activity patterns is observed:

a. A recently repaired nest with fresh sticks, or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath.
b. One adult and one bird in immature plumage at or near a nest, if mating behavior was observed (display flight, nest repair, copulation).
c. Two adults present on or near the nest.
d. One adult sitting low in the nest, presumably incubating.
e. Eggs seen in the nest.
f. Young seen in the nest.

<u>Unoccupied Breeding Area</u>: A nest or group of alternate nests at which none of the activity patterns diagnostic of an occupied Breeding Area were observed in a given breeding season.

<u>Active Nest</u>: A nest in which eggs have been laid.

The breeding area will be considered occupied if any of signs (b) through (f) of occupancy listed above are observed. If only sign (a) is observed, a follow-up survey will be conducted within 2 weeks to verify occupancy status. The breeding area will be considered unoccupied if signs (b) through (f) above are not detected after a minimum of four consecutive monthly surveys have been conducted (adapted from Driscoll 2010). Occupancy surveys will continue until one of the following occurs:

1) The breeding area is determined to be unoccupied;

2) A nest is determined to be active, upon which eagle use surveys will begin (see Section 8.9.1.2); or

3) The breeding area is occupied but there is no active nest by the end of April.

8.9.1.2 Eagle Use Surveys

The objective of the eagle use surveys is to quantify seasonal distribution and intensity of eagle use of the curtailment zone, regardless of eagle age, residency, or breeding status. A utilization distribution (possibly including data obtained via telemetry) will form the decision-making basis for adaptive management within the existing curtailment zone during the first five years of operation. Our null hypothesis is that there is little to no eagle activity in the Squaw Peak area when the associated breeding area is unoccupied. We will test this hypothesis by comparing results from occupancy surveys and eagle use surveys. Eagle use surveys will occur at up to three survey locations that provide good views of the active nest and the turbines within the curtailment zone. Surveys will be 8-hour long observations at each point.

Eagle use surveys will be performed regularly during the first three years of operation. In the first two years, surveys will be performed every other week year-round. In the third year, if eagles were seen during the non-breeding season, surveys will be performed a minimum of every other week during the breeding season (December to fledging in July or August) and a minimum of once per month during the rest of the year. If eagles were not seen or were seen minimally during the non-breeding season, surveys will be performed every other week during the breeding season and effort may be reduced during the non-breeding season. Survey efforts may be reduced during the breeding season if efforts to capture both members of the breeding pair at Squaw Peak are successful (i.e., transmitters are attached and shown to be fully operational). In this event, BP Wind Energy will pay for data transfer services for the manufacturer-guaranteed life of the transmitters. These data will be provided to the USFWS for additional analysis and research.

8.9.1.3 Telemetry Monitoring

A state and federally permitted biologist may attempt to capture adult golden eagles at the Squaw Peak breeding area. If capture attempts are successful, data from telemetered individuals will be collected via satellite. Locational data will be used to determine the home range kernel estimates by month to document the distribution of use of the Squaw Peak breeding area by golden eagles.

8.9.1.4 Curtailment Implementation

Curtailment of turbines within the existing curtailment zone will be implemented in order to avoid and minimize the risk of collisions to eagles using the Squaw Peak breeding area. Curtailment will be triggered in the first five years of operation if occupancy surveys determine that the Squaw Peak breeding area is occupied. Curtailment of turbines will occur daily from 1) 11:00 – 16:00 in December 1 – March 15, and 2) 4 hours after sunrise until 2 hours before sunset from March 16 – September 30. This timing corresponds to the approximate peak period of flight activity of golden eagles in northeastern Arizona and northwestern New Mexico, as determined by satellite telemetry (R. Murphy, USFWS, unpublished telemetry data), but extends during mid-winter to account for the peak of courtship and territorial display activity by breeding adults. Curtailment of turbines within the curtailment zone in any given breeding season will continue until one of the following occurs:

1) There is no active nest by the end of April (Driscoll 2010). The assumption is that adult birds will gradually disperse away from a nest when it is no longer active; this assumption will be evaluated by the ongoing eagle monitoring at the Project. If this assumption is not supported by results of the eagle occupancy surveys, and these surveys instead indicate that breeding eagles remain near the nest year-round,

curtailment will be conducted from 11:00 – 16:00 in October 1 – March 15, and from 4 hours after sunrise to 2 hours before sunset from March 16 – September 30;

2) The active nest is determined to have failed as indicated by two, 8-hour eagle use surveys without any signs of activity (i.e., adults perched at the nest site, adult in the nest, eggs in the nest, young in the nest); or

3) It is two months post-fledgling or less if fledglings have left the curtailment zone. Two months was selected because in a recent study by USFWS biologists, 33 PTT-marked juvenile golden eagles were within 3 km of their nest 90 percent of the time for at least 2 months (R. Murphy, USFWS, 2012 pers. comm.).

8.9.1.5 Adaptive Management

Data from the surveys and telemetry monitoring will be reviewed by BP Wind Energy, USFWS, BLM, Reclamation, and AZGFD annually to assess the evidence of eagle use of the curtailment zone. Golden eagle occurrence and breeding effort are related to prey availability and, to a lesser extent, weather (e.g., winter severity, precipitation; Millsap 1981, Watson 1997, Steenhof et al. 1997, Kochert et al. 2002). Abundance of the black-tailed hare (*Lepus californicus*), a major prey species of golden eagles in western states (Kochert et al. 2002), exhibits marked annual variation, such that surveys and studies focused on occurrence and breeding status of eagles should encompass multiple years. Thus, at least 3 years of use distribution data using telemetry and/or direct observation will be collected on golden eagles in the Squaw Peak area before the plan for curtailment of turbines within the existing curtailment zone, as outlined here, is revisited. If, after 3 years, eagle use data from telemetry and direct observations indicate eagles are not present during non-breeding portions of the year or if they are present, that use patterns are much reduced compared to the nesting season, then curtailment may be reduced or spatially altered within the existing curtailment zone to reflect eagle use.

8.10 Mitigation and Adaptive Management for Non-eagle Bird Species

This section provides an adaptive management framework in which thresholds will trigger additional avoidance and minimization measures, as well as compensatory mitigation for non-eagle bird species.

8.10.1 Thresholds

BP Wind Energy will implement mitigation for non-eagle, migratory bird species if either an annual or a turbine-specific threshold is crossed. Thresholds are a transparent means of demonstrating accountability and good-faith effort in protecting migratory birds if unanticipated, high levels of fatalities occur. BP Wind Energy is committed to avoiding and minimizing losses of migratory birds at the Project and incorporates the threshold approach to respond to unforeseen fatality events, first and foremost by identifying and correcting problems on-site and, as a last resort, through the use of compensatory mitigation.

BP Wind Energy will employ thresholds for two types of exceedances: systematic and rare. A systematic threshold exceedance will be defined as a mean annual rate of fatality over the course of any given year that exceeds the annual threshold. A rare threshold exceedance will be defined as an event at a single turbine in which Project-related fatalities occurring within a single search period are twice the magnitude of the annual threshold.

Thresholds for non-eagle birds will be based on the mean and variance of fatality rates found at wind energy facilities in desert regions in the western U.S. (Table 7b). Fatalities rates from regional projects were used to develop thresholds rather than the results from pre-construction avian use surveys because studies suggest that pre-construction use surveys are not good predictors of rates of fatalities (e.g., Ferrer et al. 2012). In addition, WEST (2011) stated that fatalities at similar facilities provide more accurate predictions of rates of fatalities. Furthermore, this approach adheres to the Land-based Wind Energy Guidelines which are intended to be voluntary and developer-driven according to the USFWS (USFWS 2012). Although fatality monitoring studies do not share identical methodologies (e.g., type of carcasses used for searcher efficiency and carcass persistence trials, fatality estimate methods), they do represent the current state of knowledge, and threshold values will be updated as new data become available. The systematic threshold for annual non-eagle bird fatalities will be two SD (1 SD = 0.83 birds/MW/year) above the western desert region average of 2.05 birds/MW/year. This threshold value is 3.71 birds/MW/year (6.65 birds/turbine/year). BP Wind Energy chose two SD as a threshold because 97.5 percent of annual fatality estimates in the desert region western U.S. would fall below that number (based on Table 7b); therefore, a value above this represents an extreme event. The rare threshold value will be defined as twice the systematic threshold, or 13.30 non-eagle bird fatalities within a single search period at one turbine.

Thresholds will also be implemented for two subgroups of non-eagle birds that are of particular concern: (1) raptor species, and (2) sensitive species (BLM Sensitive species and AZGFD SGCN Tier 1A and 1B species, combined). The threshold for the raptor subgroup uses the non-eagle fatality threshold scaled by the proportion of pre-construction bird use due to raptors. Specifically, detections of non-eagle raptors made up 13.3 percent of all non-eagle bird detections; therefore, the systematic threshold for raptor species will be 13.3 percent of the non-eagle bird systematic threshold, or 0.49 raptors/MW/year (0.88 raptors/turbine/year). This method results in the rare threshold for raptors of 1.76 raptors/turbine/year following the same rationale as for non-eagle birds (twice the systematic threshold).

The threshold for the sensitive species subgroup (i.e., BLM Sensitive species and Tier 1A, 1B species) will be the detection of three sensitive species carcasses during a single year of monitoring (standardized or incidental). This threshold value was chosen because very few detections of sensitive species were made during pre-construction surveys (10 total detections excluding eagles from 2007-2011; Appendix A).

Incidental and WIRS detections will count towards the rare threshold and the sensitive species systematic threshold because both of these thresholds use uncorrected counts of carcasses. However, because the non-eagle bird systematic threshold requires systematically collected data, incidental and WIRS detections will not count toward the non-eagle bird systematic threshold.

8.10.2 Timing of Trigger Evaluation

BP Wind Energy will proactively review post-construction fatality monitoring data to identify threshold exceedances quickly regardless of when in the reporting cycle they occur. For example, if a rare threshold is exceeded in a given season, BP Wind Energy will respond before the end of that season. This in turn will enable a swift response by BP Wind Energy in terms of assessment of the issue, determination of corrective measures, and communication with resource agencies.

8.10.3 Compensatory Mitigation

In the event that mitigation thresholds are exceeded and the problem cannot be locally corrected, mitigation payments will be made to selected funds that benefit the bird species affected. The mitigation payments are voluntary measures provided by BP Wind Energy. These may include the research branch within the AZGFD, or non-profit organizations or partnerships, or a combination thereof, to be determined in consultation with USFWS, BLM, Reclamation, and AZGFD. Most fatalities at wind projects are nocturnal migrants (e.g. Thompson et al. 2011b), many species of which only pass through the Project area during migration and use habitats not found within the Project area (e.g., ruby-crowned kinglet, yellow-rumped warbler). In order to provide a benefit for these species, payments would need to be targeted to regional or national organizations (e.g., Partners in Flight, Audubon Society) that perform conservation of habitat at breeding and wintering grounds that occur off-site. Funds for mitigation of locally breeding species covered by the MBTA would target organizations that perform desert or other local bird habitat restoration, or have programs that address reducing bird fatalities (e.g., removing or capping mining claim markers which are a source of mortality for small birds; Zuckerman 2012). Selection of appropriate funds would be subject to approval by the BLM and Reclamation. Mitigation for individual threshold exceedance (rare or systematic) will range from $10,000-$25,000 per year, depending on the type and recurrence frequency (Table 18).

Mitigation payments for any given year will be capped at the maximum value for the highest threshold trigger exceeded in that year and total Project lifetime payments will be capped at $200,000. For example, in Year 1, the cap will be $10,000 for either a rare or systematic threshold exceedance, but not both (Table 18, Figure 13). If a lower value is triggered such as the $15,000 mitigation for a rare threshold exceedance at a single turbine in two consecutive years or a systematic threshold exceedance with all turbines pooled in any two consecutive years, then the payment will be the maximum cap of $20,000 less any prior payments in that same year or $5,000 (Table 18, Figure 13).

Table 18. Mitigation Schedule for Non-eagle Birds

Event Type	Description	Mitigation
Rare (single turbine)	First occurrence at that turbine (e.g., Year 1)	$10,000
	Two time occurrence at the same turbine in any two consecutive years (e.g., Years 1 and 2)	$15,000
	Second time occurrence at the same turbine in same season of any two consecutive years (e.g., summer Year 1 and summer Year 2)	$20,000
	Third time occurrence at the same turbine in any three consecutive years (e.g., Years 1, 2, and 3)	$25,000
Systematic (all turbines pooled)	Annual occurrence (e.g., Year 1)	$10,000
	Any two consecutive years (e.g., Years 1 and 2)	$15,000
	Annual occurrence in any two consecutive years with concentration in same season (e.g., spring in Year 1 and spring in Year 2)	$20,000
	Any three consecutive years (e.g., Years 1, 2, and 3)	$25,000

Mitigation levels and payments amounts for threshold exceedance of subgroups would apply in the same manner as for exceedance of the general non-eagle bird thresholds (Table 18). However, in the case of the sensitive species subgroup, funds to which the payments are directed would be specific to benefiting the sensitive species identified at the Project.

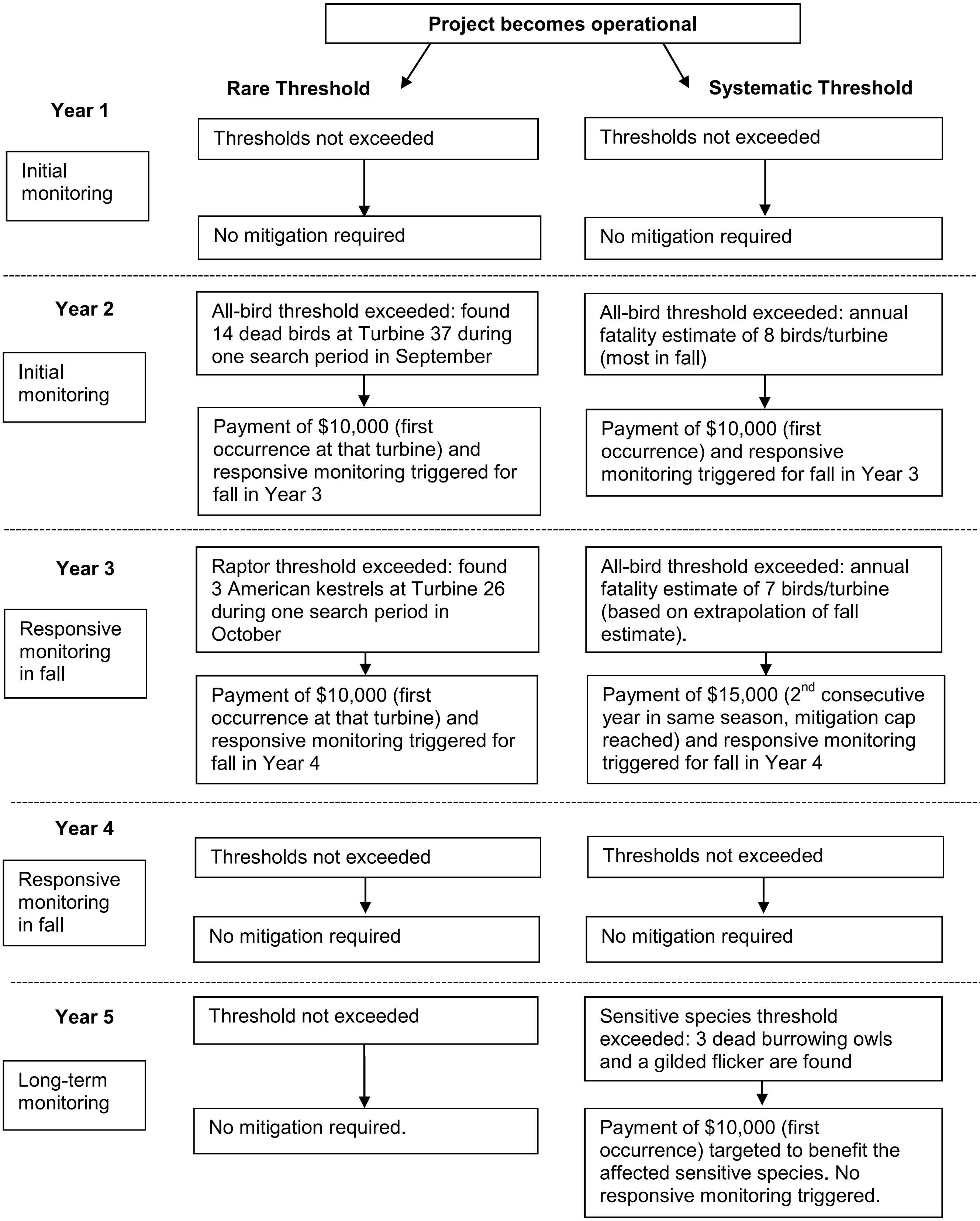


Figure 13 Flowchart of Example Non-eagle Bird Mitigation Over First Five Years of Project Operation

8.11 Responsive Monitoring

If initial or long-term standardized post-construction fatality monitoring indicates that an eagle fatality has occurred or designated non-eagle bird thresholds have been exceeded (systematic or rare) in a given year, BP Wind Energy will conduct additional responsive fatality monitoring in the subsequent year to identify the cause of the eagle fatality or threshold exceedance. Responsive monitoring will focus on the specific location and season in which the eagle fatality or threshold exceedance occurred; therefore, effort may be reduced in temporal or spatial scales compared to initial monitoring. As mentioned above, BP Wind Energy will investigate eagle fatalities and threshold exceedances quickly rather than waiting for the annual report.

9 REPORTING

An annual post-construction fatality monitoring report will be prepared for each year the surveys are conducted to summarize non-eagle and eagle fatalities (if any) associated with operations of the Project (Table 19). In years with initial, long-term, or responsive monitoring this report will include a detailed summary of the methods; results from carcass searches, carcass persistence trials, and searcher efficiency trials; an estimate of fatalities on a per turbine and per megawatt basis; and discussions of the results in the context of adaptive management thresholds. In years with only WIRS monitoring the report will be limited to details of the fatalities detected. Annual reports will be provided to USFWS, AZGFD, BLM, and Reclamation for review, and will be used to inform eagle take permit applications if and when they are pursued (Table 19).

BP Wind Energy will identify and report any threshold exceedances promptly after analysis and will not wait until the end of the annual reporting period if the potential to exceed the threshold occurs prior to the end of each annual reporting period. Any incident involving a threatened or endangered bird species or a bald or golden eagle will be reported to the USFWS, AZGFD, BLM, and Reclamation (depending on location of incident) within 24 hours of detection/discovery of a confirmed threatened, endangered, or eagle species.

In years when eagle mitigation is conducted eagle mitigation activities will be reported either as part of the mortality monitoring report, or in a separate report, depending on the timing of completion of the two activities. Reporting for eagle mitigation will include a summary of the methods and results including the number and type of carcasses removed, the number of eagles observed during surveys, and eagle use of carcasses. This report will be provided to USFWS, AZGFD, BLM, and Reclamation for review.

Table 19. Example Timeline for Reporting and Eagle Take Permitting

Permit Period	Reporting/Permitting Activity[1]	Timeframe[2]
Eagle Take Permit duration of 5 years (as of 2012): Years 1-5	Submission of Year 1 annual report of standardized fatality monitoring and WIRS results	Q1 Year 2
	Submission of Year 2 annual report of standardized fatality monitoring and WIRS results	Q1 Year 3
	Submission of Year 3 annual report of WIRS results and responsive monitoring, if performed	Q1 Year 4
	Submission of Year 4 annual report of WIRS results and responsive monitoring, if performed	Q1 Year 5
	Initiation and submission of information relevant to an Eagle Take Permit application/renewal if permit is pursued	Q1-Q2 Year 5
	Review and processing of information relevant to an Eagle Take Permit application/renewal if permit is pursued	Q3-Q4 Year 5
Anticipated Eagle Take Permit duration for life of project, if permit is pursued: Years 6-30	Submission of annual report of standardized fatality monitoring and WIRS results for Years 5, 10, 15, 20 and 25	Q1 of following year
	Submission of annual report of WIRS results (and responsive monitoring if performed) for Years 7-9, 11-14, 16-19, 21-24, 26-30	Q1 of following year

1. Reporting of any incident involving a threatened, endangered, or eagle species will occur within 24 hours of detection/discovery of a confirmed threatened, endangered or eagle species.
2. Q = quarter of calendar year

10 DECOMMISSIONING

The Project is anticipated to have a lifetime of up to 30 years after which it may no longer be cost-effective to continue operations. The Project will then be decommissioned, and the existing equipment removed. At that time, a Decommissioning Plan will be provided and will address the procedures described in this section.

The goal of Project decommissioning is to remove the installed power generation equipment and return the site to a condition as close to a pre-construction state as feasible. The major activities required for the decommissioning are as follows:

- Remove wind turbines and met towers;
- Remove electrical system;
- Remove structural foundation per requirements in ROW grants;
- Remove roads not desired for other purposes;
- Re-grade and re-contour the disturbed area; and
- Re-vegetate with native species.

Once the Project and transmission line are de-energized, the substations, switchyard, steel structures, and control building will be disassembled and removed from the site. The fence and fence posts will be removed around the O&M building. The gravel placed at Project facilities will be removed and replaced with native rock, if surface rock is prevalent in the immediate area. BLM and Reclamation will be consulted to determine if the buried substation grounding grid should be removed or left in place. Assuming the transmission line no longer serves a purpose for the site or transmission provider, it will be disassembled and removed with the foundations. The transmission line tower structures will then be disassembled. The areas around the transmission line poles including access roads, will be returned to the pre-construction condition to the maximum extent feasible.

The following BMPs from Appendix B of the Draft EIS will also be followed:

- Prior to the termination of the rights-of-way authorization, a decommissioning plan shall be developed and approved by the BLM. The decommissioning plan shall include a site reclamation plan and monitoring program.
- All management plans, BMPs, and stipulations developed for the construction phase shall be applied to similar activities during the decommissioning phase.
- All turbines and ancillary structures shall be removed from the site.
- Topsoil from all decommissioning activities shall be salvaged and reapplied during final reclamation.
- All areas of disturbed soil shall be reclaimed using weed-free native shrubs, grasses, and forbs.
- The vegetation cover, composition, and diversity shall be restored to values commensurate with the ecological setting.

11 LITERATURE CITED

ADOT (Arizona Department of Transportation). 2011. Arizona motor vehicle crash facts. Accessed October 2011. http://www.azdot.gov/mvd/statistics/crash/index.asp.

Anderson, R., J. Tom, N. Neumann, W.P. Erickson, M.D. Strickland, M. Bourassa, K.J. Bay and K.J. Semka. 2005. Avian Monitoring and Risk Assessment at the San Gorgonio Wind Resource Area: Phase I and Phase II Field Work. Prepared for the National Renewable Energy Laboratory, Golden, CO. Subcontract No(s). TAM-7-16454-01, ZAT-6-15179-02. 138 pgs.

APLIC (Avian Power Line Interaction Committee). 2006. Suggested practices for raptor protection on power Lines; the State of the Art in 2006. Edison Electric Institute, APLIC and the California Energy Commission Washington, D.C and Sacramento, CA.

Arnett, E.B., W.P. Erickson, J. Kerns, and J. Horn. 2005. Relationships between bats and wind turbines in Pennsylvania and West Virginia: An assessment of bat fatality search protocols, patterns of fatality, and behavioral interactions with wind turbines. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International, Austin, Texas, USA.

Arnett, E.B., D.B. Inkley, D.H. Johnson, R.P. Larkin, S. Manes, A.M. Manville, J.R. Mason, M.L. Morrison, M.D. Strickland, and R. Thresher. 2007. Impacts of wind energy facilities on wildlife and wildlife habitat. Wildlife Society Technical Review 07-2. The Wildlife Society, Bethesda, MA.

Arnett, E.B., M.R. Schirmacher, M.M.P. Huso, and J.P. Hayes. 2009. Patterns of bat fatality at the Casselman Wind Project in South-Central Pennsylvania. Annual report prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission.

AZGFD (Arizona Game and Fish Department). 2009. Burrowing owl project clearance guidance for landowners. Arizona Burrowing Owl Working Group, January 2009, 9 pp.

AZGFD. 2010. State Wildlife Action Plan Species of Greatest Conservation Need. Revised December 2010. Phoenix, Arizona.

AZGFD. 2011a. Evaluation of measures to promote desert bighorn sheep highway permeability post construction – Year 1 U.S. Highway 93. Quarterly report – October 2011. Presented to the Arizona Department of Transportation.

AZGFD. 2011b. Arizona Golden Eagle Nest Survey 2011. Technical Report 267. Nongame and Endangered Wildlife Program. Phoenix, Arizona. December 2011.

AZGFD. 2012a. Habimap Arizona. http://habimap.org/habimap/.

AZGFD. 2012b. Draft Strategy for Reducing Golden Eagle Fatalities on Roadways through Roadside Carcass Removal: A Compensatory Mitigation Option For Wind Energy Projects. Phoenix, Arizona. July 23, 2012.

BHE Environmental, Inc. 2011. Post-Construction Bird and Bat Mortality Study: Cedar Ridge Wind Farm, Fond Du Lac County, Wisconsin. Final Report. Prepared for Wisconsin Power and Light, Madison, Wisconsin. Prepared by BHE Environmental, Inc. Cincinnati, Ohio. February 2011.

Bates, J. W. and M. O. Moretti. 1994. Golden eagle (*Aquila chrysaetos*) population ecology in eastern Utah. Great Basin Naturalist. 54:248-255.

Beason, Robert C. 1995. Horned Lark (*Eremophila alpestris*), 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.bnaproxy.birds.cornell.edu/bna/species/195. doi:10.2173/bna.195

Bissonette, J. and C. Kassar. 2008. Locations of deer–vehicle collisions are unrelated to traffic volume or posted speed limit. Human–Wildlife Conflicts 2:122–130.

Bissonette, J.A., C.A. Kassar, and L.J. Cook. 2008. Assessment of costs associated with deer-vehicle collisions: human death and injury, vehicle damage, and deer loss. Human-Wildlife Conflicts 2:17-27.

Bittner, D. and C. Meador. 2011. Golden eagle status in selected areas of the west. Presented at the Western Raptor Symposium. Riverside, California, USA. February 8-9, 2011.

Boeker, E.L. 1974. Status of golden eagle surveys in the western states. Wildlife Society Bulletin 2:46-49.

Boeker, E.L. and E.B. Bolen. 1972. Winter golden eagle populations in the southwest. Journal of Wildlife Management 36:477-484.

BLM (Bureau of Land Management). 2012. Mohave County Wind Farm Project Draft Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Colorado River District. Kingman Field Office, Kingman, Arizona. Available at http://www.blm.gov/az/st/en/prog/energy/wind/mohave/reports/DEIS.html Accessed on April 29, 2012.

BLM. 2010a. Instruction Memorandum No. 2010-156. BLM Bald and Golden Eagle Protection Act – Golden Eagle National Environmental Policy Act and Avian Protection Plan Guidance for Renewable Energy. Issued July 9, 2010.

BLM. 2010b. Instruction Memorandum No. AZ-2011-005: Updated Bureau of Land Management (BLM) Sensitive Species List for Arizona. BLM Arizona State Office, Phoenix, AZ.BLM. 2012. Draft Environmental Impact Statement for the Proposed Mohave County Wind Farm Project. Kingman Field Office, Arizona.

Call, M. 1979. Habitat management guides for birds of prey. Bureau of Land Management. Technical. Note 338. Denver, Colorado.

Craig, E.H., and T.H. Craig. 1998. Lead and mercury levels in golden and bald eagles and annual movements of golden eagles wintering in east central Idaho 1990-1997. Submitted to: Allan Thomas, Idaho State Office, Bureau of Land Management.

Craighead, A.C., F.L. Craighead, and L. Oechsli. 2009. Bozeman Pass wildlife pre- and post-fence monitoring project. Proceedings from the International Conference on Wildlife Ecology and Transportation. Duluth, Minnesota.

Derby, C., A. Dahl, W. Erickson, K. Bay, and J. Hoban. 2007. Post-Construction Monitoring Report for Avian and Bat Mortality at the NPPD Ainsworth Wind Farm. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, for the Nebraska Public Power District.

Dodd, N.L. and J.W. Gagnon. 2010. Arizona State Route 260: promoting wildlife permeability, highway safety, and agency cultural change. Pages 257-274 *in* Highways, Wildlife, and Habitat Connectivity (J.P. Beckmann, A.P. Clevenger, M. Huijser, eds).

Dodd, N. L., J. W. Gagnon, S. Boe, A. Manzo, and R. E. Schweinsburg. 2007. Evaluation of measures to minimize wildlife-vehicle collisions and maintain wildlife permeability across highways – State Route 260, Arizona, USA. Arizona Transportation Research Center, Arizona Department of Transportation, Phoenix, Arizona, USA.

Drewitt, A.L., and R.H.W. Langston. 2006. Assessing the impacts of wind farms on birds. Ibis 148:29-42.

Driscoll, D.E. 2010. Protocol for golden eagle occupancy, reproduction, and prey population assessment. American Eagle Research Institute, Apache Junction, Arizona.

Driscoll, J. 2005. Golden Eagle.*in* T. E. Corman and C. Wise-Gervais, editors. The Arizona Breeding Bird Atlas. University of New Mexico Press, Albuquerque.

Dussault, C., M. Poulin, R. Courtois, and J-P Ouellet. 2006. Temporal and spatial distribution of moose-vehicle accidents in the Laurentides Wildlife Reserve, Quebec, Canada. Wildlife Biology 12:415-425.

Eakle, W.L., E. L. Smith, S.W. Hoffman, D.W. Stahlecker, and R.B. Duncan. 1996. Results of a raptor survey in southwestern New Mexico. Journal of Raptor Research 30:183-188.

Enk, T., K. Bay, M. Sonnenberg, and J.R. Boehrs. 2012a. Year 2 Post-Construction Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase II, Sherman County, Oregon. September 13, 2010 - September 15, 2011. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. January 7, 2011.

Enk, T., K. Bay, M. Sonnenberg, and J.R. Boehrs. 2012b. Year 1 Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase III Sherman County, Oregon. September 13, 2010 - September 9, 2011. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. April 24, 2012.

Erickson, W.P. 2007. Summary of Methods and Results for Prediction and Estimation of Impacts and Risk. Presented at NWCC Probability of Impact Workshop, 13 November 2007, Golden, CO.

Erickson, W.P., G.D. Johnson, M.D. Strickland, and K. Kronner. 2000. Avian and Bat Mortality Associated with the Vansycle Wind Project, Umatilla County, Oregon: 1999 Study Year. Technical report prepared by WEST, Inc. for Umatilla County Department of Resource Services and Development, Pendleton, Oregon. 21pp. http://www.west-inc.com/reports/vansyclereportnet.pdf.

Erickson, W.P., G.D. Johnson, M.D. Strickland, D.P. Young, K.J. Sernka, and R.E. Good. 2001a. Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of avian collision mortality in the United States. Prepared for the National Wind Coordinating Committee. Western Ecosystems Technology, Cheyenne, Wyoming, USA., http://www.west-inc.com/reports/avian_collisions.pdf.. Accessed 1 May 2007.

Erickson, W.P., E. Lack, M. Bourassa, K. Sernka, and K. Kronner. 2001b. Wildlife Baseline Study for the Nine Canyon Wind Project, Final Report May 2000-October 2001 Technical report prepared for Energy Northwest, Richland, Washington.

Erickson, W.P., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. 2002. Synthesis and comparison of baseline avian and bat use, raptor nesting and mortality information from proposed and existing wind developments. Technical report prepared by WEST, Inc., for Bonneville Power Administration, Portland, OR.

Erickson, W.P., K. Kronner, and B. Gritski. 2003a. Nine Canyon Wind Power Project avian and bat monitoring report. September 2002 – August 2003. Prepared for the Nine Canyon Technical Advisory Committee and Energy Northwest by Western EcoSystems

Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants (NWC), Pendleton, Oregon.

Erickson, W.P., D.P. Young, Jr., G. Johnson, J. Jeffrey, K. Bay, R. Good, and H. Sawyer. 2003b. Wildlife Baseline Study for the Wild Horse Wind Project. Summary of Results from 2002-2003 Wildlife Surveys May 10, 2002- May 22, 2003. Draft report prepared for Zilkha Renewable Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. November 2003.

Erickson, W.P., J. Jeffrey, K. Kronner, and K. Bay. 2003c. Stateline Wind Project Wildlife Monitoring Annual Report, Results for the Period July 2001 – December 2002. Technical report submitted to FPL Energy, the Oregon Office of Energy, and the Stateline Technical Advisory Committee.

Erickson, W.P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Final Report, July 2001—December 2003. Technical report peer- reviewed by and submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee.

Erickson, W.P., G.D. Johnson, and D.P. Young, Jr. 2005. A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191.

Erickson, W.P., K. Kronner, and K.J. Bay. 2007. Stateline Wind Project Wildlife Monitoring Annual Report, January – December 2006. Technical report submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee. 40 pgs.

Erickson, W.P., J. Jeffrey, and V.K. Poulton. 2008. Avian and Bat Monitoring: Year 1 Report. Puget Sound Energy Wild Horse Wind Project, Kittitas County, Washington. Prepared for Puget Sound Energy, Ellensburg, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 2008.

Ferguson-Lees, J., and D. A. Christie. 2001. Raptors of the World. Houghton Mifflin, Boston.

Ferrer, M., M. de Lucas, G. F. E. Janss, E. Casado, A. R. Muñoz, M. J. Bechard and C. P. Calabuig. 2012. Weak relationship between risk assessment studies and recorded mortality in wind farms. Journal of Applied Ecology 49: 38–46.

Fiedler, J.K., T.H. Henry, R.D. Tankersley, and C.P. Nicholson. 2007. Results of Bat and Bird Mortality Monitoring at the Expanded Buffalo Mountain WindFarm, 2005. Prepared for the Tennessee Valley Authority, 42 pgs.

Forman, R.T.T. and L.E. Alexander. 1998. Roads and their major ecological effects. Annual Review of Ecology and Systematics. 29:207-231.

Gagnon, J.W., N.L. Dodd, S. Boe, and R.E. Schweinsburg. 2009. Using global positioning system technology to determine wildlife crossing structure placement and evaluating their success in Arizona, USA. Proceedings from the International Conference on Ecology and Transportation. Duluth, Minnesota.

Gleason, J.S. and J.A. Jenks. 1993. Factors influencing deer/vehicle mortality in east central South Dakota. Prairie Naturalist 25:281-288.

Gritski, B., K. Kronner, and S. Downes. 2008. Leaning Juniper Wind Power Project, 2006 − 2008. Wildlife Monitoring Final Report. Prepared for PacifiCorp Energy, Portland, Oregon. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 30, 2008.

Gritski, B., S. Downes, and K. Kronner. 2010. Klondike III (Phase 1) Wind Power Project Wildlife Monitoring Study October 2007–October 2009. Prepared for Iberdrola Renewables, Klondike Wind Power III, LLC, Portland, OR. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 21, 2010.

Gritski, R., S. Downes, and K. Kronner. 2011. Klondike IIIa (Phase 2) Wind Power Project, Wildlife Monitoring August 2008 - August 2010. Prepared for Iberdrola Renewables, Klondike Wind Power III LLC, Portland, Oregon. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 2011.

Grodsky, S.M. and D. Drake. 2011. Assessing Bird and Bat Mortality at the Forward Energy Center. Final Report. Public Service Commission (PSC) of Wisconsin. PSC REF No:152052. Prepared for Forward Energy LLC. Prepared by Department of Forest and Wildlife Ecology, University of Wisconsin-Madison, Madison, Wisconsin. August 2011.

Grovenburg, T.W., J.A. Jenks, R.W. Klaver, K.L. Monteith, D.H. Galster, R.J. Schauer, W.W. Morlock, and J.A. Delger. 2008. Factors affecting road mortality of white-tailed deer in eastern South Dakota. Human-Wildlife Conflicts 2:48-59.

Gruver, J., M. Sonnenburg, K. Bay, and W. Erickson. 2009. Post-Construction Bat and Bird Fatality Study at the Blue Sky Green Field Wind Energy Center, Fond Du Lac County, Wisconsin July 21 - October 31, 2008 and March 15 - June 4, 2009. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. December 17, 2009.

Gunther, K.A., M.J. Biel, and H.L. Robison. 1998. Factors influencing the frequency of road-killed wildlife in Yellowstone National Park. Proceedings from the International Conference on Wildlife Ecology and Transportation. Fort Myers, Florida.

Harmata, A.R. 2002. Encounters of golden eagles banded in the Rocky Mountain West. Journal of Field Ornithology 73:23-32.

HDMS (Heritage Data Management System). 2012. Data requests of the Arizona HDMS for the Mohave County Wind Farm.

Holmes, T.L., R.L. Knight, L. Stegall, and G.R. Craig. 1993. Responses of wintering grassland raptors to human disturbance. Wildlife Society Bulletin 21:461-468.

Howe, R.W., W. Evans, and A.T. Wolf. 2002. Effects of Wind Turbines on Birds and Bats in Northeastern Wisconsin. Prepared by University of Wisconsin-Green Bay, for Wisconsin Public Service Corporation and Madison Gas and Electric Company, Madison, Wisconsin. November 21, 2002. 104 pp.

Howell, J.A. and J. Noone. 1992. Examination of avian use and mortality at a U.S. windpower wind energy development site, Montezuma Hills, Solano County, California. Final report to Solano County Department of Environmental Management, Fairfield, California.

Hunt, G. 2002. Golden eagles in a perilous landscape: predicting the effects of mitigation for wind turbine blade-strike mortality. Consultant Report, California Energy Commission.

Huso, M.M.P. 2011. An estimator of wildlife fatality from observed carcasses. Environmetrics 22:318-329.

Insignia Environmental. 2009. 2008/2009 Annual Report for the Buena Vista Avian and Bat Monitoring Project. Prepared for Contra Costa County, Martinez, CA. 95 pgs.

Jacques Whitford (Jacques Whitford Stantec Limited). 2009. Ripley Wind Power Project Postconstruction Monitoring Report. Project No. 1037529.01. Report to Suncor Energy Products Inc., Calgary, Alberta, and Acciona Energy Products Inc., Calgary, Alberta. Prepared for the Ripley Wind Power Project Post-Construction Monitoring Program. Prepared by Jacques Whitford, Markham, Ontario. April 30, 2009. www.jacqueswhitford.com.

Jain, A. 2005. Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm. M.S. Thesis. Iowa State University, Ames, Iowa.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2007. Annual Report for the Maple Ridge Wind Power Project post-construction bird and bat fatality study—2006. Prepared by Curry and Kerlinger, LLC for PPM Energy, Horizon Energy, and Technical Advisory Committee for the Maple Ridge Project.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, and M. Lehman. 2009. Maple Ridge Wind Power Avian and Bat Fatality Study Report - 2008. Annual Report for the Maple Ridge Wind Power Project, Post-construction Bird and Bat Fatality Study - 2008. Prepared for Iberdrola Renewables, Inc., Horizon Energy, and the Technical Advisory Committee (TAC) for the Maple Ridge Project Study. Prepared by Curry and Kerlinger, LLC. May 14, 2009.

Jain, A.A., R.R. Koford, A.W. Hancock, and G.G. Zenner. 2011. Bat Mortality and Activity at a Northern Iowa Wind Resource Area. American Midland Naturalist. 165: 185-200.

Jeffrey, J.D., K. Bay, W.P. Erickson, M. Sonneberg, J. Baker, M. Kesterke, J. Boehrs, and A. Palochak. 2009a. Portland General Electric Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring First Annual Report, Sherman County, Oregon. January 2008 - December 2008. Technical report prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology (WEST) Inc., Cheyenne, Wyoming, and Walla Walla, Washington. April 29, 2009.

Jeffrey, J.D., W.P. Erickson, K. Bay, M. Sonneberg, J. Baker, J. Boehrs, and A. Palochak. 2009b. Horizon Wind Energy, Elkhorn Valley Wind Project, Post-Construction Avian and Bat Monitoring, First Annual Report, January-December 2008. Technical report prepared for Horizon Wind Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming, and Walla Walla, Washington.

Johnson, G.D., and W.P. Erickson. 2011. Avian, Bat and Habitat Cumulative Impacts Associated with Wind Energy Development in the Columbia Plateau Ecoregion Of Eastern Washington and Oregon. May 2011. Prepared for Klickitat County Planning Department. Prepared by Western EcoSystems Technology, Inc. (WEST). Cheyenne, Wyoming. May 18, 2011. Available online at: http://www.klickitatcounty.org/Planning/filesHtml/200408-EOZ-EIS/cummulative2.pdf.

Johnson, G.D. and S.E. Stephens. 2011. Wind Power and Bio Fuels: A Green Dilemma for Wildlife Conservation. Chapter 8. In: Energy Development and Wildlife Conservation in Western North America. D. E. Naugle, ed. Island Press, Washington, D.C. Pp. 131-155.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, and D.A. Shepherd. 2000a. Avian monitoring studies at the Buffalo Ridge Wind Resource Area, Minnesota: Results of a 4-Year Study. Final report prepared for Northern States Power Company, Minneapolis, Minnesota, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Johnson, G.D., D.P. Young, W.P. Erickson, C.E. Derby, M.D. Strickland, and R.E. Good. 2000b. Wildlife Monitoring Studies, SeaWest Windpower Plant, Carbon County, Wyoming, 1995-1999. Final report prepared for SeaWest Energy Corporation, San Diego, California, and the Bureau of Land Management, Rawlins, Wyoming, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind power development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 30:879-887.

Johnson, G.D., W.P. Erickson, and J. White. 2003. Avian and bat mortality at the Klondike Oregon Phase I Wind Plant, Sherman County, Oregon. Technical Report prepared for Northwestern Wind Power. Prepared by WEST, Cheyenne, WY.

Kerlinger, P., R.Curry, L. Culp, A. Hasch and A. Jain. 2006a. Avian monitoring study and risk assessment for the Shiloh Wind Power Project, Solano County, California. Prepared for EnXco.

Kerlinger, P., R. Curry, L. Culp, A. Jain, C. Wilkerson, B. Fischer, and A. Hasch. 2006b. Post construction avian and bat fatality monitoring study for the High Winds wind power project. Solano County, California: Two Year Report. Prepared for High Winds, LLC, FPL Energy.

Kerlinger, P., R. Curry, L. Culp, A. Hasch and A. Jain. 2009. Post-construction avian monitoring study for the Shiloh I wind power project, Solano County, California. Prepared for Iberdrola Renewables.

Kerns, J., and P. Kerlinger. 2004. A study of bird and bat collision fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: Annual report for 2003. Technical report prepared by Curry and Kerlinger, LLC for FPL Energy and Mountaineer Wind Energy Center Technical Review Committee.

Kline, N.C. and D.E. Swann. 1998. Quantifying wildlife road mortality in Saguaro National Park. Proceedings from the International Conference on Wildlife Ecology and Transportation. Fort Myers, Florida.

Kochert, M.N, K. Steenhof, C.L. McIntyre, and E.H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). In: The Birds of North America. No. 684. A. Poole and F. Gill (Eds.), Philadelphia, PA: The Birds of North America, Inc.

Kronner, K., B. Gritski, J. Baker, V. Marr, G. Johnson and K. Bay. 2005. Wildlife baseline study for the Leaning Juniper Wind Power Project. Prepared for PPM Energy, Portland, Oregon and CH2M Hill, Portland, Oregon. Prepared by Northwest Wildlife Consultants, Inc., Pendleton, Oregon and WEST, Inc., Cheyenne, Wyoming.

Kronner, K., R. Gritski, and S. Downes. 2008. Big Horn Wind Power Project Wildlife Fatality Monitoring Study: 2006−2007. Final report prepared for PPM Energy and the Big Horn Wind Project Technical Advisory Committee by Northwest Wildlife Consultants, Inc. (NWC), Mid-Columbia Field Office, Goldendale, Washington. June 1, 2008.

Laundré, J.W. and B.L. Keller. 1984. Home-range size of coyotes: a critical review. The Journal of Wildlife Management 48:127-139.

Leddy, K.L., K.F. Higgins, and D.E. Naugle. 1999. Effects of Wind Turbines on Upland Nesting Birds in CRP Grasslands. Wilson Bulletin 111:100-104.

Lightfoot, D.C., A.D. Davidson, C.M. McGlone, and D.G. Parker. 2011. Rabbit abundance relative to rainfall and plant production in northern Chihuahuan Desert grassland and shrubland habitats. Western North American Naturalist 70:490–499.

Lowe, C.H. 1985. Arizona's Natural Environment. The University of Arizona Press. Tucson, Arizona.

Marzluff, J. M., S. T. Knick, M. S. Vekasy, L. S. Schueck, and T. J. Zarriello. 1997. Spatial use and habitat selection of golden eagles in southwestern Idaho. Auk 114:673-687.

McCarty, K.M. and K.V. Jacobson. 2011. Arizona golden eagle nest survey 2011 summary report. Nongame and Endangered Wildlife Program Technical Report 267. Arizona Game and Fish Department, Phoenix, Arizona.

McIntyre, C. L. and L. G. Adams. 1999. Reproductive characteristics of migratory golden eagles in Denali National Park, Alaska. Condor 101:115-123.

McShea, W.J., C.M. Stewart, L.J. Kearns, S. Liccioli, D. Kocka. 2008. Factors affecting autumn deer-vehicle collisions in a rural Virginia county. Human-Wildlife Conflicts 2:110-121.

Millsap, B.A. 1981. Distributional status of Falconiformes in west central Arizona with notes on ecology, reproductive success, and management. United States Department of Interior, Bureau of Land Management, Technical Note 355.

Millsap, B.A. and G.T. Allen. 2006. Effects of falconry harvest on wild raptor populations in the United States: theoretical considerations and management recommendations. Wildlife Society Bulletin 34:1392-1400.

Myers, W.L., W.Y. Chang, S.S. Germaine, W.M. Vander Haegen, and T.E. Owens. 2008. An analysis of deer and elk-vehicle collision sites along state highways in Washington State. Completion Report, Washington Department of Fish and Wildlife. Olympia, WA.

NatureServe. 2011. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed on December 2011.

NCDC (National Climatic Data Center). 2011. Climate Data Online. Available at: http://www7.ncdc.noaa.gov/CDO/cdo.

Nicholson, C.P., J. R.D. Tankersley, J.K. Fiedler, and N.S. Nicholas. 2005. Assessment and Prediction of Bird and Bat Mortality at Wind Energy Facilities in the Southeastern United States. Final Report. Tennessee Valley Authority, Knoxville, Tennessee.

Nielson, R.M., T. Rintz, L. McManus, and L.L. McDonald. 2012. A survey of golden eagles (*Aquila chrysaetos*) in the western US: 2011 Annual Report. Report prepared by Western EcoSystems Technology, Inc. for the US Fish and Wildlife Service.

North American Bird Conservation Initiative (NABCI). 2000. Bird Conservation Regions. Available at: http://www.nabci-us.org/bcrs.htm. Accessed on June 26, 2012.

NWC (Northwest Wildlife Consultants, Inc.) and WEST (Western EcoSystems Technology, Inc.). 2007. Avian and Bat Monitoring Report for the Klondike II Wind Power Project. Sherman County, Oregon. Prepared for PPM Energy, Portland, Oregon. Managed and conducted by NWC, Pendleton, Oregon. Analysis conducted by WEST, Cheyenne, Wyoming. July 17, 2007.

Olendorff, R. R., and W. D. Zeedyk. 1978. Land management for the conservation of endangered birds. Pp. 419-428 in S. A. Temple Editor. Endangered birds. University of Wisconsin Press, Madison, Wisconsin.

Oregon EFSC (Oregon Energy Facility Siting Council). 2009a. Golden Hills Wind Project: Wildlife Monitoring and Mitigation Plan.

Oregon EFSC. 2009b. Leaning Juniper II Wind Project: Wildlife Monitoring and Mitigation Plan.

Oregon EFSC. 2010. Montague Wind Power Facility: Wildlife Monitoring and Mitigation Plan.

Pagel, J.E., D.M. Whittington and G.T. Allen. 2010. Interim golden eagle inventory and monitoring protocols; and other recommendations. Division of Migratory Birds, U.S. Fish and Wildlife Service.

Pagel, J.E., B.A. Millsap, E. Kernsher, S. Covenington, and R. Murphy. 2011. Known eagle mortalities at wind turbine technology facilities in the western United States. Raptor Research Foundation Meetings, Duluth, Minnesota, October 2011.

Palmer, R.S. 1988. Golden Eagle. Pages 180-231 in R. Palmer (ed.), Handbook of North American Birds. Vol. 5. Yale Univ. Press, New Haven, Connecticut.

Peterson Guides. 2011. Bird Finder List for Mohave County Arizona. Peterson Guides, Cornell Laboratory of Ornithology, and Appweavers, Inc. Available at http://petersonguides.com/BirdFinder/counties/AZ-015.html. Accessed online August 7, 2012.

Phillips R.L. 1986. Current issues concerning the management of golden eagles in the western U.S.A. Birds of Prey Bulletin 3:149-156.

Poulton, V. 2010. Summary of Post-Construction Monitoring at Wind Projects Relevant to Minnesota, Identification of Data Gaps, and Recommendations for Further Research Regarding Wind-Energy Development in Minnesota. Prepared for State of Minnesota Department of Commerce. 52 Pgs.

Reynolds, R.T., J.M. Scott, and R.A. Nussbaum. 1980. A Variable Circular-Plot Method for Estimating Bird Numbers. Condor 82(3): 309-313.

Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Iñigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, T.C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.

Robinson, S.K., F.R. Thompson III, T.M. Donovan, D. R. Whitehead, and J. Faaborg. 1995. Regional forest fragmentation and the nesting success of migratory birds. Science 267: 1987-1990.

Rudnick, J.A., T.E. Katzner, E.A. Bragin, O.E. Rhodes, and J.A. Dewoody. 2005. Using naturally shed feathers for individual identification, genetic parentage analyses, and population monitoring in an endangered Eastern imperial eagle (*Aquila heliaca*) population from Kazakhstan. Molecular Ecology 14:2959-2967.

Russell, A.C. and J.E. Harden. 2009. RAVEN project: application of WRI rehabilitation acquisition data to state endangered and threatened species and species of conservation concern. Report to New Mexico Department of Fish and Game, Share With Wildlife Program.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2011. The North American Breeding Bird Survey, Results and Analysis 1966 - 2010. Version 12.07.2011 USGS Patuxent Wildlife Research Center, Laurel, MD. Available at http://www.mbr-pwrc.usgs.gov/bbs/bbs.html. Accessed on September 17, 2012.

Smallwood, S.K. and B. Karas. 2009. Avian and Bat Fatality Rates at Old-Generation and Repowered Wind Turbines in California. Journal of Wildlife Management 73(7):1062–1071.

Shaffer, J., and D. Johnson. 2008. Displacement Effects of Wind Developments on Grassland Birds in the Northern Great Plains. NWCC Wind Wildlife Conference, October 2008. Milwaukee, WI.

SGEMC (Southwestern Golden Eagle Management Committee). 2011. Arizona golden eagle survey and monitoring protocol. Developed by the Southwestern Golden Eagle Management Committee Science Subcommittee, April 2011.

SGEMC. 2012. Golden Eagle Nest Survey Results. Unpublished report.

Steenhoff, K., M.N. Kochert and T.L. MacDonald. 1997. Interactive effects of prey and weather on golden eagle reproduction. Journal of Animal Ecology 66:350-362.

Strickland, M.D., E.B. Arnett, W.P. Erickson, D.H. Johnson, G.D. Johnson, M.L., Morrison, J.A. Shaffer, and W. Warren-Hicks. 2011. Comprehensive Guide to Studying Wind Energy/Wildlife Interactions. Prepared for the National Wind Coordinating Collaborative, Washington, D.C., USA.

Suter, G.W., H, and J.L. Joness. 1981. Criteria for golden eagle, ferruginous hawk, and prairie falcon nest site protection. Journal of Raptor Research 15:12-18.

Taylor, K., J. Gruver, and K. Bay. 2008. Wildlife Studies for the Campbell Hill Wind Resource Area, Converse County, Wyoming. Fall Summary Report: September 9 - November 5,

2008. Prepared for Three Buttes Windpower, LLC/Duke Energy. Prepared by Western EcoSystems Technology, Inc.(WEST), Cheyenne, Wyoming. December 30, 2008

Tetra Tech. 2011. AWEA report on eagle citations, nest locations, and fatalities. Report prepared for the American Wind Energy Association.

Tetra Tech. 2012. Mohave County Wind Farm 2012 Golden Eagle Surveys January – May, 2012. Prepared for BP Wind Energy North America Inc. Prepared by Tetra Tech EC, Inc. June 2012.

Thompson, J. 2011. Raptor nest survey for the proposed Mohave County Wind Resource Area, Mohave County, Arizona. Report prepared for BP Wind Energy.

Thompson, J. D. Solick, J. Gruver, and K. Bay. 2011a. Wildlife baseline studies for the Mohave County Wind Farm, Mohave County, Arizona. Final report prepared for BP Wind Energy.

Thompson, J. D. Solick, and K. Bay. 2011b. Post-construction fatality surveys for the Dry Lake Phase I Wind Project Iberdrola Renewables September 2009 – December 2010. Prepared for Iberdrola Renewables.

Tierney, R. 2009. Buffalo Gap 2 Wind Farm Avian Mortality Study: July 2007 - December 2008. Final Survey Report. Submitted by TRC, Albuquerque, New Mexico. TRC Report No. 151143-B-01. June 2009.

TRC Environmental Corporation. 2008. Post-Construction Avian and Bat Fatality Monitoring and Grassland Bird Displacement Surveys at the Judith Gap Wind Energy Project, Wheatland County, Montana. Prepared for Judith Gap Energy, LLC, Chicago, Illinois. TRC Environmental Corporation, Laramie, Wyoming. TRC Project 51883-01 (112416). January 2008. http://www.newwest.net/pdfs/AvianBatFatalityMonitoring.pdf.

USEPA (US Environmental Protection Agency). 2007. Level III and IV Ecoregions. National Health and Environmental Effects Research Laboratory, USEPA. Available online at: http://www.epa.gov/wed/pages/ecoregions/level_iii.htm. Accessed online May 31, 2012.

USFWS (US Fish and Wildlife Service). 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. Available online at: http://www.fws.gov/migratorybirds/

USFWS. 2009. Eagle permits; Take necessary to protect interests in particular localities; final rule. Federal register. 74:46836-46879.

USFWS. 2010. Discussions on recent range and use areas of released California condors in Arizona. Communication between URS and the USFWS, April 2010.

USFWS. 2011a. Draft eagle conservation plan guidance. Released January, 2011.

USFWS. 2011b. Eagle Conservation Plan Review and Sufficiency Checklist –Wind Energy Projects. USFWS Region 2. Version dated August 24, 2011.

USFWS. 2012a. Draft eagle conservation plan guidance version 2. Technical Appendices. Released August 2012.

USFWS. 2012b. U.S. Fish and Wildlife Service Final Land-Based Wind Energy Guidelines. Available from: http://www.fws.gov/windenergy/docs/WEG_final.pdf Accessed March 2012.

USGS (US Geological Survey). 1999. 10 meter National Elevation Dataset. 7.5-minute elevation data for the conterminous US. Sioux Falls, South Dakota: US Geological Survey.

USGS. 2010. Bird banding laboratory band returns for eagles 1960-2010 (unpublished data). Received by Tetra Tech EC, December 20 2010.

University of California Museum of Paleontology. 2012. The Desert Biome. Available at http://www.ucmp.berkeley.edu/exhibits/biomes/deserts.php Accessed on August 9, 2012.

Watson, J. 1997. The golden eagle. 1st ed. T and A. D. Poyser, London, United Kingdom.

Watson, J.W., A.A. Duff, and R.W. Davies. 2012. Breeding range characteristics and resource use of Golden Eagles in Washington and implications for wind turbine placement. Presentation at The Wildlife Society Annual Meeting on October 17, 2012 in Portland, Oregon.

WEST (Western Ecosystems Technology, Inc.). 2006. Diablo Winds Wildlife Monitoring Progress Report March 2005 - February 2006. 32 pgs.

WEST. 2008. Diablo Winds Wildlife Monitoring Progress Report: March 2005 – February 2007. Prepared by WEST, Cheyenne, Wyoming. August 2008.

WEST. 2011. Presentation at the Northwest Wind Energy and Wildlife Workshop. Portland, Oregon. June 7-8, 2011.

WRCC (Western Regional Climate Center). 2012. Climatological Summary: Boulder City, NV, Temple Bar, AZ, Yucca, AZ, Searchlight, NV, Kingman, AZ, Kingman 2, AZ. Available online at http://www.wrcc.dri.edu/summary/igm.az.html. Accessed on May 31, 2012.

Whitfield, D. P. 2009. Collision avoidance of golden eagles at wind farms under the ‘Band’ collision risk model. Report from Natural Research to Scottish Natural Heritage, Banchory, UK.

Young, D.P. Jr., W.P. Erickson, K. Bay, J. Jeffrey, E.G. Lack, R.E. Good, and H.H. Sawyer. 2003a. Baseline Avian Studies for the Proposed Hopkins Ridge Wind Project, Columbia County, Washington. Final Report, March 2002 - March 2003. Prepared for RES North America, LLC., Portland, Oregon, by Western EcoSystems Technology, Inc.(WEST), Cheyenne, Wyoming. April 30, 2003.

Young, D.P., Jr., W.P. Erickson, R.E. Good, M.D. Strickland, and G.D. Johnson. 2003b. Avian and bat mortality associated with the initial phase of the Foote Creek Rim Wind Power Project, Carbon County, Wyoming: November 1998–June 2002. Technical report prepared by WEST, Inc. for PacifiCorp, Inc., SeaWest Windpower, Inc., and Bureau of Land Management.

Young, Jr., D.P., W.P. Erickson, J.D. Jeffrey, K. Bay, and M. Bourassa. 2003c. Avian and Sensitive Species, Baseline Study Plan and Final Report, Eurus Combine Hills Turbine Ranch, Umatilla County, Oregon. Technical Report for Eurus Energy America

Corporation and Aeropower Services, Inc. Prepared by: Western EcoSystems Technology, Inc., Cheyenne, Wyoming.

Young, D.P. Jr., J. Jeffrey, W.P. Erickson, K. Bay, and V.K. Poulton. 2006. Eurus Combine Hills Turbine Ranch. Phase 1 post construction wildlife monitoring first annual report. Technical report prepared for Eurus Energy America Corporation, San Diego, California, and the Combine Hills Technical Advisory Committee, Umatilla County, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon.

Young, D.P. Jr., W.P. Erickson, J. Jeffrey, and V.K. Poulton. 2007. Puget Sound Energy Hopkins Ridge Wind Project Phase 1 Post-Construction Avian and Bat Monitoring First Annual Report, January - December 2006. Technical report for Puget Sound Energy, Dayton, Washington and Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Western EcoSystems Technology, Inc. (WEST) Cheyenne, Wyoming, and Walla Walla, Washington. 25 pp.

Young, D.P., Jr., C. LeBeau, W. Erickson, S. Nomani, J.R. Boehrs, and B. Oakleaf. 2010. Status of breeding populations of ferruginous hawks, golden eagles and bald eagles in Albany and Carbon County, Wyoming. Prepared for the Wyoming Game and Fish Department (WGFD).

Zar, J.H. 1996. Biostatistical Analysis, 3rd ed. Prentice Hall, Upper Saddle River, NJ.

Zuckerman, L. 2012. Mining claim markers killing millions of birds in U.S. West. Reuters. June 30, 2012. Available at http://articles.chicagotribune.com/2012-06-30/news/sns-rt-us-usa-birds-miningbre85t0jj-20120630_1_migratory-birds-pvc-pipes-american-bird-conservancy. Accessed on August 21, 2012.

Appendix A
Table of All Avian Species Detected

Appendix A. Table of All Avian Species Detected During Baseline Surveys of the Mohave County Wind Project (2007-2011)

Species Common Name	Species Scientific Name	Size Class[1]	Resident Classification[2]	Total Number Detected			USFWS BCC[3]	BLM Status[4]	State Status[5]	Species of Continental Importance[6]
				Point Counts	Songbird Migration	Incidental				
Abert's Towhee	*Pipilo aberti*	Small	Resident	-	-	1	-	-	1B	WL3
American kestrel	*Falco sparverius*	Large	Resident	9	4	168	-	-	-	-
ash-throated flycatcher	*Myiarchus cinerascens*	Small	Resident	18	130	25	-	-	-	-
bank swallow	*Riparia riparia*	Small	Migrant	2	-	-	-	-	-	-
barn owl	*Tyto alba*	Large	Migrant	-	-	7	-	-	-	-
Bendire's thrasher	*Toxostoma bendirei*	Small	Resident	-	-	4	BCC	-	1C	WL3
black-headed grosbeak	*Pheucticus melanocephalus*	Small	Resident	-	1	-	-	-	-	-
black-tailed gnatcatcher	*Polioptila melanura*	Small	Resident	1	12	11	-	-	1C	AS1
black-throated sparrow	*Amphispiza bilineata*	Small	Resident	181	428	108	-	-	-	AS1
Brewer's sparrow	*Spizella breweri*	Small	Migrant	2	90	120	-	-	1C	WL2
brown-headed cowbird	*Molothrus ater*	Small	Resident	-	-	7	-	-	-	-
Bullock's oriole	*Icterus bullockii*	Small	Resident	-	-	1	-	-	1C	-
burrowing owl	*Athene cunicularia*	Small	Resident	-	-	1	BCC	S	1B	-
cactus wren	*Campylorhynchus brunneicapillus*	Small	Resident	26	213	47	-	-	-	AS1
Cassin's kingbird	*Tyrannus vociferans*	Small	Resident	2	-	-	-	-	-	-
chipping sparrow	*Spizella passerina*	Small	Resident	3	4	-	-	-	-	-
chukar	*Alectoris chukar*	Large	Resident	-	-	3	-	-	-	-
cliff swallow	*Petrochelidon pyrrhonota*	Small	Resident	2	-	-	-	-	-	-
common poorwill	*Phalaenoptilus nuttallii*	Large	Resident	-	-	4	-	-	1C	-
common raven	*Corvus corax*	Large	Resident	65	7	55	-	-	-	-
common yellowthroat	*Geothlypis trichas*	Small	Resident	-	-	1	-	-	-	-
Cooper's hawk	*Accipiter cooperii*	Large	Resident	-	-	2	-	-	-	-
Costa's hummingbird	*Calypte costae*	Small	Resident	-	4	3	BCC	-	1C	WL3
dark-eyed junco	*Junco hyemalis*	Small	Resident	2	-	-	-	-	-	-

Species Common Name	Species Scientific Name	Size Class[1]	Resident Classification[2]	Total Number Detected			USFWS BCC[3]	BLM Status[4]	State Status[5]	Species of Continental Importance[6]
				Point Counts	Songbird Migration	Incidental				
Gambel's quail	*Callipepla gambelii*	Large	Resident	28	56	47	-	-	-	AS1
gilded flicker	*Colaptes chrysoides*	Small	Resident	1	-	4	BCC	S	1B	-
golden eagle	*Aquila chrysaetos*	Large	Resident	5	-	3	-	S	1A	-
greater roadrunner	*Geococcyx californianus*	Large	Resident	-	4	3	-	-	-	-
great horned owl	*Bubo virginianus*	Large	Resident	-	-	2	-	-	-	-
horned lark	*Eremophila alpestris*	Small	Resident	64	2	250	-	-	-	-
house finch	*Carpodacus mexicanus*	Small	Resident	11	44	12	-	-	-	-
ladder-backed woodpecker	*Picoides scalaris*	Small	Resident	1	1	1	-	-	-	-
lark sparrow	*Chondestes grammacus*	Small	Migrant	-	-	3	-	-	-	-
lark bunting	*Calamospiza melanocorys*	Small	Migrant	-	1	-	-	-	-	AS1
loggerhead shrike	*Lanius ludovicianus*	Small	Resident	20	84	45	-	-	1C	-
merlin	*Falco columbarius*	Large	Migrant	1	-	2	-	-	-	-
mourning dove	*Zenaida macroura*	Large	Resident	19	128	36	-	-	-	-
northern flicker	*Colaptes auratus*	Small	Resident	3	10	9	-	-	-	-
northern harrier	*Circus cyaneus*	Large	Resident	-	-	3	-	-	-	-
northern mockingbird	*Mimus polyglottos*	Small	Resident	22	109	49	-	-	-	-
northern rough-winged swallow	*Stelgidopteryx serripennis*	Small	Resident	2	-	-	-	-	-	-
phainopepla	*Phainopepla nitens*	Small	Resident	-	-	4	-	-	1C	AS1
prairie falcon	*Falco mexicanus*	Large	Resident	-	-	1	BCC	-	1C	-
red-tailed hawk	*Buteo jamaicensis*	Large	Resident	23	14	134	-	-	-	-
rock wren	*Salpinctes obsoletus*	Small	Resident	25	61	42	-	-	-	-
sage sparrow	*Amphispiza belli*	Small	Resident	2	2	-	-	-	1C	AS1
sage thrasher	*Oreoscoptes montanus*	Small	Migrant	27	45	38	-	-	1C	AS1
savannah sparrow	*Passerculus sandwichensis*	Small	Migrant	-	2	1	-	-	1B	-

Species Common Name	Species Scientific Name	Size Class[1]	Resident Classification[2]	Total Number Detected			USFWS BCC[3]	BLM Status[4]	State Status[5]	Species of Continental Importance[6]
				Point Counts	Songbird Migration	Incidental				
Say's phoebe	*Sayornis saya*	Small	Resident	5	-	1	-	-	-	-
Scott's oriole	*Icterus parisorum*	Small	Resident	5	40	10	-	-	1C	AS1
sharp-shinned hawk	*Accipiter striatus*	Large	Resident	1	-	2	-	-	-	-
song sparrow	*Melospiza melodia*	Small	Resident	-	1	-	-	-	-	-
tree swallow	*Tachycineta bicolor*	Small	Resident	-	-	6	-	-	-	-
turkey vulture	*Cathartes aura*	Large	Resident	42	1	58	-	-	-	-
vesper sparrow	*Pooecetes gramineus*	Small	Migrant	-	-	1	-	-	-	-
violet-green swallow	*Tachycineta thalassina*	Small	Resident	-	-	2	-	-	-	-
western kingbird	*Tyrannus verticalis*	Small	Resident	-	5	15	-	-	-	-
western meadowlark	*Sturnella neglecta*	Small	Resident	2	-	-	-	-	-	-
western scrub-jay	*Aphelocoma californica*	Small	Resident	1	-	-	-	-	1C	AS1
western wood pewee	*Contopus sordidulus*	Small	Resident	-	-	1	-	-	-	-
white-crowned sparrow	*Zonotrichia leucophrys*	Small	Resident	-	12	84	-	-	1C	-
white-throated swift	*Aeronautes saxatalis*	Small	Resident	1	-	9	-	-	1C	WL2
Wilson's warbler	*Wilsonia pusilla*	Small	Migrant	-	1	4	-	-	-	-
zone-tailed hawk	*Buteo albonotatus*	Large	Resident	-	-	1	-	-	-	-
Total Number of Birds Detected				**683**	**1549**	**1467**	**5**	**3**	**20**	**15**

1. Small defined as a bird ≤ 10 inches in length Large defined as a bird > 10 inches in length
2. Migrants defined as species with occurrence in Mohave County restricted to spring and fall migration periods; Residents defined as species with year-round, winter or summer occurrence. Occurrence data used from Peterson Guides Bird Finder List for Mohave County, Arizona
3. USFWS 2008 Birds of Conservation Concern (BCC) for Bird Conservation Region 33 (Sonoran and Mojave Deserts)
4. 2010 BLM Sensitive Species
5. Tiers of Species of Greatest Conservation Need (revised 2010) from the Arizona State Wildlife Action Plan
   1A Scored 1 for Vulnerability in at least one of the 9 categories, or is federal endangered, threatened or candidate species; is covered under a signed conservation agreement; or is petitioned for listing
   1B Scored 1 for Vulnerability but matches none of the additional criteria above
   1C Unknown Vulnerability status species
6. Partners in Flight 2004 North American Landbird Conservation Plan Species of Continental Importance
   WL2 Watch List Species—Moderately abundant or widespread with declines or high threats
   WL3 Watch List Species—Restricted distribution or low population size
   AL1 Additional Stewardship Species—High percent of Global Population in single biome (breeding or winter)

Appendix B
Wildlife Incident Reporting System Protocol

BP WIND ENERGY
POLICIES AND PROCEDURES

WILDLIFE INCIDENT REPORTING SYSTEM (WIRS)

Document Control Details

BP Wind Energy	**_Document Number: HSSE 60.01.01_**

Wildlife Incident Reporting System (WIRS)

1.0 Purpose/Scope

1.1 The purpose of this policy is to define the procedures that employees and contractors should take when they observe an injured animal or animal carcass (an "incident") at a wind operating asset.

- For the purposes of this reporting system, "incident" is a general term that refers to any bird, bat, or other animal, or evidence thereof, that is found either dead or injured within the wind project facility.
- An intact, carcass, carcass parts, bones, scattered feathers (10 or more feathers constitute a feather spot), or an injured bird or bat are all considered reportable incidences.

1.2 These procedures are intended to be in place for the life of the project.

1.3 These procedures are independent of any formal monitoring studies and should occur simultaneously to any formal monitoring studies.

1.4 Implementation of the WIRS will be part of the AE Power Services staff training program.

1.5 New or existing projects may from time to time have additional special requirements. Projects with special considerations are listed in Attachment 3. The VP - Operations and Asset Management, Director of HSSE and the Environmental Manager, Construction and Operations are authorized to periodically update Attachment 3 and communicate those requirements to Director of O&M, Facility Managers, and Deputy Facility Managers, where appropriate..

2.0 Reference

3.0 Responsibilities

3.1 Facility Manager (Facility/Project) or Deputy Facility Manager (if no Facility Manager on site)

A. Facility (or Deputy Facility) Managers have overall accountability to ensure that the requirements of this procedure are being followed by all facility employees and contractors within their respective organizations.

3.2 Employees and Contractors

A. Employees must take action when they observe a wildlife incident.

B. Employees must report, using the procedure herein, all wildlife incidents.

C. Contractors must take action when they observe a wildlife incident, as directed by the Facility (or Deputy Facility) Manager.

3.3 Environmental Manager, Construction & Operations

A. Maintain completed WIRS reports and photos.

B. Answers questions as they arise, regarding the WIRS and wildlife interactions at the site.

C. Contacts agency(s) if an incident arises pertaining to threatened or endangered species.

4.0 Procedure

4.1 General

A. Prior to assuming a bird, bat, or other animal is injured, it should be observed to determine if it does not display normal behaviors.

- For example, raptors will occasionally walk on the ground, especially if they have captured a prey item. Raptors also "mantle" or hold their wings out and down covering a prey item. These types of behaviors may make the wings appear broken or the animal injured. Identification of specific behaviors typical to bird life cycles and distress behaviors will be part of the AE POWER SERVICES training program.

B. Always exercise caution before approaching or attempting to capture an injured bird. Typically, site personnel will not handle carcasses or injured animals on site, except with express approval from the HSSE Director.

C. Any incident involving a threatened or endangered species or a bald or golden eagle must be reported to BP Wind Environmental Manager, Construction & Operations immediately after identification.

4.2 Materials Needed to Complete a Report

- A copy of this WIRS procedure (unless already comfortable with the procedure)
- Wildlife Incident Report Form (see Attachment 1)
- Camera
- Pen/pencil

4.3 Incident Reporting Procedure

A. If the animal is injured:

- Move yourself to a distance far enough away that the animal is not further disturbed or uneasy due to your presence.
- Follow the procedure in Section 4.3B
- Call Environmental Manager, Construction & Operations, *immediately* to find out how the facility should handle getting the injured animal to a rehabilitation center. Leave a message if there is no answer.

B. If mortality occurs:

- Leave the animal in place.
- Photograph the incident, as it was found in the field. Take at least 2 pictures: a close-up shot of the animal as it lays in the field; and a broader view of the animal

with a local feature (turbine, road) in view. For the close-up picture, lay a measuring object (radio, coin, pencil) next to the carcass so that there is a scale comparison.

- Prepare the Wildlife Incident Report Form (Attachment 2, for an example)
- Submit the report to the Facility (or Deputy Facility) Manager and the Environmental Manager, Construction & Operations within 24 hours.

NOTE:
Do not touch or pick up the dead animal. A Collection Permit is required in order to do this.

5.0 Training

5.1 Training on the content and requirements of the WIRS procedure shall be conducted upon hiring and/or assignment to a job with exposure to wildlife incidents, and new contractor orientation.

6.0 Auditing

6.1 The requirements called for in this procedure are subject to periodic inspection by the BP Facility (or Deputy Facility) Manager and annually during the BPWE site-specific HSSE audit.

6.2 This procedure shall be reviewed at least every three years.

7.0 Acronyms and Definitions

Acronyms Table

Acronym	Definition
HSSE	Health, Safety, Security and Environmental
WIRS	Wildlife Incident Reporting System

Attachment 1
Wildlife Incident Reporting Form

Wildlife Incident Reporting Form

Site:

Date: ______________________ Time: ______________________

Observer: ______________________

(Please list all observers in the close vicinity of the discovered animal)

Animals Observed:

Type of Animal: Bird / Bat / Other

Common Name (if known): ______________________

Color/Markings: ______________________

Sex: Male / Female / Unknown

Age: Adult / Juvenile / Unknown

Condition: Injured / Deceased

If injured what behavior is animal exhibiting? ______________________

____

If deceased what is the condition of the carcass? ______________________

Condition of remains		Age of remains	Was animal photographed?
Intact	Feather Spot	Fresh	Yes
Scavenged	Other	Aged	No
Dismembered		Unknown	Film roll/photo no. ______

Location of Animal:

Plot type: ______________________ Plot no. ______________________

Location if not on plot ______________________

UTM or long, lat coords (NAD27) ______________________

Distance and bearing from nearest tower/pole ______________________

Environmental conditions:

	Precipitation	Ambient Temperature	Wind Conditions	Other Weather Observations
Weather:	Clear	Cold	Calm	______
	Fog	Cool	Gusty wind	______
	Cloudy	Mild	Storm	______
	Rain	Warm	Violent storm	______
	Snow	Hot		______
Habitat:	Bare ground	Forest	Other (describe)	______
	Grassland	Tilled agriculture		______
	Gravel road	Mix of above (check all that apply)		______

Insect Pests: Mosquitos Fleas Ticks Flies None ______________________

Attachment 2
Wildlife Incident Reporting Form & Photos
(completed)

Wildlife Incident Reporting Form

Date: 6/22/11 Time: 1:35PM

Observer: Mark Hallowell

(Please list all observers in the close vicinity of the discovered animal)

Animals Observed:

Type of Animal: Bird / X Bat / Other

Common Name:

Color/Markings: Brown/Black

Is animal bagged or tagged? Yes / X No / Unknown

Does animal resemble a threatened or endangered species? Yes / No / X Unknown

Which species?

Sex: Male / Female / X Unknown

Age: Adult / Juvenile / X Unknown

Condition: Injured / Deceased X

If injured what behavior is animal exhibiting?

If deceased what is the condition of the carcass?

Condition of remains: Intact X / Scavenged / Dismembered / Feather Spot / Other

Age of remains: Fresh / Aged / Unknown

Was animal photographed? X Yes / No

Film roll/photo no.

Location of Animal:

Plot type: D4 Plot no. N/A

Location if not on plot Approximately 20 ft West of Turbine

UTM or long lat coords (NAD27) (hddd.mm.ss.s)

Distance and bearing from nearest tower/pole

Environmental conditions:

Weather:

Precipitation	Ambient Temperature	Wind Conditions	Other Weather Observations
X Clear	Cold	X Calm	
Fog	Cool	Gusty wind	
Cloudy	X Mild	Storm	
Rain	Warm	Violent storm	
Snow	Hot		

Habitat: X Bare ground / Grassland / Gravel road / forest / Tilled agriculture / Mix of above (check all that apply) / Other (describe)

Insect Pests Present: mosquitos / Ticks / Fleas / Biting flies / X None


1
16 ft
2
STANLEY®
3
4
5
6/23/2011


6/23/2011

Attachment 3
Projects with Special Conditions

Project	Special Condition	Date of Condition
Fowler Ridge WF	All reports of bat incidents must be made within 4 hours of the observance.	July 15, 2011

DOCUMENT CONTROL DETAILS

Document Name				Wildlife Incident Reporting System	
Scope				BP Wind Energy	
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Authority	Matt Sakurada	VP Operations & Asset Management	Custodian	Blayne Gunderman	Environmental Manager

REV #	REV DATE	Revision Detail	Authority	Custodian
0.0	07-14-11	Wildlife Incident Reporting System procedure	Matt Sakurada	Blayne Gunderman

Appendix C
Wildlife Incident Reporting Form

Wildlife Incident Reporting Form

Site:

Date: ______________________ Time: ______________________

Observer: ______________________

(Please list all observers in the close vicinity of the discovered animal)

Animals Observed:

Type of Animal: Bird / Bat / Other

Common Name (if known): ______________________

Color/Markings: ______________________

Sex: Male / Female / Unknown

Age: Adult / Juvenile / Unknown

Condition: Injured / Deceased

If injured what behavior is animal exhibiting? ______________________

____

If deceased what is the condition of the carcass? ______________________

Condition of remains		Age of remains	Was animal photographed?
Intact	Feather Spot	Fresh	Yes
Scavenged	Other	Aged	No
Dismembered		Unknown	Film roll/photo no. ______

Location of Animal:

Plot type: ______________________ Plot no. ______________________

Location if not on plot ______________________

UTM or long, lat coords (NAD27) ______________________

Distance and bearing from nearest tower/pole ______________________

Environmental conditions:

	Precipitation	Ambient Temperature	Wind Conditions	Other Weather Observations
Weather:	Clear	Cold	Calm	______
	Fog	Cool	Gusty wind	______
	Cloudy	Mild	Storm	______
	Rain	Warm	Violent storm	______
	Snow	Hot		______
Habitat:	Bare ground	Forest	Other (describe)	______
	Grassland	Tilled agriculture		______
	Gravel road	Mix of above (check all that apply)		______

Insect Pests: Mosquitos Fleas Ticks Flies None ______________________