

Leaning Juniper II Wind Project: Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 This plan describes wildlife monitoring that the certificate holder shall conduct during
2 operation of the Leaning Juniper II Wind Power Facility (LJF).¹ The monitoring objectives are to
3 determine whether the facility causes significant fatalities of birds and bats and to determine
4 whether the facility results in a loss of habitat quality.

5 The LJF facility consists of up to 133 wind turbines, four non-guyed meteorological
6 (met) towers and other related or supporting facilities as described in the site certificate. The
7 permanent facility components occupy approximately 64 acres, of which approximately 45 acres
8 is Category 5 wildlife habitat or better, based on the Oregon Department of Fish and Wildlife
9 (ODFW) standards (OAR 635-415-0025).

10 The certificate holder shall use experienced personnel to implement the monitoring
11 required under this plan and properly trained personnel to conduct the monitoring, subject to
12 approval by the Oregon Department of Energy (Department) as to professional qualifications.
13 For all components of this plan except PPM Energy’s Leaning Juniper II Wildlife Reporting and
14 Handling System, the certificate holder shall hire an independent third party (not employees of
15 the certificate holder) to perform monitoring tasks.

16 The Wildlife Monitoring and Mitigation Plan for the LJF has the following components:

- 17 1) Fatality monitoring program including:
 - 18 a) Removal trials
 - 19 b) Searcher efficiency trials
 - 20 c) Fatality search protocol
 - 21 d) Statistical analysis
- 22 2) Raptor nesting surveys
- 23 3) Washington ground squirrel surveys
- 24 4) Grassland bird study
- 25 5) PPM Energy’s Leaning Juniper II Wildlife Reporting and Handling System

26 Based on the results of the monitoring programs, mitigation of significant impacts may be
27 required. The selection of the mitigation actions should allow for flexibility in creating
28 appropriate responses to monitoring results that cannot be known in advance. If the Department
29 determines that mitigation is needed, the certificate holder shall propose appropriate mitigation
30 actions to the Department and shall carry out mitigation actions approved by the Department,
31 subject to review by the Oregon Energy Facility Council (Council).

¹ This plan is incorporated by reference in the site certificate for the LJF and must be understood in that context. It is not a “stand-alone” document. This plan does not contain all mitigation required of the certificate holder.

Leaning Juniper II Wildlife Monitoring and Mitigation Plan
[SEPTEMBER 21, 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 a systematic sampling design that ensures that the selected search plots are representative of the habitat conditions in different parts of the site. 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 before beginning fatality monitoring at the facility. The certificate holder shall use the same search plots for each search conducted during a monitoring year.

Scheduling

In each monitoring year, the certificate holder shall conduct fatality monitoring searches at the rates of frequency shown below. Over the course of one monitoring year, the certificate holder would conduct 16 searches, 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)

Sample Size

The sample size for fatality monitoring is the number of turbines searched per monitoring year. During each monitoring year, the certificate holder shall search a minimum of 50 turbines. If fewer than 50 turbines are built, the certificate holder shall search all turbines.

As described in the site certificate, the certificate holder may choose to build the LJF using turbine types in two size classes:

- Small: turbines having a rotor diameter of 82 meters or less
- Large: turbines having a rotor diameter greater than 82 meters

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 If the final design of the LJF facility includes both small and large turbines, the
2 certificate holder, before beginning fatality monitoring, shall consult with an independent expert
3 with experience in statistical analysis of avian fatality data to determine whether it would be
4 possible to design a 50-turbine sample with a sufficient number of turbines in each size class to
5 allow a statistical comparison of fatality rates for all birds as a group. The certificate holder shall
6 submit the expert's written analysis to the Department. If the expert's analysis shows that a
7 comparison study is possible and if the Department approves, the certificate holder shall sample
8 the appropriate number of turbines in each class and conduct the comparison study. The
9 certificate holder may choose to sample more than 50 turbines in each monitoring year, if a
10 larger sample size would allow the comparison study to be done.

11 (b) Removal Trials

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

18 The certificate holder shall conduct carcass removal trials within each of the seasons
19 defined above during the years in which fatality monitoring occurs. During the first year in
20 which fatality monitoring occurs, the certificate holder shall conduct one removal trial per season
21 (four removal trials per year). For each trial, at least 10 small bird carcasses and at least 10 large
22 bird carcasses will be distributed throughout the project area (approximately 80 trial carcasses
23 per year).

24 Before beginning removal trials for the second year of fatality monitoring, the certificate
25 holder shall report the results of the first year removal trials to the Department and ODFW. In the
26 report, the certificate holder shall analyze whether four removal trials per year, as described
27 above, provides sufficient data to accurately estimate adjustment factors for carcass removal. The
28 number of removal trials for the second year of fatality monitoring may be adjusted up or down,
29 subject to the approval of the 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) or 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.

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 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 approximately every day for the first 4 days, and then on day 7, day 10, day 14, day 20,
4 day 30 and day 40. This schedule may vary depending on weather and coordination with the
5 other survey work. At the end of the 40-day period, the trial carcasses and scattered feathers will
6 be 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. A pooled estimate of searcher efficiency will be used to adjust carcass counts for
13 detection bias.

14 The certificate holder shall conduct searcher efficiency trials within each of the seasons
15 defined above during the years in which the fatality monitoring occurs. During each season of
16 the years in which fatality monitoring occurs, the certificate holder shall use approximately 25
17 carcasses for searcher efficiency trials (approximately 100 carcasses per year). The certificate
18 holder shall vary the number of trials per season and the number of carcasses per trial so that the
19 searchers will not know the total number of trial carcasses being used in any trial. The certificate
20 holder shall distribute trial carcasses in varied habitat in rough proportion to the habitat types
21 within the facility site. During each season, both small bird and large bird carcasses will be used
22 in approximately equal numbers. "Small bird" and "large bird" size classes and carcass selection
23 are as described above for the removal trials.

24 Before beginning searcher efficiency trials for the second year of fatality monitoring, the
25 certificate holder shall report the results of the first year efficiency trials to the Department and
26 ODFW. In the report, the certificate holder shall analyze whether the efficiency trials as
27 described above (using approximately 100 carcasses per year) provides sufficient data to
28 accurately estimate adjustment factors for carcass removal. The number of removal trials for the
29 second year of fatality monitoring may be adjusted up or down, subject to the approval of the
30 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 Efficiency trials will be spread over the entire season to incorporate effects of varying
40 weather and vegetation growth. Carcasses will be placed in a variety of postures to simulate a
41 range of conditions. For example, birds will be: 1) placed in an exposed posture (thrown over the
42 shoulder), 2) hidden to simulate a crippled bird or 3) partially hidden.

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 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 searcher efficiency trials
7 will be conducted to ensure that detection rates incorporate searcher differences. The certificate
8 holder shall include a discussion of any changes in search personnel and any additional detection
9 trials in the reporting required under Section 6 of this plan.

10 (d) Fatality Monitoring Search Protocol

11 The objective fatality monitoring is to estimate the number of bird and bat fatalities that
12 are attributable to facility operation as an indicator of the impact of the facility on habitat quality.
13 The goal of bird and bat fatality monitoring is to estimate fatality rates and associated variances.
14 The certificate holder shall conduct fatality monitoring using standardized carcass searches. The
15 certificate holder shall conduct fatality monitoring for two years (32 searches), beginning one
16 month after the start of commercial operation of the facility.

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

22 The certificate holder shall calculate fatality rates using the statistical methods described
23 in Section (e). On an annual basis, the certificate holder shall report an estimate of fatalities in
24 eight categories: 1) all birds, 2) small birds, 3) large birds, 4) raptors, 5) grassland birds, 6)
25 nocturnal migrants, 7) State Sensitive Species listed under OAR 635-100-0040 and 8) bats.

26 If the sample size is large enough to conduct a comparison study of large and small
27 turbines and the Department approves, the certificate holder shall compare the fatality rates in
28 the “all birds” category for each of the turbine size classes. In proposing a comparison study of
29 large and small turbines, the certificate holder may include available data collected at other wind
30 energy facilities in similar habitat areas, if the data are based on comparable survey protocols and
31 are appropriately adjusted for removal and searcher efficiency bias.

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

38 Personnel trained in proper search techniques (“the searchers”) will conduct the carcass
39 searches by walking parallel transects within the search plots.² Transects will be initially set at 6
40 meters apart in the area to be searched. A searcher will walk at a rate of approximately 45 to 60

² Where search plots are adjacent, the search area may be rectangular.

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 meters per minute along each transect searching both sides out to three meters for casualties.
2 Search area and speed may be adjusted by habitat type after evaluation of the first searcher
3 efficiency trial. The searchers will record the condition of each carcass found, using the
4 following condition categories:

- 5 ▪ Intact – a carcass that is completely intact, is not badly decomposed and shows no
6 sign of being fed upon by a predator or scavenger
- 7 ▪ Scavenged – an entire carcass that shows signs of being fed upon by a predator or
8 scavenger, or portions of a carcass in one location (e.g., wings, skeletal remains,
9 legs, pieces of skin, etc.)
- 10 ▪ Feather Spot – 10 or more feathers at one location indicating predation or
11 scavenging or 2 or more primary feathers

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

25 The searchers might discover carcasses incidental to formal carcass searches (e.g., while
26 driving within the project area). For each incidentally discovered carcass, the searcher shall
27 identify, photograph, record data and collect the carcass as would be done for carcasses within
28 the formal search sample during scheduled searches. If the incidentally discovered carcass is
29 found within a formal search plot, the fatality data will be included in the calculation of fatality
30 rates. If the incidentally discovered carcass is found outside a formal search plot, the data will be
31 reported separately. The certificate holder shall coordinate collection of incidentally discovered
32 state endangered, threatened, sensitive or other state protected species with ODFW. The
33 certificate holder shall coordinate collection of incidentally discovered federally-listed
34 endangered or threatened species and Migratory Bird Treaty Act protected avian species with the
35 USFWS.

36 The certificate holder shall develop and follow a protocol for handling injured birds. Any
37 injured native birds found on the facility site will be carefully captured by a trained project
38 biologist or technician and transported to a qualified rehabilitation specialist approved by the
39 Department.³ The certificate holder shall pay costs, if any, charged for time and expenses related

³ Approved specialists include Lynn Tompkins (wildlife rehabilitator) of Blue Mountain Wildlife, a wildlife rehabilitation center in Pendleton, and the Audubon Bird Care Center in Portland. The certificate holder must obtain Department approval before using other specialists.

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 to care and rehabilitation of injured native birds found on the site, unless the cause of injury is
2 clearly demonstrated to be unrelated to the facility operations.

3 (e) Statistical Methods for Fatality Estimates

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

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

12 Definition of Variables

13 The following variables are used in the equations below:

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

⁴ If a different cause of death is not apparent, the fatality will be attributed to facility operation.

Leaning Juniper II Wildlife Monitoring and Mitigation Plan
[SEPTEMBER 21, 2007]

1 Observed Number of Carcasses

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

3
$$\bar{c} = \frac{\sum_{i=1}^n c_i}{k} . \tag{1}$$

4 Estimation of Carcass Removal

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

7
$$\bar{t} = \frac{\sum_{i=1}^s t_i}{s - s_c} . \tag{2}$$

8 This estimator is the maximum likelihood estimator assuming the removal times follow an
 9 exponential distribution and there is right-censoring of data. Any trial carcasses still remaining at
 10 40 days are collected, yielding censored observations at 40 days. If all trial carcasses are
 11 removed before the end of the trial, then s_c is 0, and \bar{t} is just the arithmetic average of the
 12 removal times. Removal rates will be estimated by carcass size (small and large), habitat type
 13 and season.

14 Estimation of Observer Detection Rates

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

18 Estimation of Facility-Related Fatality Rates

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

20
$$m_t = \frac{\bar{c}}{\hat{\pi}} , \tag{3}$$

21 where $\hat{\pi}$ includes adjustments for both carcass removal (from scavenging and other means) and
 22 observer detection bias assuming that the carcass removal times t_i follow an exponential
 23 distribution. Under these assumptions, this detection probability is estimated by:

24
$$\hat{\pi} = \frac{\bar{t} \cdot p}{I} \cdot \left[\frac{\exp\left(\frac{I}{\bar{t}}\right) - 1}{\exp\left(\frac{I}{\bar{t}}\right) - 1 + p} \right] . \tag{4}$$

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

26
$$m = \frac{m_t}{C} . \tag{5}$$

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 The certificate holder shall calculate fatality estimates for: (1) all birds, (2) small birds,
2 (3) large birds, (4) raptors, (5) grassland birds, (6) nocturnal migrants 7) State Sensitive Species
3 listed under OAR 635-100-0040 and 8) bats. If the sample size is large enough to conduct a
4 comparison study of large and small turbines and the Department approves, the certificate holder
5 shall compare the fatality rates in the “all birds” category for each of the turbine size classes. The
6 final reported estimates of m , associated standard errors and 90% confidence intervals will be
7 calculated using bootstrapping (Manly 1997). Bootstrapping is a computer simulation technique
8 that is useful for calculating point estimates, variances and confidence intervals for complicated
9 test statistics. For each iteration of the bootstrap, the plots will be sampled with replacement, trial
10 carcasses will be sampled with replacement and \bar{c} , \bar{t} , p , $\hat{\pi}$ and m will be calculated. A total of
11 5,000 bootstrap iterations will be used. The reported estimates will be the means of the 5,000
12 bootstrap estimates. The standard deviation of the bootstrap estimates is the estimated standard
13 error. The lower 5th and upper 95th percentiles of the 5000 bootstrap estimates are estimates of
14 the lower limit and upper limit of 90% confidence intervals.

15 Nocturnal Migrant and Bat Fatalities

16 Differences in observed nocturnal migrant and bat fatality rates for lit turbines, unlit
17 turbines that are adjacent to lit turbines and unlit turbines that are not adjacent to lit turbines will
18 be compared graphically and statistically.

19 (f) Mitigation

20 Mitigation may be appropriate if fatality rates exceed a “threshold of concern.” For the
21 purpose of determining whether a threshold has been exceeded, the certificate holder shall
22 calculate the average annual fatality rates for species groups after two years of monitoring. Based
23 on current knowledge of the species that are likely to use the habitat in the area of the facility, the
24 following thresholds apply to the LJV facility:

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
Grassland species (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.)	0.2
Bat species as a group	2.5

25 If the data show that a threshold of concern for a species group has been exceeded, the
26 certificate holder shall implement additional mitigation if the Department determines that
27 mitigation is appropriate based on analysis of the data, consultation with ODFW and
28 consideration of any other significant information available at the time. In addition, the
29 Department may determine that mitigation is appropriate if fatality rates for individual avian or
30 bat species (especially State Sensitive Species) are higher than expected and at a level of

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 biological concern. If the Department determines that mitigation is appropriate, the certificate
2 holder, in consultation with the Department and ODFW, shall propose mitigation measures
3 designed to benefit the affected species. The certificate holder shall implement mitigation as
4 approved by the Council. The Department may recommend additional, targeted data collection if
5 the need for mitigation is unclear based on the information available at the time. The certificate
6 holder shall implement such data collection as approved by the Council.

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

18 2. Raptor Nest Surveys

19 The objectives of raptor nest surveys are: (1) to estimate the size of the local breeding
20 populations of raptor species that nest on the ground or aboveground in trees or other
21 aboveground nest locations in the vicinity of the facility; and (2) to determine whether operation
22 of the facility results in a reduction of nesting activity or nesting success in the local populations
23 of the following raptor species: Swainson's hawk, golden eagle, ferruginous hawk and burrowing
24 owl.

25 (a) Survey Protocol

26 For Raptor Species that Nest Aboveground

27 The certificate holder shall use aerial and ground surveys to evaluate nest success by
28 gathering data on active nests, on nests with young and on young fledged. The certificate holder
29 will share the data with state and federal biologists. The certificate holder shall conduct the first
30 year of post-construction raptor nest surveys in the first raptor nesting season after construction
31 is completed. The second year of surveys will be done in the fourth year after construction is
32 completed. Thereafter, the certificate holder shall conduct raptor nest surveys as described in
33 Section 2(d) below.

34 During each survey year, the certificate holder will conduct a minimum of one helicopter
35 survey in late May or early June and additional surveys as described in this section. All nests
36 discovered during pre-construction surveys and any nests discovered during post-construction
37 surveys, whether active or inactive, will be given identification numbers. Nest locations will be
38 recorded on U.S. Geological Survey 7.5-minute quadrangle maps. Global positioning system
39 coordinates will be recorded for each nest. Locations of inactive nests will be recorded because
40 they could become occupied during future years.

41 The certificate holder shall conduct the aerial surveys within the LJF site and a 2-mile
42 buffer around the site to determine nest occupancy. Determining nest *occupancy* will likely

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 require two helicopter visits to each nest. For occupied nests, the certificate holder shall
2 determine nesting *success* by a minimum of one ground visit to determine species, number of
3 young and young fledged. “Nesting success” means that the young have successfully fledged
4 (the young are independent of the core nest site). Nests that cannot be monitored due to the
5 landowner denying access will be checked from a distance where feasible.

6 For Burrowing Owls

7 If burrowing owl nest sites are discovered, the certificate holder will monitor them
8 according to the following protocol. This species is not easily detected during aerial raptor nest
9 surveys. The certificate holder shall record active burrowing owl nest sites in the vicinity of the
10 facility as they are discovered during other wildlife monitoring tasks. Any nests discovered
11 during post-construction surveys, whether active or showing signs of intermittent use by the
12 species, will be given identification numbers. Nest locations will be recorded on U.S. Geological
13 Survey 7.5-minute quadrangle maps. Global positioning system coordinates will be recorded for
14 each nest site. Coordinates for ancillary burrows used by one nesting pair or a group of nesting
15 pairs will also be recorded. Locations of inactive nests will be recorded because they could
16 become occupied during future years.

17 For occupied nests, the certificate holder shall determine nesting *success* by a minimum
18 of one ground visit to determine species, number of young and young fledged. “Nesting success”
19 means that the young have successfully fledged (the young may or may not be independent of
20 the core nest site). Three visits to the nest sites may be necessary to determine outcome. Nests
21 that cannot be monitored due to the landowner denying access will be checked from a distance
22 where feasible.

23 If burrowing owl nests are discovered during the first year of post-construction raptor
24 nest surveys (the first raptor nesting season after construction is completed), the certificate holder
25 shall monitor those nest locations during the second year of surveys in the fourth year after
26 construction is completed. Thereafter, the certificate holder shall monitor all known burrowing
27 owl nest locations as a part of the long-term raptor nest monitoring program described in Section
28 2(d) below.

29 (b) Analysis

30 The certificate holder shall analyze the raptor nesting data collected after two survey
31 years to determine whether a reduction in either nesting success or nest use has occurred in the
32 vicinity of the LJF facility. If the analysis indicates a reduction in nesting success or nest use by
33 Swainson’s hawks, golden eagles, ferruginous hawks or burrowing owls within the facility site
34 or within 2 miles of the facility site, then the certificate holder shall propose appropriate
35 mitigation for the affected species as described in Section 2(c) and shall implement mitigation as
36 approved by the Council. At a minimum, if the analysis shows that any raptors of these species
37 have abandoned a nest territory within the facility site or within ½ mile of the facility site or has
38 not fledged any young over the two survey years within that same area, the certificate holder
39 shall assume the abandonment or unsuccessful fledging is due to operation of the facility unless
40 another cause can be demonstrated convincingly.

41 Any reduction in nesting success or nest use could be due to operation of the LJF facility,
42 operation of another wind facility in the vicinity or some other cause. The certificate holder shall
43 attribute the reduction to operation of the LJF if the wind turbine closest to the affected nest site

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 is an LJF turbine, unless the certificate holder demonstrates, and the Department agrees, that the
2 reduction was due to a different cause.

3 Given the low raptor nesting densities in the area, statistical power to detect a relationship
4 between distance from a wind turbine and nesting parameters (e.g., number of fledglings per
5 reproductive pair) will be very low. Therefore, impacts may have to be judged based on trends in
6 the data, results from other wind energy facility monitoring studies and literature on what is
7 known regarding the populations in the region.

8 (c) Mitigation

9 The certificate holder shall propose mitigation for the affected species in consultation
10 with the Department and ODFW and shall implement mitigation as approved by the Council. In
11 proposing appropriate mitigation, the certificate holder shall advise the Department if any other
12 wind project in the area is obligated to provide mitigation for a reduction in raptor nesting
13 success at the same nest site. Mitigation should be designed to benefit the affected species or
14 contribute to overall scientific knowledge and understanding of what causes nest abandonment or
15 nest failure. Mitigation may be designed to proceed in phases over several years. It may include,
16 but is not limited to, additional raptor nest monitoring, protection of natural nest sites from
17 human disturbance or cattle activity (preferably within the general area of the facility) or
18 participation in research projects designed to improve scientific understanding of the needs of the
19 affected species.

20 (d) Long-term Raptor Nest Monitoring and Mitigation Plan

21 In addition to the two years of post-construction raptor nest surveys described in Section
22 2(a), the certificate holder shall conduct long-term raptor nest surveys at five-year intervals for
23 the life of the facility.⁵ The certificate holder shall conduct the first long-term raptor nest survey
24 in the ninth year after construction is completed. In conducting long-term surveys, the certificate
25 holder shall follow the same survey protocols as described above in Section 2(a) unless the
26 certificate holder proposes an alternative protocol that is approved by the Department. In
27 developing an alternative protocol, the certificate holder shall consult with ODFW.

28 The certificate holder shall analyze the raptor nesting data collected after each year of
29 long-term raptor nest surveys to determine whether a reduction in either nesting success or nest
30 use has occurred in the vicinity of the LJF facility. If the analysis indicates a reduction in nesting
31 success or nest use by Swainson's hawks, golden eagles, ferruginous hawks or burrowing owls
32 within the facility site or within 2 miles of the facility site, then the certificate holder shall
33 propose appropriate mitigation for the affected species as described in Section 2(c) and shall
34 implement mitigation as approved by the Council. At a minimum, if the analysis shows that any
35 raptors of these species have abandoned a nest territory within the facility site or within ½ mile
36 of the facility site or has not fledged any young over the two survey years within that same area,
37 the certificate holder shall assume the abandonment or unsuccessful fledging is due to operation
38 of the facility unless another cause can be demonstrated convincingly.

39 Any reduction in nesting success or nest use could be due to operation of the LJF facility,
40 operation of another wind facility in the vicinity or some other cause. The certificate holder shall

⁵ As used in this plan, "life of the facility" means continuously until the facility site is restored and the site certificate is terminated in accordance with OAR 345-027-0110.

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 attribute the reduction to operation of LJF if the wind turbine closest to the affected nest site is an
2 LJF turbine unless the certificate holder demonstrates, and the Department agrees, that the
3 reduction was due to a different cause.

4 Given the low raptor nesting densities in the area, statistical power to detect a relationship
5 between distance from a wind turbine and nesting parameters (e.g., number of fledglings per
6 reproductive pair) will be very low. Therefore, impacts may have to be judged based on trends in
7 the data, results from other wind energy facility monitoring studies and literature on what is
8 known regarding the populations in the region.

9 **3. Washington ground squirrel surveys**

10 The certificate holder shall conduct long-term post-construction surveys to collect data on
11 Washington ground squirrel (WGS) activity within the lease boundary. A qualified professional
12 biologist will monitor the WGS sites identified during the pre-construction surveys (2005
13 through 2007) and the buffer area within 500 feet in all directions from the identified WGS sites
14 in suitable habitat. The certificate holder shall conduct surveys during the year following
15 construction and every three years thereafter for the life of the facility. Surveyors will walk
16 standard protocol-level transects twice between late March and late May and record level of use,
17 notes on natal sites and physical extent of the sites. Details of the post-construction WGS
18 monitoring are set forth in the Incidental Take Permit application as set forth in Attachment E of
19 the Final Order on the Application.

20 **4. Grassland Bird Study**

21 The grassland bird study is a 2-year, post-construction evaluation of grassland bird use in
22 the LJF area. Parts of the LJF facility occupy native habitat suitable for various ground-nesting
23 bird species that nest in grassland or open low shrub habitat. Grassland birds that were
24 documented on-site during baseline surveys conducted in 2006 included long-billed curlew,
25 grasshopper sparrow, savannah sparrow, Western meadowlark and horned lark. These species
26 are likely to nest on-site. Loggerhead shrikes may be present in the area but were not observed.

27 During the 2006 pre-construction surveys of the northern area of the LJF, the applicant
28 surveyed 57 transects. The transects were approximately 60-meters wide. They were searched
29 twice during the peak period of activity for the target species (March through May). Locations of
30 territorial male grasshopper sparrows were recorded with a GPS unit. GPS locations of
31 (assumed) paired long-billed curlews or approximate location of the pair's primary activity area
32 and locations of curlew nests were also recorded. Surveyors made notes on the general location
33 of special status grassland bird species observed in the area and on any observed behavior (for
34 example, nesting, staging, courtship, non-breeders foraging in loose groups).⁶ The surveyors
35 noted detections of common species in blocks of areas surveyed (several transects combined) but
36 did not record GPS locations or count the number of individuals present.

37 The objective of the post-construction grassland bird study is to determine if there are
38 noticeable changes in the presence and overall use by special status grassland bird species
39 compared to pre-construction data collected in 2006. By surveying a large area that includes the
40 undisturbed area between turbine strings, the study could provide information on whether

⁶ As used in this section, "special status grassland bird species" means grasshopper sparrows, long-billed curlews, loggerhead shrikes and burrowing owls.

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 operation of the LJF facility discourages use of the area by two indicator species: grasshopper
2 sparrows and long-billed curlews. In addition to focusing on the two indicator species, the post-
3 construction surveys will include observations of common species such as western meadowlark,
4 savannah sparrow and horned lark to provide information on the presence and distribution of
5 these species within the study area and their behavior relative to turbine locations. The phrase
6 “behavior relative to turbine locations” is intended to address observations of behavior that is
7 different near turbines compared behavior away from turbines.

8 (a) Study Area

9 The study area is located within the northern LJF lease boundary and covers
10 approximately 1,362 acres.⁷ For purposes of this discussion, the area north of Rattlesnake Road
11 is referred to as the “north study area,” and the area south of the road is referred to as the “south
12 study area.”

13 The north study area is bounded by the lease boundary on the northeast and west sides
14 and by Rattlesnake Road on the southeast side. The south study area is bounded by an existing
15 power line on the west and natural topography on the other sides. The north study area contains
16 two proposed turbine strings of up to 18 turbines (G 1-15 and H 1-3) and associated access roads
17 and transmission components. The south study area contains proposed access roads and one or
18 two turbines (H-10 and H-11). The south study area might include burrowing owl dens, but no
19 confirmed nests were discovered in the baseline surveys. The habitat in the north study area is
20 primarily shrub-steppe with grassland-like vegetation in a recovery stage (it is assumed that fire
21 disturbance has removed areas of mature shrubs). The south study area includes relatively flat
22 ground with some gentle slopes and a dry drainage. The habitat in the south study area is similar
23 to the habitat in the north study area and is relatively open grassland with some shrubs. Habitat
24 for both the north and south study areas is not highly variable and is representative of a large
25 portion of the remainder of the LJF North lease area.⁸

26 The study areas were selected because they are somewhat removed from human activity
27 (except low traffic use on facility access roads and one county road) and contain a large area of
28 grassland/shrub-steppe habitat (mapped as habitat sub-type “SSB”) that is not proposed to be
29 altered during project construction or operations.

30 (b) Survey Protocol

31 After completion of construction of the facility, the certificate holder shall survey the 57
32 transects that were searched before construction in 2006. Surveyors will collect data on the
33 indicator species (grasshopper sparrows and long-billed curlews) and other special status
34 grassland bird species. For all special status grassland bird species observed, the surveyors will
35 record the number of observations of these species and their GPS locations, using the same
36 methodology used in 2006. Special status grassland bird species that fly readily in the surveyor’s
37 presence will be tracked visually to attempt to determine defended territories and to limit
38 potential double-counting of individuals. Surveyors will record notes on the general location and
39 behavior of special status grassland bird species (for example, defensive responses, nesting,

⁷ Figure 1 (“Area to be studied for Grassland Birds during Operations Phase”), App Supp, Appendix C, Attachment 4.

⁸ Habitat types are shown in the site certificate application, Exhibit P, Figures P-1 and P-2.

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 staging, courtship, non-breeders foraging in loose groups). This plotted data will provide
2 information on the location of special status grassland bird species at distances near and far from
3 turbines and other facilities.

4 Surveyors will record notes on the location and abundance of common species. Abundant
5 common species that fly readily in the surveyor's presence will be tracked visually to avoid
6 double counting. Horned lark observations will be totaled for each survey area completed in one
7 survey day. The data on the relative abundance and distribution of common species will provide
8 information on the location of common species at distances near and far from turbines and other
9 facilities.

10 The certificate holder shall conduct the first year of post-construction grassland surveys
11 in the first spring following the beginning of commercial operation of the LJF facility. The
12 certificate holder shall conduct a second year of grassland surveys two to five years after the first
13 survey. The certificate holder will determine when the second survey will be done, in
14 consultation with ODFW and subject to approval by the Department, based on the restoration of
15 grassland cover in areas disturbed during facility construction.

16 In each survey year, surveyors will complete two walking transect surveys of the north
17 and south study areas (one in April and one in May). A third visit to specific potential burrowing
18 owl dens (based on 2006 data and any newly discovered sites) will be conducted during the
19 period from late May to early July, if the surveyor determines a third visit is needed to confirm
20 use by burrowing owls. The April and May time period includes the seasonal period of staging
21 (pre-nesting) of long-billed curlews (April), the major period of territorial calling of grasshopper
22 sparrows (May) and the nesting period for long-billed curlews and other species (May).

23 (c) Data Analysis and Reporting

24 After the first survey year, the certificate holder shall submit a preliminary summary
25 report to the Department. After the second survey year, the certificate holder shall submit a more
26 comprehensive final report. The certificate holder shall submit maps for each survey year,
27 showing transects walked and specific areas of use by the indicator species, other special status
28 grassland bird species and common species (except horned larks). The certificate holder shall
29 overlay a grid system on the mapped "as-built" locations of facility components within the study
30 areas. Using the grid system, the certificate holder shall describe the survey results by area and
31 distance from turbines.

32 The reports will include a description of vegetation compared to pre-construction
33 conditions as recorded in 2006, including notes on any changes in land use by the landowner,
34 wildfire influences and grazing and noting any areas of intense vegetation impact. Vegetation
35 communities will be sampled by the transect method and a description of plant communities will
36 be provided for each survey year.

37 The certificate holder shall report on observed changes in use by the indicator species.
38 For example, the report will compare the locations and numbers of grasshopper sparrows plotted
39 during the pre-construction surveys in the north study area to the locations and numbers of this
40 species plotted during the post-construction survey years. The certificate holder shall report on
41 the location of any burrowing owls observed during the transect searches or subsequent visits
42 made to confirm use. The certificate holder shall analyze the locations for all special status

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 grassland bird species (using GPS data) and common species (except horned larks) to calculate
2 distance from turbines or other facilities.⁹

3 The certificate holder shall evaluate the data to determine if there are changes in the use
4 of the study areas by the two indicator species before and after construction. In addition, the
5 certificate holder shall evaluate the data to determine if there is noticeable difference in the
6 distribution, abundance or behavior of special status grassland bird species or common species
7 relative to turbine locations.

8 **5. PPM Energy's Leaning Juniper II Wildlife Reporting and Handling System**

9 PPM Energy's LJF Wildlife Reporting and Handling System (WRHS) is a monitoring
10 program to search for and handle avian and bat casualties found by maintenance personnel
11 during operation of the facility. Maintenance personnel will be trained in the methods needed to
12 carry out this program. This monitoring program includes the initial response, the handling and
13 the reporting of bird and bat carcasses discovered incidental to maintenance operations
14 ("incidental finds").

15 All avian and bat carcasses discovered by maintenance personnel will be photographed
16 and the data recorded as would be done for carcasses within the formal search sample during
17 scheduled searches. If maintenance personnel discover incidental finds, the maintenance
18 personnel will notify a project biologist. The project biologist must be a qualified independent
19 professional biologist who is not an employee of the certificate holder. The project biologist (or
20 the project biologist's experienced wildlife technician) will collect the carcass or will instruct
21 maintenance personnel to have an on-site carcass handling permittee collect the carcass. The
22 certificate holder's on-site carcass handling permittee must be a person who is listed on state and
23 federal scientific or salvage collection permits and who is available to process (collect) the find
24 on the day it is discovered. The find must be processed on the same day as it is discovered.

25 During the years in which fatality monitoring occurs, if maintenance personnel discover
26 incidental finds outside the search plots for the fatality monitoring searches, the data will be
27 reported separately from fatality monitoring data. If maintenance personnel discover carcasses
28 within search plots, the data will be included in the calculation of fatality rates. The maintenance
29 personnel will notify a project biologist. The project biologist will collect the carcass or will
30 instruct maintenance personnel to have an on-site carcass handling permittee collect the carcass.
31 As stated above, the on-site permittee must be available to process the find on the day it is
32 discovered. The certificate holder shall coordinate collection of state endangered, threatened,
33 sensitive or other state protected species with ODFW. The certificate holder shall coordinate
34 collection of federally-listed endangered or threatened species and Migratory Bird Treaty Act
35 protected avian species with the USFWS.

36 **6. Data Reporting**

37 The certificate holder will report wildlife monitoring data and analysis to the Department.
38 Monitoring data include fatality monitoring program data, raptor nest survey data, WGS survey
39 data, grassland bird study data and WRHS data. The certificate holder may include the reporting
40 of wildlife monitoring data and analysis in the annual report required under OAR 345-026-0080

⁹ Data on common species cannot be compared to preconstruction data because the 2006 surveys did not record the location or abundance of these species by transect line. GPS data will not be collected for common species.

Leaning Juniper II Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 21, 2007]

1 or submit this information as a separate document at the same time the annual report is
2 submitted. In addition, the certificate holder shall provide to the Department any data or record
3 generated in carrying out this monitoring plan upon request by the Department.

4 The certificate holder shall notify USFWS and ODFW immediately if any federal or state
5 endangered or threatened species are killed or injured on the facility site.

6 The public will have an opportunity to receive information about monitoring results and
7 to offer comment. Within 30 days after receiving the final versions of reports that are required
8 under this plan, the Department will make the reports available to the public on its website and
9 will specify a time in which the public may submit comments to the Department.¹⁰

10 **7. Amendment of the Plan**

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

¹⁰ 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.