



Oregon

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To: Oregon Energy Facility Siting Council

From: Duane Kilsdonk, Compliance Officer

Date: May 29, 2019

Subject: Biglow Canyon Wind Farm – Annual Monitoring for Wildlife Monitoring and Mitigation Plan (Condition 61)

Wildlife Monitoring and Mitigation Plan Overview

Biglow Canyon Wind Farm is a wind energy generation facility consisting of 217 wind turbines, with a peak generating capacity of 450 megawatts (MW). The facility is located in Sherman County, approximately 2.5 miles northeast of the town of Wasco. The Council issued a site certificate for the facility in 2006.

Condition 61 of the site certificate states that, “The certificate shall conduct wildlife monitoring and mitigation in accordance with the Wildlife Monitoring and Mitigation Plan (WMMP) that is incorporated in the Final Order on Amendment #2 as Attachment A and as may be amended from time to time.”

The WMMP requires that the certificate holder implement short- and long-term wildlife monitoring during facility operation. Short-term wildlife monitoring requirements include a 2-year post construction Bird and Bat Fatality Monitoring Program and Avian Use and Behavior Surveys; both of these wildlife monitoring activities were completed in 2010-12. On-going long-term wildlife monitoring requirements include:

- Long-Term Raptor Nesting Surveys (Every 5-years for operational life of facility; 2012, 2017, 2022, etc.)
- Wildlife Incident Response and Handling System (Ongoing)

Long-Term Raptor Nesting Surveys

Raptor nesting surveys are required to be completed for the life of the facility, on a 5-year cycle. Raptor nesting surveys were completed in 2017; the next raptor nesting survey will be completed in 2022. The objectives of raptor nesting surveys are to estimate the size of local breeding populations of tree or other above ground-nesting raptor species within a 2-mile radius of the facility, and to determine whether facility operation is contributing to a reduction in nesting activity or nesting success in local populations of the Swainson's hawk (*Buteo swainsoni*), ferruginous hawk (*Buteo regalis*) and golden eagle (*Aquila chrysaeto*). A summary of raptor nesting survey results to date is presented in Table 1 below.

Table 1: Long-Term Raptor Nesting Survey Results for Biglow Canyon Wind Farm

Nest Status	2006	2012	2017	2022
Located Nests	28	24	22	TBD
Occupied Nests	10	13	11	TBD
Species				
Species	2006	2012	2017	2022
Swainson's Hawk	3	3	3	TBD
Red-tailed Hawk	7	7	7	TBD
Great Horned Owl	-	2	1	TBD
Common Raven	-	1	0	TBD

Based on the long-term raptor nesting surveys to date, the certificate holder's results demonstrate that there has been very little change in the breeding population from the first survey in 2006 to the 2017 survey. In all years, the number of occupied Swainson's and red-tailed hawk nests has remained constant in the survey area.

Wildlife Incident Response and Handling System

Monitoring activities during 2018 for this facility include the ongoing Wildlife Incident Response and Handling System, a program for responding to and handling avian and bat casualties found by personnel at the site during routine maintenance operations. In 2018, PGE biologists met with facility staff and contractors on several occasions to provide ongoing training for handling wildlife incidents. PGE also maintains a State of Oregon Scientific Take Permit (#046-17) (Attachment A) and a Federal Migratory Bird Permit (MB# 65566B-0) (Attachment B) to lawfully collect and handle state protected birds and bats and federal Migratory Bird Treaty Act protected birds. Consistent with permit requirements, PGE filed annual reports with both the Oregon Department of Fish and Wildlife (ODFW) and the U.S. Fish and Wildlife Service (USFWS) for 2018 activities conducted under the permits. During 2018, no incidental avian and bat mortality reports were logged by facility maintenance staff.

Public Comments on Wildlife Monitoring Results

Section 5 of the WMMP, Data Reporting, establishes an opportunity for the public to review and comment on monitoring results. Specifically the WMMP states, "The public will have an opportunity to receive information about monitoring results and to offer comment. Within 30

days after receiving the annual report of monitoring results, the Department will make the report available to the public on its website and will specify a time in which the public may submit comments to the Department.”

The Department received the annual monitoring results for the facility on April 30, 2019. In accordance with the terms of the WMMP, the Department provides a copy of the 2018 monitoring results for the Biglow Canyon Wind Farm to the Council for review (attached) and posted a copy to the Department’s project website at: <http://www.oregon.gov/energy/facilities-safety/facilities/Pages/BCW.aspx> and has established 60-day timeframe to accept public comments.

Comments are due within 60-days of posting, or **July 29, 2019 at 5pm** and may be submitted to Duane Kilsdonk at duane.kilsdonk@oregon.gov

Attachments: Wildlife Monitoring and Mitigation Plan (May 10, 2007)
2018 Wildlife Monitoring Report

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1. Fatality Monitoring

(a) Definitions and Methods

Seasons

This plan uses the following dates for defining seasons:

Season	Dates
Spring Migration	March 16 to May 15
Summer/Breeding	May 16 to August 15
Fall Migration	August 16 to October 31
Winter	November 1 to March 15

Search Plots

The certificate holder shall conduct fatality monitoring within search plots. The certificate holder, in consultation with the Oregon Department of Fish and Wildlife (ODFW), shall select search plots based on the following sampling scheme, consistent with the sample size requirements for that phase of the facility, as outlined below: On each of the nine turbine strings that extend toward the John Day River, the certificate holder shall include in search plots the two turbines closest to the river for each phase in which these turbines are built. In addition, the certificate holder shall include, for each phase, representative turbines distributed throughout the site, consistent with the sample size described below. Each search plot will contain one turbine. Search plots will be square or circular. Circular search plots will be centered on the turbine location and will have a radius equal to the maximum blade tip height of the turbine contained within the plot. "Maximum blade tip height" is the turbine hub-height plus one-half the rotor diameter. Square search plots will be of sufficient size to contain a circular search plot as described above.

The certificate holder shall provide maps of the search plots to the Department and ODFW before beginning fatality monitoring at the facility. The certificate holder will use the same search plots for each search conducted during each monitoring year. During the second monitoring year, the same end-of-row turbines nearest the John Day River will be sampled, but the other search plots will be selected from the turbines not sampled during the first monitoring year.

Sample Size

The sample size for fatality monitoring is the number of turbines searched per monitoring year. The facility will be built in phases. For the first phase of development (in which 76 turbines will be built), the certificate holder shall conduct fatality monitoring during the first two monitoring years in search plots that include 50 turbines.

The sample size for future phases of the facility, if they are built, will include search plots for a minimum of 40 percent of the wind turbines in that phase but not fewer than 50 turbines, unless the entire phase is fewer than 50 turbines, in which event all turbines will be sampled. The sample size might be larger if, under Section 1(g) of this plan, mitigation is required based on the results of fatality monitoring of the first phase.

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1 If no mitigation is required under Section 1(g) of this plan based on the results of fatality
2 monitoring of the first phase, then the sample size for monitoring future phases of the facility
3 may be reduced appropriately if the Department concurs.

4 If mitigation is required under Section 1(g) of this plan based on the results of fatality
5 monitoring of the first phase, then the certificate holder shall propose an appropriate sample size
6 for monitoring the next phase of the facility. The need for, and scope of, fatality monitoring for
7 subsequent phases are subject to the approval of the Department.

8 *Scheduling and Sampling Frequency*

9 Fatality monitoring will begin upon the commencement of commercial operation of the
10 facility. Fatality monitoring for each subsequent phase will begin upon commercial operation of
11 that phase.

12 For each phase, the first fatality monitoring year will commence on the first day of the
13 month following the commercial operation date of that phase of the facility and will conclude
14 twelve months later (for example, if commercial operation begins in October of 2007, the
15 monitoring year will commence on November 1, 2007, and conclude on October 31, 2008).
16 Subsequent monitoring years of that phase will follow the same schedule (for example, the
17 second monitoring year would begin November 1, 2008) unless the second fatality-monitoring
18 year is postponed with the concurrence of the Department.

19 In each monitoring year, the certificate holder shall conduct fatality-monitoring searches
20 at the rates of frequency shown below. Over the course of one monitoring year, the certificate
21 holder would conduct 16 searches², as follows:

Season	Frequency
Spring Migration	2 searches per month (4 searches)
Summer/Breeding	1 search per month (3 searches)
Fall Migration	2 searches per month (5 searches)
Winter	1 search per month (4 searches)

22 *Duration of Fatality Monitoring*

23 Fatality monitoring of the first phase of the facility will be complete after two monitoring
24 years, except as follows: A worst-case analysis will be used to resolve any uncertainty in the
25 results of the two years of monitoring data for purposes of determining the mitigation
26 requirements for the facility. If the first two years of monitoring data indicate the potential for
27 unexpected impacts of a type that cannot be resolved appropriately by worst-case analysis and
28 appropriate mitigation, additional, targeted monitoring may be conducted for the first phase of
29 the facility for up to an additional two years before determining the mitigation requirements for
30 the facility, or, alternatively, sample sizes larger than those outlined above will be used in
31 monitoring of subsequent phases of development of the facility.

32 *Meteorological Towers*

33 The facility will most likely use non-guyed meteorological towers. Non-guyed towers are
34 known to cause little if any bird and bat mortality. Therefore, monitoring will not occur at non-

² Fewer than 16 searches may be conducted if searches are not possible due to safety reasons or severe weather.

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1 guyed meteorological towers. If the meteorological towers are guyed, the certificate holder shall
2 search all towers on the same monitoring schedule as fatality monitoring. The certificate holder
3 will use circular search plots. The radius of the circular search plots will extend a minimum of 5
4 meters beyond the most distant guy wire anchor point.

5 (b) Removal Trials

6 The objective of the removal trials is to estimate the length of time avian and bat
7 carcasses remain in the search area. Carcass removal studies will be conducted during each
8 season in the vicinity of the search plots. Estimates of carcass removal rates will be used to
9 adjust carcass counts for removal bias. "Carcass removal" is the disappearance of a carcass from
10 the search area due to predation, scavenging or other means such as farming activity. Removal
11 rates will be estimated by size class, habitat and season.

12 During the first phase, the certificate holder shall conduct carcass removal trials within
13 each of the seasons defined above during the years in which fatality monitoring occurs. During
14 the first year in which fatality monitoring occurs, trials will occur in at least eight different
15 calendar weeks in a year, with at least one calendar week between starting dates. Trials will be
16 spread throughout the year to incorporate the effects of varying weather, farming practices and
17 scavenger densities. At least two trials will be started in each season. Each trial will use at least
18 20 carcasses. For each trial, at least 5 small bird carcasses and at least 5 large bird carcasses will
19 be distributed in cultivated agriculture habitat and at least 3 small bird carcasses and at least 3
20 large bird carcasses will be distributed in non-cultivated habitat (grassland/shrub-steppe and
21 CRP). In a year, about 100 carcasses will be placed in cultivated agriculture and about 60 in non-
22 cultivated grassland/shrub-steppe and CRP for a total of about 160 trial carcasses. The number of
23 removal trials may be reduced to one per season (80 trial carcasses) during the second year of
24 fatality monitoring, subject to approval by the Department, if the certificate holder can
25 demonstrate that the calculation of fatality rates will continue to have statistical validity with the
26 reduced sample size.

27 The need for, and scope of, removal trials for subsequent phases may be modified based
28 on the variability of results of removal trials for the first phase, subject to the approval of the
29 Department.

30 The "small bird" size class will use carcasses of house sparrows, starlings, commercially
31 available game bird chicks or legally obtained native birds to simulate passerines. The "large
32 bird" size class will use carcasses of raptors provided by agencies, commercially available adult
33 game birds or cryptically colored chickens to simulate raptors, game birds and waterfowl. If
34 fresh bat carcasses are available, they may also be used.

35 To avoid confusion with turbine-related fatalities, planted carcasses will not be placed in
36 fatality monitoring search plots. Planted carcasses will be placed in the vicinity of search plots
37 but not so near as to attract scavengers to the search plots. The planted carcasses will be located
38 randomly within the carcass removal trial plots.

39 Carcasses will be placed in a variety of postures to simulate a range of conditions. For
40 example, birds will be: 1) placed in an exposed posture (e.g., thrown over the shoulder), 2)
41 hidden to simulate a crippled bird (e.g., placed beneath a shrub or tuft of grass) and, 3) partially
42 hidden. Trial carcasses will be marked discreetly for recognition by searchers and other
43 personnel. Trial carcasses will be left at the location until the end of the carcass removal trial.

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1 It is expected that carcasses will be checked as follows, although actual intervals may
2 vary. Carcasses will be checked for a period of 40 days to determine removal rates. They will be
3 checked about every day for the first 4 days, and then on day 7, day 10, day 14, day 20, day 30
4 and day 40. This schedule may vary depending on weather and coordination with the other
5 survey work. At the end of the 40-day period, the trial carcasses and scattered feathers will be
6 removed.

7 (c) Searcher Efficiency Trials

8 The objective of searcher efficiency trials is to estimate the percentage of bird and bat
9 fatalities that searchers are able to find. The certificate holder shall conduct searcher efficiency
10 trials on the fatality monitoring search plots in both grassland/shrub-steppe and cultivated
11 agriculture habitat types. Searcher efficiency will be estimated by size class, habitat type and
12 season. Estimates of searcher efficiency will be used to adjust carcass counts for detection bias.

13 During the first phase, searcher efficiency trials will be conducted in each season as
14 defined above, during the years in which the fatality monitoring occurs. Trials will be spread
15 throughout the year to incorporate the effects of varying weather, farming practices and
16 scavenger densities. At least two trials will be conducted in each season. Each trial will use about
17 20 carcasses, although the number will be variable so that the searcher will not know the total
18 number of trial carcasses being used in any trial. For each trial, both small bird and large bird
19 carcasses will be used in about equal numbers. “Small bird” and “large bird” size classes and
20 carcass selection are as described above for the removal trials. A greater proportion of the trial
21 carcasses will be distributed in cultivated agriculture habitat than in non-cultivated habitat
22 (grassland/shrub steppe and CRP). In a year, about 100 carcasses will be placed in cultivated
23 agriculture and about 60 in non-cultivated grassland/shrub steppe and CRP for a total of about
24 160 trial carcasses. The number of searcher efficiency trials may be reduced to one per season
25 (80 trial carcasses) during the second year of fatality monitoring, subject to approval by the
26 Department, if the certificate holder can demonstrate that the calculation of fatality rates will
27 continue to have statistical validity with the reduced sample size.

28 The need for, and scope of, searcher efficiency trials for subsequent phases may be
29 modified based on the variability of results of searcher efficiency trials for the first phase, subject
30 to the approval of the Department.

31 Personnel conducting searches will not know in advance when trials are conducted; nor
32 will they know the location of the trial carcasses. If suitable trial carcasses are available, trials
33 during the fall season will include several small brown birds to simulate bat carcasses. Legally
34 obtained bat carcasses will be used if available.

35 On the day of a standardized fatality monitoring search (described below) but before the
36 beginning of the search, efficiency trial carcasses will be placed at random locations within areas
37 to be searched. If scavengers appear attracted by placement of carcasses, the carcasses will be
38 distributed before dawn.

39 Searcher efficiency trials will be spread over the entire season to incorporate effects of
40 varying weather and vegetation growth. Carcasses will be placed in a variety of postures to
41 simulate a range of conditions. For example, birds will be: 1) placed in an exposed posture
42 (thrown over the shoulder), 2) hidden to simulate a crippled bird and 3) partially hidden.

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1 Each non-domestic carcass will be discreetly marked so that it can be identified as an
2 efficiency trial carcass after it is found. The number and location of the efficiency trial carcasses
3 found during the carcass search will be recorded. The number of efficiency trial carcasses
4 available for detection during each trial will be determined immediately after the trial by the
5 person responsible for distributing the carcasses.

6 If new searchers are brought into the search team, additional detection trials will be
7 conducted to ensure that detection rates incorporate searcher differences.

8 (d) Coordination with the Klondike III Wind Project

9 The proposed Klondike III Wind Project lies to the south of the BCWF on similar terrain
10 and habitat. The Council has approved site certificates for both facilities and requires similar
11 wildlife monitoring. Subject to the approval of both certificate holders and the Department, the
12 number of trials at each site and the number of trial carcasses used at each site can be reduced by
13 combining the removal data and efficiency data from both facilities, if the certificate holder can
14 demonstrate that the calculation of fatality rates will continue to have statistical validity for both
15 facilities and that combining the data will not affect any other requirements of the monitoring
16 plans for either facility.

17 (e) Fatality Monitoring Search Protocol

18 The objective of fatality monitoring is to estimate the number of bird and bat fatalities
19 that are attributable to facility operation and associated variances. The certificate holder shall
20 conduct fatality monitoring using standardized carcass searches.

21 The certificate holder shall use a worst-case analysis to resolve any uncertainty in the
22 results and to determine whether the data indicate that additional mitigation should be
23 considered. The Department may require additional, targeted monitoring if the data indicate the
24 potential for significant impacts that cannot be addressed by worst-case analysis and appropriate
25 mitigation.

26 The certificate holder shall estimate the number of avian and bat fatalities attributable to
27 operation of the facility based on the number of avian and bat fatalities found at the facility site.
28 All carcasses located within areas surveyed, regardless of species, will be recorded and, if
29 possible, a cause of death determined based on blind necropsy results. If a different cause of
30 death is not apparent, the fatality will be attributed to facility operation. The total number of
31 avian and bat carcasses will be estimated by adjusting for removal and searcher efficiency bias.

32 Personnel trained in proper search techniques (“the searchers”) will conduct the carcass
33 searches by walking parallel transects within the search plots.³ Transects will be initially set at 6
34 meters apart in the area to be searched. A searcher will walk at a rate of about 45 to 60 meters
35 per minute along each transect searching both sides out to three meters for casualties. Search area
36 and speed may be adjusted by habitat type after evaluation of the first searcher efficiency trial.
37 The searchers will record the condition of each carcass found, using the following condition
38 categories:

- 39 ■ Intact – a carcass that is completely intact, is not badly decomposed and shows no
40 sign of being fed upon by a predator or scavenger

³ Where search plots are adjacent, the search area may be rectangular.

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

- 1 ▪ Scavenged – an entire carcass that shows signs of being fed upon by a predator or
2 scavenger, or portions of a carcass in one location (e.g., wings, skeletal remains, legs,
3 pieces of skin, etc.)
- 4 ▪ Feather Spot – 10 or more feathers at one location indicating predation or scavenging
5 or 2 or more primary feathers

6 All carcasses (avian and bat) found during the standardized carcass searches will be
7 photographed as found, recorded and labeled with a unique number. Distance from observer to
8 the carcass will be measured (to the nearest 0.25 meters), as will the perpendicular distance from
9 the transect line to the carcass. Each carcass will be bagged and frozen for future reference and
10 possible necropsy. A copy of the data sheet for each carcass will be kept with the carcass at all
11 times. For each carcass found, searchers will record species, sex and age when possible, date and
12 time collected, location, condition (e.g., intact, scavenged, feather spot) and any comments that
13 may indicate cause of death. Searchers will map the find on a detailed map of the search area
14 showing the location of the wind turbines and associated facilities such as power lines. The
15 certificate holder shall coordinate collection of state endangered, threatened, sensitive or other
16 state protected species with ODFW. The certificate holder shall coordinate collection of
17 federally-listed endangered or threatened species and Migratory Bird Treaty Act protected avian
18 species with the U.S. Fish and Wildlife Service (USFWS). The certificate holder shall obtain
19 appropriate collection permits from ODFW and USFWS.

20 The searchers might discover carcasses incidental to formal carcass searches (e.g., while
21 driving within the project area). For each incidentally discovered carcass, the searcher shall
22 identify, photograph, record data and collect the carcass as would be done for carcasses within
23 the formal search sample during scheduled searches

24 If the incidentally discovered carcass is found within a formal search plot, the fatality
25 data will be included in the calculation of fatality rates. If the incidentally discovered carcass is
26 found outside a formal search plot, the data will be reported separately.

27 The certificate holder shall coordinate collection of incidentally discovered state
28 endangered, threatened, sensitive or other state protected species with ODFW. The certificate
29 holder shall coordinate collection of incidentally discovered federally-listed endangered or
30 threatened species and Migratory Bird Treaty Act protected avian species with the USFWS.

31 The certificate holder shall develop and follow a protocol for handing injured birds. Any
32 injured native birds found on the facility site will be carefully captured by a trained project
33 biologist or technician and transported to Jean Cypher (wildlife rehabilitator) in The Dalles, the
34 Blue Mountain Wildlife Rehabilitation Center in Pendleton or the Audubon Bird Care Center in
35 Portland in a timely fashion.⁴ The certificate holder shall pay costs, if any are charged, for time
36 and expenses related to care and rehabilitation of injured native birds found on the site, unless
37 the cause of injury is clearly demonstrated to be unrelated to the facility operations.

38 (f) Statistical Methods for Fatality Estimates

39 The estimate of the total number of wind facility-related fatalities is based on:

⁴ The people and centers listed here may be changed with Department approval.

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

- 1 (1) The observed number of carcasses found during standardized searches during the two
2 monitoring years for which the cause of death is attributed to the facility.⁵
- 3 (2) Searcher efficiency expressed as the proportion of planted carcasses found by
4 searchers.
- 5 (3) Non-removal rates expressed as the estimated average probability a carcass is
6 expected to remain in the study area and be available for detection by the searchers
7 during the entire survey period.

8 Definition of Variables

9 The following variables are used in the equations below:

- 10 c_i the number of carcasses detected at plot i for the study period of interest (e.g., one
11 year) for which the cause of death is either unknown or is attributed to the facility
- 12 n the number of search plots
- 13 k the number of turbines searched (includes the turbines centered within each
14 search plot and a proportion of the number of turbines adjacent to search plots to
15 account for the effect of adjacent turbines on the 90-meter search plot buffer area)
- 16 \bar{c} the average number of carcasses observed per turbine per year
- 17 s the number of carcasses used in removal trials
- 18 s_c the number of carcasses in removal trials that remain in the study area after 40
19 days
- 20 se standard error (square of the sample variance of the mean)
- 21 t_i the time (days) a carcass remains in the study area before it is removed
- 22 \bar{t} the average time (days) a carcass remains in the study area before it is removed
- 23 d the total number of carcasses placed in searcher efficiency trials
- 24 p the estimated proportion of detectable carcasses found by searchers
- 25 I the average interval between searches in days
- 26 $\hat{\pi}$ the estimated probability that a carcass is both available to be found during a
27 search and is found
- 28 m_t the estimated annual average number of fatalities per turbine per year, adjusted
29 for removal and observer detection bias
- 30 C nameplate energy output of turbine in megawatts (MW)

31 Observed Number of Carcasses

32 The estimated average number of carcasses (\bar{c}) observed per turbine per year is:

⁵ If a different cause of death is not apparent, the fatality will be attributed to facility operation.

**BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]**

$$\bar{c} = \frac{\sum_{i=1}^n c_i}{k} . \tag{1}$$

Estimation of Carcass Removal

Estimates of carcass removal are used to adjust carcass counts for removal bias. Mean carcass removal time (\bar{t}) is the average length of time a carcass remains at the site before it is removed:

$$\bar{t} = \frac{\sum_{i=1}^s t_i}{s - s_c} . \tag{2}$$

This estimator is the maximum likelihood estimator assuming the removal times follow an exponential distribution and there is right-censoring of data. Any trial carcasses still remaining at 40 days are collected, yielding censored observations at 40 days. If all trial carcasses are removed before the end of the trial, then s_c is 0, and \bar{t} is just the arithmetic average of the removal times. Removal rates will be estimated by carcass size (small and large) and season.

Estimation of Observer Detection Rates

Observer detection rates (i.e., searcher efficiency rates) are expressed as p , the proportion of trial carcasses that are detected by searchers. Observer detection rates will be estimated by carcass size and season.

Estimation of Facility-Related Fatality Rates

The estimated per turbine annual fatality rate (m_t) is calculated by:

$$m_t = \frac{\bar{c}}{\hat{\pi}} , \tag{3}$$

where $\hat{\pi}$ includes adjustments for both carcass removal (from scavenging and other means) and observer detection bias assuming that the carcass removal times t_i follow an exponential distribution unless a different assumption about carcass removal is made with the approval of the Department. Under these assumptions, this detection probability is estimated by:

$$\hat{\pi} = \frac{\bar{t} \cdot p}{I} \cdot \left[\frac{\exp\left(\frac{I}{\bar{t}}\right) - 1}{\exp\left(\frac{I}{\bar{t}}\right) - 1 + p} \right] . \tag{4}$$

The estimated per MW annual fatality rate (m) is calculated by:

$$m = \frac{m_t}{C} . \tag{5}$$

The certificate holder shall calculate fatality estimates for: (1) all birds, (2) small birds, (3) large birds, (4) raptors, (5) target grassland birds, (6) nocturnal avian migrants, 7) avian State Sensitive Species listed under OAR 635-100-0040, and 8) bats. The final reported estimates of m , associated standard errors and 90% confidence intervals will be calculated using bootstrapping (Manly 1997). Bootstrapping is a computer simulation technique that is useful for

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1 calculating point estimates, variances and confidence intervals for complicated test statistics. For
 2 each iteration of the bootstrap, the plots will be sampled with replacement, trial carcasses will be
 3 sampled with replacement and \bar{c} , \bar{t} , p , $\hat{\pi}$ and m will be calculated. A total of 5,000 bootstrap
 4 iterations will be used. The reported estimates will be the means of the 5,000 bootstrap estimates.
 5 The standard deviation of the bootstrap estimates is the estimated standard error. The lower 5th
 6 and upper 95th percentiles of the 5000 bootstrap estimates are estimates of the lower limit and
 7 upper limit of 90% confidence intervals.

8 Nocturnal Migrant and Bat Fatalities

9 Differences in observed nocturnal avian migrant and bat fatality rates for lit turbines,
 10 unlit turbines that are adjacent to lit turbines, and unlit turbines that are not adjacent to lit
 11 turbines will be compared graphically and statistically.

12 (g) Mitigation

13 Mitigation may be appropriate if analysis of the fatality data collected after two
 14 monitoring years shows fatality rates for avian species that exceed a threshold of concern. For
 15 the purpose of determining whether a threshold has been exceeded, the certificate holder shall
 16 calculate the average annual fatality rates for the species groups after the initial two years of
 17 monitoring. Based on current knowledge of the species that are likely to use the habitat in the
 18 area of the facility, the following thresholds apply to the BCWF:

Species Group	Threshold of Concern (fatalities per MW)
Raptors (All eagles, hawks, falcons and owls, including burrowing owls.)	0.09
Raptor species of special concern (Swainson’s hawk, ferruginous hawk, peregrine falcon, golden eagle, bald eagle, burrowing owl and any federal threatened or endangered raptor species.)	0.06
Target grassland birds (All native bird species that rely on grassland habitat and are either resident species, occurring year round, or species that nest in the area, excluding horned lark, burrowing owl and northern harrier.)	0.59
State sensitive avian species listed under OAR 635-100-0040 (Excluding raptors listed above.)	0.20
Bat species as a group	2.50
Guyed Meteorological Tower Mortality	
Raptor T&E species and raptor species of special concern, as a group (Swainson’s hawk, ferruginous hawk, golden eagle and burrowing owl; bald eagle, peregrine falcon, and any other federal threatened or endangered raptor species)	0.20/ guyed tower
Avian State Sensitive Species listed under OAR 635-100-0040 (Excluding raptors)	0.20/ guyed tower

19 In addition, mitigation may be appropriate if fatality rates for individual species
 20 (especially State Sensitive Species) are higher than expected and at a level of biological concern.
 21 If the data show that a threshold of concern for a species group has been exceeded or that the
 22 fatality rate for any individual species is at a level of biological concern, mitigation shall be
 23 required if the Department determines that mitigation is appropriate based on analysis of the data
 24 and any other significant information available at the time. If mitigation is appropriate, the
 25 certificate holder, in consultation with ODFW, shall propose mitigation measures designed to

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1 benefit the affected species. This may take into consideration whether mitigation required or
2 provided for other impacts, such as raptor nesting or grassland bird displacement, would also
3 benefit the affected species.

4 The certificate holder shall implement mitigation as approved by the Council. The
5 Department may recommend additional, targeted data collection if the need for mitigation is
6 unclear based on the information available at the time. The certificate holder shall implement
7 such data collection as approved by the Council.

8 Mitigation shall be designed to benefit the affected species group. Mitigation may
9 include, but is not limited to, protection of nesting habitat for the affected group of native species
10 through a conservation easement or similar agreement. Tracts of land that are intact and
11 functional for wildlife are preferable to degraded habitat areas. Preference should be given to
12 protection of land that would otherwise be subject to development or use that would diminish the
13 wildlife value of the land. In addition, mitigation measures might include: enhancement of the
14 protected tract by weed removal and control; increasing the diversity of native grasses and forbs;
15 planting sagebrush or other shrubs; constructing and maintaining artificial nest structures for
16 raptors; reducing cattle grazing; improving wildfire response; and local research that would aid
17 in understanding more about the species and conservation needs.

18 If the threshold for bats species as a group is exceeded, the certificate holder shall
19 contribute to Bat Conservation International or to a Pacific Northwest bat conservation group
20 (\$10,000 per year for three years) to fund new or ongoing research in the Pacific Northwest to
21 better understand impacts to the bat species impacted by the facility and to develop possible
22 ways to reduce impacts to the affected species.

23 In addition, mitigation may be appropriate if fatality rates for a State Sensitive bat species
24 listed under OAR 635-100-0040 are higher than expected and at a level of concern. If the data
25 show that a threshold of concern for a species group has been exceeded or that the fatality rate
26 for any individual species is at a level of concern, mitigation shall be required if the Department
27 determines that mitigation is appropriate based on analysis of the data and any other significant
28 information available at the time. If mitigation is appropriate, the certificate holder, in
29 consultation with ODFW, shall propose mitigation measures designed to benefit the affected
30 species. The certificate holder shall implement mitigation as approved by the Council.

2. Raptor Nest Surveys

31 The objectives of raptor nest surveys are to estimate the size of the local breeding
32 populations of tree or other above-ground-nesting raptor species in the vicinity of the facility and
33 to determine whether operation of the facility results in a reduction of nesting activity or nesting
34 success in the local populations of the following raptor species: Swainson's hawk, ferruginous
35 hawk and golden eagle. The certificate holder shall direct a qualified biologist, approved by the
36 Department, to conduct the raptor nest surveys. The Department has approved the qualifications
37 of the four biologists identified in the Final Order on Amendment #2. The certificate holder may
38 select other qualified biologists to conduct the raptor nest surveys, subject to Department
39 approval.

(a) Survey Protocol

41 For the species listed above, aerial and ground surveys will be used to gather nest success
42 data on active nests, nests with young and young fledged. The certificate holder will share the

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1 data with state and federal biologists. The certificate holder shall conduct two years of post-
2 construction raptor nest surveys for each phase of construction and long-term raptor nest surveys
3 for the completed facility during the sensitive nesting and breeding season. One year of post-
4 construction surveys will be done in the first nesting season after construction of the phase is
5 completed. The second year of post-construction surveys will be done after construction of the
6 phase is completed at a time recommended by the certificate holder and approved by the
7 Department. Long-term surveys will be conducted starting in the fifth year following completion
8 of the last post-construction survey and each five years thereafter for the life of the facility. The
9 certificate holder may collaborate with other certificate holders in the vicinity of the facility in
10 the development of useful information about future impacts on raptor nesting activity and nesting
11 success.

12 Prior to the raptor nesting surveys, the certificate holder shall review the locations of
13 known raptor nests based on the BCWF and Klondike Wind Project pre-construction surveys as
14 well as any nest survey data collected after construction. All known nest sites and any new nests
15 observed within the BCWF site and within two miles of the BCWF site will be given
16 identification numbers. Nest locations will be recorded on U.S. Geological Survey 7.5-minute
17 quadrangle maps. Global positioning system coordinates will be recorded for each nest and
18 integrated with the baseline database. Locations of inactive nests will also be recorded as they
19 may become occupied during future years.

20 During each raptor nesting monitoring year, the certificate holder shall conduct a
21 minimum of one helicopter survey in late May or early June within the BCWF site and a 2-mile
22 zone around the turbines to determine nest occupancy. Determining nest occupancy will likely
23 require two visits to each nest: The second visit may be done by air or by ground as appropriate.
24 For occupied nests of the species identified above, the certificate holder shall determine nesting
25 success by a minimum of one ground visit to determine species, number of young and nesting
26 success. "Nesting success" means that the young have successfully fledged (the young are
27 independent of the core nest site). Nests that cannot be monitored due to the landowner denying
28 access will be checked from a distance where feasible.

29 (b) Mitigation

30 The certificate holder shall analyze the raptor nesting data collected after two monitoring
31 years to determine whether a reduction in either nesting success or nest use has occurred in the
32 vicinity of the BCWF. If the analysis indicates a reduction in nesting success by Swainson's
33 hawk, ferruginous hawk or golden eagle within two miles of the facility (including the area
34 within the BCWF site), then the certificate holder shall propose appropriate mitigation and shall
35 implement mitigation as approved by the Council. At a minimum, if the analysis shows that any
36 of these species has abandoned a nest territory within the facility site or within ½ mile of the
37 facility site, or has not fledged any young over the two-year period within the facility site or
38 within ½ mile of the facility site, the certificate holder shall assume the abandonment or
39 unsuccessful fledging is the result of the facility unless another cause can be demonstrated
40 convincingly. If the BCWF facility and the Klondike III facility are both required to provide
41 mitigation for the same nest, the two certificate holders shall coordinate the required mitigation
42 with the approval of the Department.

43 Given the very low buteo nesting densities in the area, statistical power to detect a
44 relationship between distance from a wind turbine and nesting parameters (*e.g.*, number of

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1 fledglings per reproductive pair) will be very low. Therefore, impacts may have to be judged
2 based on trends in the data, results from other wind energy facility monitoring studies and
3 literature on what is known regarding the populations in the region.

4 If the analysis shows that mitigation is appropriate, the certificate holder shall propose
5 mitigation for the affected species in consultation with the Department and ODFW, and shall
6 implement mitigation as approved by the Council. Mitigation should be designed to benefit the
7 affected species or contribute to overall scientific knowledge and understanding of what causes
8 nest abandonment or nest failure. Mitigation may be designed to proceed in phases over several
9 years. It may include, but is not limited to, additional raptor nest monitoring, protection of
10 natural nest sites from human disturbance or cattle activity (preferably within the general area of
11 the facility), or participation in research projects designed to improve scientific understanding of
12 the needs of the affected species. Mitigation may take into consideration whether mitigation
13 required or provided for other impacts, such as fatality impacts or grassland bird displacement,
14 would also benefit the raptor species whose nesting success was adversely affected.

3. Avian Use and Behavior Surveys

15 The certificate holder shall conduct a before/after avian behavior and monitoring study to
16 determine whether operation of the BCWF reduces bird use and abundance in the area (often
17 referred to as displacement). The results of this study will aid in estimating indirect avian
18 impacts of the BCWF and guide potential mitigation.

19 The before/after study will use two of the observation stations that were used during the
20 baseline study (H and I) and two new survey stations (A5 and A6).⁶ Avian use and behavior will
21 be monitored at these four stations 6 times each month from November 2005 – August 15, 2006
22 (pre-construction period) and 6 times each month during two post-construction monitoring years
23 (after construction of wind turbines located near these survey stations).⁷

24 These four stations are located in the northeastern portion of the BCWF area near the
25 John Day River canyon. The areas surrounding these survey stations were subject to numerous
26 micrositing decisions during facility layout. Primary micrositing decisions included shortening
27 and re-orientating turbine corridors to avoid native habitat, maintaining a minimum one-mile
28 distance from the centerline of the John Day River, and avoiding locating turbines on steep
29 slopes.

30 Each survey will consist of one 30-minute observation period at each of these four
31 stations using the same protocol that was used for baseline data collection. In particular, raptor
32 and waterfowl use estimates and behavior relative to turbine locations and flight path maps will
33 be compared between the pre- and post-construction periods to provide information on raptor
34 and waterfowl displacement and to estimate indirect impacts on raptors and waterfowl. The
35 phrase “behavior relative to turbine locations” is intended to address observations of behavior
36 that is different near turbines compared to behavior away from turbines.

37 In addition to surveys at these four stations, searchers will also record bird species
38 observed and their behavior relative to turbine locations before or after each standardized carcass

⁶ The observation stations are identified in a report by Western EcoSystems Technology, Inc., “John Day Avian Studies for the Biglow Canyon Wind Farm Project, February 2007.”

⁷ Fewer than 6 monitoring sessions may be conducted if necessary due to safety reasons or severe weather.

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1 search (as described in Section 1(e) above). Observations will be recorded during 5-minute
2 surveys at each turbine sampled during the fatality monitoring program, using standard variable
3 circular plot point count survey methods. Collection and recording of these additional
4 observations of live birds will be carried out in a manner that does not distract searchers from
5 carrying out the standardized carcass searches.

6 All of these avian use and behavior data, as well as raptor and waterfowl mortality
7 observed at the turbines near these stations, will be used to understand direct and indirect impacts
8 of the BCWF facility on raptors, waterfowl and other avian species. The certificate holder shall
9 include an analysis of this data in the reports described in Section 5.

4. Biglow Wildlife Incident Response and Handling System

10 The Wildlife Incident Response and Handling System is a monitoring program set up for
11 responding to and handling avian and bat casualties found by construction and maintenance
12 personnel during construction and operation of the facility. This monitoring program includes the
13 initial response, the handling and the reporting of bird and bat carcasses discovered incidental to
14 construction and maintenance operations (“incidental finds”). Construction and maintenance
15 personnel will be trained in the methods needed to carry out this program.

16 All carcasses discovered by construction or maintenance personnel will be photographed,
17 recorded and collected.

18 If construction or maintenance personnel find carcasses within the plots for protocol
19 searches, they will notify a qualified biologist, as approved by the Department, who will collect
20 the carcasses. The fatality data will be included in the calculation of fatality rates.

21 If construction or maintenance personnel discover incidental finds that are not within
22 plots for fatality monitoring protocol searches, they will notify a qualified biologist, as approved
23 by the Department, and the carcass will be collected by a carcass-handling permittee (a person
24 who is listed on state and federal scientific or salvage collection permits). Data for these
25 incidental finds will be reported separately from standardized fatality monitoring data.

26 The certificate holder shall coordinate collection of state endangered, threatened,
27 sensitive or other state protected species with ODFW. The certificate holder shall coordinate
28 collection of federally-listed endangered or threatened species and Migratory Bird Treaty Act
29 protected avian species with the USFWS.

5. Data Reporting

30 The certificate holder will report the monitoring data and analysis to the Department.
31 Monitoring data include fatality monitoring program data, raptor nest survey data, avian use and
32 behavior survey data and data on incidental finds by fatality searchers and BCWF personnel. The
33 report may be included in the annual report required under OAR 345-026-0080 or may be
34 submitted as a separate document at the same time the annual report is submitted. In addition, the
35 certificate holder shall provide to the Department any data or record generated in carrying out
36 this monitoring plan upon request by the Department.

37 The certificate holder shall immediately notify USFWS and ODFW, respectively, in the
38 event that any federal or state endangered or threatened species are killed or injured on the
39 facility site.

BIGLOW CANYON WIND FARM: WILDLIFE MONITORING AND MITIGATION PLAN
[MAY 10, 2007]

1 The public will have an opportunity to receive information about monitoring results and
2 to offer comment. Within 30 days after receiving the annual report of monitoring results, the
3 Department will make the report available to the public on its website and will specify a time in
4 which the public may submit comments to the Department.⁸

6. Amendment of the Plan

5 This Wildlife Monitoring and Mitigation Plan may be amended from time to time by
6 agreement of the certificate holder and the Council. Such amendments may be made without
7 amendment of the site certificate. The Council authorizes the Department to agree to
8 amendments to this plan and to mitigation actions that may be required under this plan. The
9 Department shall notify the Council of all amendments and mitigation actions, and the Council
10 retains the authority to approve, reject or modify any amendment of this plan or mitigation action
11 agreed to by the Department.

⁸ The certificate holder may establish a Technical Advisor Committee (TAC) but is not required to do so. If the certificate holder establishes a TAC, the TAC may offer comments to the Council about the results of the monitoring required under this plan.

**BIGLOW CANYON WIND FARM
WILDLIFE MONITORING, HABITAT MITIGATION, AND REVEGETATION
2018 ANNUAL REPORT**

The Site Certificate for Biglow Canyon Wind Farm (BCWF) (OEFSC 2006) requires mitigation and monitoring for facility impacts on wildlife and associated habitats. Three plans included as attachments to the Site Certificate describe in detail the mitigation and monitoring requirements. These include the Wildlife Monitoring and Mitigation Plan (Condition 61), Revegetation Plan (Condition 62), and Habitat Mitigation Plan (Condition 63). The following sections describe the activities conducted during 2018 in accordance with those three plans and other Site Certificate wildlife-related requirements.

WILDLIFE MONITORING AND MITIGATION

The Wildlife Monitoring and Mitigation Plan for BCWF describes wildlife monitoring that Portland General Electric (PGE) must conduct during operation of the facility, including: 1) avian and bat fatality monitoring; 2) raptor nesting surveys; 3) avian use and behavior surveys; and, 4) wildlife incident response handling. In 2018 activities conducted by PGE were associated with the Wildlife Incident Response and Handling System. The details of these activities are listed below.

Wildlife Incident Response and Handling System

The Wildlife Incident Response and Handling System is a program for responding to and handling avian and bat casualties found by personnel at the project site during construction and routine maintenance operations. In 2018, PGE biologists met with project staff and contractors on several occasions to provide ongoing training for handling wildlife incidents. PGE also maintains a State of Oregon Scientific Take Permit (#046-17) (Attachment A) and a Federal Migratory Bird Permit (MB# 65566B-0) (Attachment B) to lawfully collect and handle state protected birds and bats and federal Migratory Bird Treaty Act protected birds. Consistent with permit requirements, PGE filed annual reports with both the Oregon Department of Fish and Wildlife (ODFW) and the U.S. Fish and Wildlife Service (USFWS) for 2018 activities conducted under the permits at BCWF.

During 2018, no incidental avian and bat mortality reports were logged by project maintenance staff. The annual mortality report was electronically filed with both ODFW and USFWS. Copies of both reports are available by contacting Lenna Cope or Kristi Boken at Portland General Electric.

REVEGETATION PLAN

Monitoring

The Revegetation Plan for BCWF describes methods and standards for revegetating areas temporarily disturbed during construction, maintenance or repair of the facility. The objective is to restore temporarily disturbed areas to pre-construction condition or better. In addition to describing revegetation procedures, the plan also includes criteria for measuring revegetation